PROJECT MANUAL

FINAL DOCUMENTS

PROJECT:
SRO OFFICES - WARHAWK FIELDHOUSE MODIFICATIONS
MCDONOUGH, GEORGIA

LOCAL EFFORT

CLIENT:
HENRY COUNTY SCHOOLS
MCDONOUGH, GEORGIA

PBK PROJECT NO: 250306

DATE: 2026-06-18

525 EAST TAYLOR STREET POST OFFICE BOX 880 GRIFFIN, GA 30223 TELEPHONE 770.227.5473

This page intentionally left blank

SECTION 000101 - PROJECT TITLE PAGE

PROJECT MANUAL
FOR

SRO OFFICES - WARHAWK FIELDHOUSE MODIFICATIONS
MCDONOUGH, GEORGIA

HENRY COUNTY SCHOOLS
MCDONOUGH, GEORGIA

ARCHITECT'S PROJECT NUMBER: 250306

PBK ARCHITECTS GEORGIA, P.C.
525 EAST TAYLOR STREET
GRIFFIN, GEORGIA 30223
PHONE: 770-227-5473
WEB SITE: PBK.COM

ISSUED: 2026-06-18

COPYRIGHT © 2026 PBK. ALL RIGHTS RESERVED.

END OF SECTION 000101

This page intentionally left blank

SECTION 000107.1 - SEALS PAGE - ARCHITECT

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - ARCHITECT OF RECORD

Name and Georgia License No.: Brett R. McIver, RA 9020
Firm Name:PBK Architects Georgia, P.C.
Firm Address:
525 East Taylor Street
Griffin,Georgia 30223
770-227-5473

Divisions 1 - 14 & 31 Sections except where indicated as prepared by other design professionals of record.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 000107.1

This page intentionally left blank

SECTION 000107.2 - SEALS PAGE - CIVIL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - CIVIL

Name and Georgia License No.: Don L. Carter, No. 18064
Firm Name: Carter Engineering Group
Firm Address:
6310 Peake Rd, Suite 200
Macon, GA 31210
(478) 219-2600

Divisions 31-33 Sections except
where indicated as prepared by other
design professionals of record.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 000107.2

This page intentionally left blank

SECTION 000107.3 - SEALS PAGE - STRUCTURAL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - STRUCTURAL

Name and Georgia License No.: Srikanth Bajaj. SE000368
Firm Name: Kubala Engineers
Firm Address:
5019 W Broad St NE Suite M223
Sugar Hill, GA 30518
(770) 227-5473

Divisions 3, 4 and 5 Sections except
where indicated as prepared by other d
design professionals of record.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 000107.3

This page intentionally left blank

SECTION 000107.4 - SEALS PAGE - MECHANICAL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - MECHANICAL ENGINEER OF RECORD

Name and Georgia License No.: James A. Andrews, No. 17029

Firm Name: Andrews, Hammock and Powell

Firm Address:

250 Charter Lane Suite 100
Macon, GA 31210
(478) 405-8301

Divisions 21, 22 ,and 23 Sections except where indicated as prepared by other design professionals of record.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 000107.4

This page intentionally left blank

SECTION 000107.5 - SEALS PAGE - ELECTRICAL

PART 1 GENERAL

1.1 DESIGN PROFESSIONAL - ELECTRICAL ENGINEER OF RECORD

Name and Georgia License No.: James A. Andrews, No. 17029
Firm Name: Andrews, Hammock and Powell
Firm Address:
250 Charter Lane Suite 100
Macon, GA 31210
(478) 405-8301

Divisions 26, 27 and 28 Sections except where indicated as prepared by other design professionals of record.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 000107.5

This page intentionally left blank

SECTION 000110 - TABLE OF CONTENTS

BIDDING REQUIREMENTS, CONTRACT REQUIREMENTS, SITE CONSTRUCTION AND TECHNICAL SPECIFICATION DIVISIONS 3-33

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

000101	PROJECT TITLE PAGE	2
000107.1	SEALS PAGE - ARCHITECT	2
000107.2	SEALS PAGE - CIVIL	2
000107.3	SEALS PAGE - STRUCTURAL	2
000107.4	SEALS PAGE - MECHANICAL	2
000107.5	SEALS PAGE - ELECTRICAL	2
000110	TABLE OF CONTENTS	6
000115	LIST OF DRAWING SHEETS	2
001113	INVITATION TO BID	2
002113	INSTRUCTIONS TO BIDDERS	8
003121.20	EXISTING CONDITION INFORMATION	8
004113	BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)	2
004313	BID SECURITY FORMS	2
004321	ALLOWANCE FORM	2
004322	UNIT PRICES FORM	2
005213	AGREEMENT BETWEEN OWNER AND CONTRACTOR	10
006000	PROJECT FORMS	2
006113	PERFORMANCE AND PAYMENT BONDS	14
006127	GEORGIA SECURITY AND IMMIGRATION ACT	2
006127.10	CONTRACTOR AFFIDAVIT AND AGREEMENT	2
006128	COMPETITIVE AWARD AFFIDAVIT	2
006128.10	COMPETITIVE AWARD AFFIDAVIT FORM	2
006313	REQUEST FOR INFORMATION	2
007213	GENERAL CONDITIONS	54

DIVISION 01 - GENERAL REQUIREMENTS

011000	SUMMARY	4
012100	ALLOWANCES	4
012200	UNIT PRICES	2
012600	CONTRACT MODIFICATION PROCEDURES	2
012900	PAYMENT PROCEDURES	16
013100	PROJECT MANAGEMENT AND COORDINATION	8
013200	CONSTRUCTION PROGRESS DOCUMENTATION	6
013300	SUBMITTAL PROCEDURES	10
014000	QUALITY REQUIREMENTS	8
014200	REFERENCES	16
015000	TEMPORARY FACILITIES AND CONTROL	4
016000	PRODUCT REQUIREMENTS	4
017300	EXECUTION	8
017700	CLOSEOUT PROCEDURES	4

017823 OPERATION AND MAINTENANCE DATA 6
017839 PROJECT RECORD DOCUMENTS 4
017900 DEMONSTRATION AND TRAINING 4

DIVISION 02 - EXISTING CONDITIONS
024119-A SELECTIVE DEMOLITION 6

DIVISION 03 - CONCRETE
030580 UNDER-SLAB VAPOR BARRIER 2
031000 CONCRETE FORMING AND ACCESSORIES 10
032000 CONCRETE REINFORCING 6
033000 CAST-IN-PLACE CONCRETE 18
033519 STAINED CONCRETE FINISHING 4

DIVISION 04 - MASONRY
040110 MASONRY CLEANING 6
042000 UNIT MASONRY 14
047200 CAST STONE MASONRY 4
047314 MANUFACTURED ARCHITECTURAL STONE MASONRY 4

DIVISION 05 - METALS
054000 COLD-FORMED METAL FRAMING 8
055000 METAL FABRICATIONS 6
055213 PIPE AND TUBE RAILINGS 6

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
061000 ROUGH CARPENTRY 6
061600 SHEATHING 4
062026 INTERIOR FINISH CARPENTRY 4
064113 WOOD-VENEER-FACED ARCHITECTURAL CABINETS 6

DIVISION 07 -THERMAL AND MOSITURE PROTECTION
070150.19 PREPARATION FOR REROOFING 4
072100 THERMAL INSULATION 4
072726 FLUID-APPLIED MEMBRANE AIR BARRIERS 8
074293 METAL SOFFIT PANELS 6
075423 THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING 8
075423.1 ROOFING INSTALLER'S WARRANTY 2
077100 ROOF SPECIALTIES 8
078413 PENETRATION FIRESTOPPING 6
078443 JOINT FIRESTOPPING 6
079200 JOINT SEALANTS 8

DIVISION 08 - OPENINGS
081213 HOLLOW METAL FRAMES 6

081416 FLUSH WOOD DOORS 4
081613 FIBERGLASS REINFORCED POLYESTER DOORS 4
083113 ACCESS DOORS AND FRAMES 4
084113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS 8
085659 SERVICE AND TELLER WINDOW UNITS 4
087100 DOOR HARDWARE 26
088000 GLAZING 8

DIVISION 09 - FINISHES
092216 NON-STRUCTURAL METAL FRAMING 6
092900 GYPSUM BOARD 6
093013 CERAMIC TILING 8
095113 ACOUSTICAL PANEL CEILINGS 6
096513 RESILIENT BASE AND ACCESSORIES 4
096519 RESILIENT TILE FLOORING 4
096810 COMPOSITE MODULAR TEXTILES 4
099113 EXTERIOR PAINTING 6
099123 INTERIOR PAINTING 8

DIVISION 10 - SPECIALTIES
101100 VISUAL DISPLAY UNITS 4
101416 PLAQUES 4
101423 PANEL SIGNAGE 4
102800 TOILET, BATH, AND LAUNDRY ACCESSORIES 4
104413 FIRE EXTINGUISHER CABINETS 4
104416 FIRE EXTINGUISHERS 2
105113 METAL EVIDENCE LOCKERS 2
107326 WALKWAY COVERINGS 4
107516 GROUND-SET FLAGPOLES 4

DIVISION 12 - FURNISHINGS
122413 ROLLER WINDOW SHADES 4
123623.13 PLASTIC-LAMINATE-CLAD COUNTERTOPS 4

DIVISION 22 - PLUMBING
220513 COMMON REQUIREMENTS FOR PLUMBING EQUIPMENT 8
220514 CLOSEOUT DOCUMENTS FOR PLUMBING 4
220519 METERS AND GAGES FOR PLUMBING PIPING 2
220523 GENERAL-DUTY VALVES FOR PLUMBING PIPING 2
220529 HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT 8
220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT 2
220716 PLUMBING EQUIPMENT INSULATION 4
221116 DOMESTIC WATER PIPING 6
221119 DOMESTIC WATER PIPING SPECIALTIES 2
221316 SANITARY WASTE AND VENT PIPING 6
221319 SANITARY WASTE PIPING SPECIALTIES 4

221423 FACILITY NATURAL-GAS PIPING 6
223300 ELECTRIC, DOMESTIC-WATER HEATERS 4
224000 PLUMBING FIXTURES 6

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
230513 COMMON REQUIREMENTS FOR HVAC EQUIPMENT 10
230514 CLOSEOUT DOCUMENT REQUIREMENTS FOR HVAC 2
230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT 6
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT 2
230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC 6
230716 HVAC EQUIPMENT INSULATION 4
230900 INSTRUMENTATION AND CONTROL FOR HVAC 6
232113 HYDRONIC PIPING 4
232300 REFRIGERANT PIPING 4
233113 METAL DUCTS 6
233300 AIR DUCT ACCESSORIES 8
233423 HVAC POWER VENTILATORS 2
233713 DIFFUSERS, REGISTERS, AND GRILLES 2
234100 PARTICULATE AIR FILTRATION AND BI-POLAR IONIZATION UNITS 4
238119 SELF-CONTAINED AIR-CONDITIONERS 6
238126 SPLIT-SYSTEM AIR-CONDITIONERS 4
238240 ELECTRIC HEATERS 2

DIVISION 26 - ELECTRICAL
260500 COMMON WORK RESULTS FOR ELECTRICAL 6
260501 ELECTRICAL DEMOLITION FOR REMODELING 2
260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES 4
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS 4
260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS 4
260533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS 12
260537 CABLE HOOK SUPPORT SYSTEM 2
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS 6
260941 DIGITAL LIGHTING CONTROLS 6
260943 BUILDING LIGHTING CONTROLS 8
262410 SERVICE ENTRANCE 2
262416 PANELBOARDS 6
262726 WIRING DEVICES 6
262813 FUSES 2
262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS 4
263213 ENGINE GENERATORS 8
263600 TRANSFER SWITCHES 6
265100 INTERIOR LIGHTING 4

DIVISION 27 - COMMUNICATIONS
270500 COMMON WORK RESULTS FOR COMMUNICATIONS 4
271301 VOICE AND DATA COMMUNICATION CABLING 18

274133 INTERACTIVE AUDIO VISUAL AND IPTV VIDEO ON DEMAND SYSTEMS 12

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY
280500 COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY 6
281300 SECURITY ACCESS 18
282300 VIDEO SURVEILLANCE 10
283110 FIRE ALARM SYSTEM 10

DIVISION 31 - EARTHWORK
311111 SITE CLEARING 6
312300 EARTHWORK 12
312315 ROCK REMOVAL 4
312500 EROSION, SILTATION AND DUST CONTROL 4
313116 TERMITE CONTROL 4

DIVISION 32 - EXTERIOR IMPROVEMENTS
321313 CONCRETE PAVING, SIDEWALKS & CURB AND GUTTERS 4
321316 ASPHALT CONCRETE PAVING 4
323113 CHAIN LINK FENCES AND GATES 8
329000 LANDSCAPE WORK 8
329210 FINISHING LAWN AND LANDSCAPE AREAS 4

DIVISION 33 - UTILITIES
331116 SITE WATER DISTRIBUTION AND FIRE PROTECTION 10
333313 SITE SANITARY SEWER CONSTRUCTION 10
334116 STORM DRAINAGE 8

END OF SECTION 000110

This page intentionally left blank

SECTION 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS: DRAWINGS CONSIST OF THE FOLLOWING CONTRACT DRAWINGS:

ARCHITECTURAL GENERAL
G-000 COVER SHEET

CIVIL
C1.1 OVERALL SITE PLAN
C2.1 SITE SURVEY AND DEMOLITION PLAN
C3.1 SITE LAYOUT AND PAVING PLAN
C4.1 SITE GRADING AND DRAINAGE PLAN
C5.1 SITE WATER AND SANITRY SEWER PLAN
C6.1 SOIL EROSION AND SEDIMENT CONTROL PLAN
C6.2 SOIL EROSION AND SEDIMENT CONTROL NOTES
C6.3 SOIL EROSION AND SEDIMENT CONTROL DETAILS
C7.1 MISCELLANEOUS SITE DETAILS
C7.2 MISCELLANEOUS SITE DETAILS
L1.1 LANDSCAPE PLAN
L1.2 LANDSCAPE NOTES AND DETAILS

ARCHITECTURAL GENERAL
G-121 LIFE SAFETY PLAN

ARCHITECTURAL SITE
AS-101 ARCHITECTURAL SITE PLAN
AS-102 ALUMINUM WALKWAY CANOPY DETAILS

ARCHITECTURAL DEMOLITION
AD-101 DEMOLITION PLAN

ARCHITECTURAL
A-101 FLOOR PLAN
A-111 DIMENSION FLOOR PLAN
A-201 REFLECTED CEILING PLAN & DETAILS
A-301 ROOF PLAN & DETAILS
A-401 ENLARGED TOILET PLANS
A-501 EXTERIOR ELEVATIONS
A-601 BUILDING & WALL SECTIONS
A-801 DOOR SCHEDULE & DETAILS
A-802 PARTITION TYPES
A-901 FINISH PLAN
A-902 MILLWORK ELEVATIONS & DETAILS

ARCHITECTURAL GRAPHICS

AG051 SIGNAGE GRAPHIC STANDARDS

STRUCTURAL

S-010 GENERAL NOTES
S-011 GENERAL NOTES
SD-101 DEMO PLAN
S-101 FOUNDATION PLAN
S-102 ROOF FRAMING PLAN
S-300 GENERAL CONCRETE AND STL REINF NOTES AND TYP DETAILS
S-301 GENERAL SLAB-ON-GRADE NOTES AND TYP DETAILS
S-302 FOUNDATION DETAILS
S-400 GENERAL CMU NOTES AND TYP DETAILS
S-401 GENERAL CMU NOTES AND TYP DETAILS
S-402 MISC CMU DETAILS
S-501 GENERAL EXISTING FRAMING NOTES AND TYP DETAILS

PLUMBING

PD-101 PLUMBING OVERALL DEMOLITION PLAN
P-101 PLUMBING FLOOR PLAN - WATER PIPING
P-102 PLUMBING FLOOR PLANS - WASTE PIPING
P-201 PLUMBING WATER RISER
P-202 PLUMBING WASTE RISER
P-301 PLUMBING SCHEDULES, LEGEND, AND DETAILS

MECHANICAL

MD-101 MECHANICAL DEMOLITION FLOOR PLAN
M-101 MECHANICAL NEW WORK FLOOR PLAN
M-501 MECHANICAL DETAILS
M-502 MECHANICAL DETAILS
M-601 MECHANICAL SCHEDULES, LEGEND & GENERAL NOTES

ELECTRICAL

E001 ELECTRICAL SITE PLAN
E101 ELECTRICAL LIGHTING AND POWER FLOOR PLAN
E201 ELECTRICAL LOW VOLTAGE AND MECHANICAL POWER FLOOR PLAN
E801 ELECTRICAL PANELS AND SCHEDULES
E802 ELECTRICAL DETAILS AND LEGEND

END OF SECTION 000115

SECTION 001113 - INVITATION TO BID

Sealed bids from General Contractors will be received by Henry County Board of Education Administrative Office Annex, 396 Tomlinson Street, McDonough, Georgia 30253 until **3:00 P.M**., Prevailing Time, **August 13, 2026,** for **SRO Offices - Warhawk Fieldhouse Modifications, Henry County, Georgia.** At the time and place noted above, the bids for the Project will be publicly opened and read.

A non-mandatory Pre-Bid Conference will be held July 30, 2026, at 1:00 P.M. at the Henry County Board of Education located at 396 Tomlinson Street, McDonough, Georgia.

Electronic bidding documents may be obtained at the office of the PBK Architects Georgia, P.C., 525 East Taylor Street, P.O. Box 880, Griffin, Georgia30223. Registration for documents, together with non-refundable deposit of $250.00 should be filed promptly with the Architects. A share file link for accessing PDFs of bid documents will be emailed as soon as possible. Only bids received from Contractors registered with the Architect will be accepted.

Bidding Documents may be examined at the following location(s):

a. **Construct Connect c/o CMD Attn: DPC**
   800-364-2059

b. **Dodge Data & Analytics**
   413-507-3179

c. **PBK Architects Georgia, P.C.**
   770-227-5473

Only a bid submitted by a Bidder on record with the Architect as having received plans and specifications from the Architect will be opened.

The contract, if awarded, will be on a lump sum basis. No bid may be withdrawn for a period of 60 days after time has been called on date of opening. Bids must be accompanied by a Bid Bond in an amount not less than 5% of the Base Bid. Both a Performance and a Payment Bond will be required in an amount equal to 100% of the Contract Price. The Owner reserves the right to reject any or all bids and to waive technicalities.

For: Henry County Board of Education

By: Dr. John Pace III, Superintendent

END OF SECTION 001113

This page intentionally left blank

SECTION 002113 - INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

AIA Document A701, "Instructions to Bidders," as edited is hereby incorporated into the Procurement and Contracting Requirements.

A copy of AIA Document A701, "Instructions to Bidders," as edited is bound in this Project Manual at the end of this document.

END OF SECTION (WITH EXCEPTION OF DOCUMENT) 002113

This page intentionally left blank

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

SRO Offices - Warhawk Fieldhouse Modifications
47 Lemon Street
McDonough, GA 30253

THE OWNER:
(Name, legal status, address, and other information)

Henry County Board of Education
33 North Zack Hinton Parkway
McDonough, Georgia 30253

THE ARCHITECT:
(Name, legal status, address, and other information)

PBK Architects Georgia, P.C.
525 East Taylor Street
Griffin, GA 30223

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

1.2.1 The parties agree that any contradiction in terms and provisions of the Bidding Documents and the actual AIA Contract and its Addenda shall be resolved by following the provisions or terms in the AIA Contract.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

.1 the Bidder has read and understands the Bidding Documents;

.2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;

.3 the Bid complies with the Bidding Documents;

.4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;

2.1.4.1 Visiting the Site: Any bidder that would like to visit the site(s) for the purpose of familiarizing themselves with existing conditions must first contact Michael Felgenhauer, Facility Supervisor, Henry County Schools at 770-957-1891.

2.1.4.2 If soil and subsurface investigations were conducted at the site, a copy of the report is available upon written request from the Henry County Board of Education. The report is not a part of the bid documents, construction documents or contract documents. Such information is provided for the purpose of disclosure only, and shall not relieve the Contractor from its obligation to investigate the soil and subsurface conditions. The accuracy or completeness of the data is not guaranteed by the Owner or the Architect, and neither the Owner nor the Architect shall be responsible or accept any liability therefore. The Contractor shall not rely on such subsurface information. Bidders shall make their own

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

investigation of subsurface conditions. Any interpretations, conclusions, beliefs and use of this report by the bidders in preparing your bid is purely a decision made at your our risk. Neither the Owner nor the Architect will be responsible in any way for additional compensation because of the reliance on or assumptions based on the soil investigation data furnished with the Bidding Documents.

.5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and

.6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, , from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Paragraphs deleted)

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least eight days prior to the date for receipt of Bids.
(Paragraphs deleted)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

3.3.1 Substitutions are not acceptable and will not be considered.

(Paragraphs deleted)

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted via E-Mail to Bidders known by the issuing office to have received complete Bidding Documents.
(Paragraphs deleted)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than 72 hours prior to the date for receipt of Bids, excluding Saturdays, Sundays, and legal holidays. However, if necessity arises to issue an Addendum within the 72 hour period prior to date or receipt

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

of bids excluding Saturdays, Sundays, and legal holidays, then the opening of bids shall be extended at least 72 hours, excluding Saturdays, Sundays, and legal holidays, from the date of original bid..

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:
(Paragraph deleted)
4.2.1.1 The Bid Bond shall be in the amount of no less than 5% of the Base Bid.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

§ 4.2.3 The Surety Bond shall be written on AIA Document A310™, Bid Bond. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies as follows:

4.2.3.1 Acceptable Surety Companies: Only surety companies holding certificates of authority as acceptable sureties on federal bonds and are listed in the latest edition of The Federal Register, Part II, U.S. Department of the Treasury Notices and are listed in the notices as holding surety licenses in the State of Georgia, will be acceptable as sureties for the Project.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning60 days after the opening of Bids, withdraw its Bid and request the return of its bid security.

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated
(Paragraphs deleted)
in the Invitation to Bid:

§ 4.3.2 One original Bid Form, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

4.3.2.1 Envelope notations initialed by the Bidder that modify the sealed Bid will be read aloud and considered part of the Bid.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be
(Paragraphs deleted)
returned.

ARTICLE 5 CONSIDERATION OF BIDS

(Paragraphs deleted)

§5.1 Only a bid submitted by a Bidder on record with the Architect as having received plans and specifications from the Architect will be opened.

§5.2Opening of Bids

Bids properly identified and received within the specified time limits will be publicly opened and read aloud.

§ 5.3 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

(Paragraphs deleted)

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

§ 5.4 Acceptance of Bid (Award)

§ 5.4.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§5.4.2 The Owner may use Deductive Alternates to reduce the Base Bid on the Project; however, the Alternates will be considered in numerical sequence and accepted in that order.

§5.4.3 The Owner will not use Additive Alternates to determine the low Bidder on the Project. Low Bidder shall be determined on the Base Bid less any Deductive Alternates. Additive Alternates may be exercised in any order and shall be considered only after the low Bidder has been declared.

§5.4.4 It is to be understood that if the same combination of Deductive Alternates accepted for all Bidders results in a different low Bidder than that received on the Base Bid, such new low Bidder will become the low Bidder of record for the purpose of further negotiation and/or for the award of the Contract.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

(Paragraphs deleted)

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 The requirements for Performance and Payment Bonds are provided in the General Conditions of the Contract for Construction and are included in Document 006113 "Performance and Payment Bonds."

(Paragraphs deleted)

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.
(Table deleted)(Paragraphs deleted)(Paragraphs deleted)

AIA Document A701 – 2018. Copyright © 1970, 1974, 1978, 1987, 1997 and 2018. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:33:27 on 02/27/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (1915963439)

SECTION 003121.20 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. An existing roof evaluation report per the project, prepared by BEAM Professionals, dated December 04, 2025, is appended to this document.

C. Related Requirements:
   1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF SECTION 003121.20

This page intentionally left blank

HCS SRO OFFICES ASSESSMENT REPORT

Observation Report No.: 1 **Date:** 12/04/2025

Time (arrived): 10:00 AM **(departed):** 11:00 AM **Total Hours:** 1

Project: HCS SRO Offices- 47 Lemon St, McDonough, GA 30253

Project Number:

General Contractor: N/A **Roof Contractor:** N/A

Weather Conditions: ( ) Sunny (✓) Cloudy ( ) Windy ( ) Rain ( ) Drizzle (✓) Temperature: 42°

General Information:

Crew Size: Roofing – Sheet Metal - Waterproofing - Other -

Wall System Type: CMU with Brick Exterior

System Type/Manufacturer: Spray Foam over Built-Up Roofing

Attachment Type: Bitumen - Adhesive - Mechanical - Other -

Production Information: Fill in product info with a check (☑) box as needed.

☐	Deck Replacement:	Sq. Ft.:	Roof Area:
☐	Deck Repair:	Sq. Ft.:	Roof Area:
☐	Deck Coat:	Sq. Ft.:	Roof Area:
☐	Tear-Off:	Sq. Ft.:	Roof Area:
☐	Installation:	Sq. Ft.:	Roof Area:
☐	Metal Roof / Wall Panels:	Sq. Ft.:	Roof Area:
☐	Surfacing:		Roof Area:
☐	Detailing:		Roof Area:
☐	Sheet Metal:		Roof Area
☐	Misc.: Crew was not on site		Roof Area

Current Project Status / Notes:

Roofing is a spray foam with embedded granule over built-up roofing. Roofing is in poor condition, with several holes in spray foam. Previous patching falling apart. Core samples consisted of varying depths of spray foam, over 3 plys of fiberglass matting BUR, over 1.5 inches of perlite insulation, over metal decking that is structurally sloped 1/4" per foot.

5201 W Kennedy Blvd, Suite 515 \\ Tampa, Florida 33609 \\ P 813-286-8206 \\ BEAMProf.com

Observation Date	OR# - item#	Photo(s)	Description
12/04/2025	01-01		Location: East Elevation Orientation: Facing West Observation: Overview Overview
12/04/2025	01-02		Location: East Elevation Orientation: Facing Southwest Observation: Overview Overview
12/04/2025	01-03		Location: South Elevation Orientation: Facing Northeast Observation: Overview Overview
12/04/2025	01-04		Location: Fieldhouse Orientation: Facing South Observation: Overview Overview

Observation Date	OR# - item#	Photo(s)	Description
12/04/2025	01-05		Location: Fieldhouse Orientation: Facing South Observation: Overview Overview
12/04/2025	01-06		Location: Fieldhouse Orientation: Observation: Previous patch of spray foam degrading/opening.
12/04/2025	01-07		Location: Fieldhouse Orientation: Facing West Observation: Two HVAC units. One inoperable. Exposed wood at base of curb.
12/04/2025	01-08		Location: Fieldhouse Orientation: Facing Southwest Observation: HVAC unit curbing with degrading spray foam and exposed wood.

5201 W Kennedy Blvd, Suite 515 \\ Tampa, Florida 33609 \\ P 813-286-8206 \\ BEAMProf.com

Observation Date	OR# - item#	Photo(s)	Description
12/04/2025	01-09		Location: Fieldhouse Orientation: Facing West Observation: Holes in spray foam with vegetation growing inside.
12/04/2025	01-10		Location: Fieldhouse Orientation: Observation: Many holes observed in spray foam allowing moisture intrusion.
12/04/2025	01-11		Location: Fieldhouse Orientation: Observation: Multiple locations of spray foam patching that are separating and opening again.
12/04/2025	01-12		Location: Fieldhouse Orientation: Facing East Observation: Inoperable HVAC unit.

Observation Date	OR# - item#	Photo(s)	Description
			Location: Fieldhouse at Breezeway Canopy Orientation: Facing West Observation: Downspout from breezeway too low to allow splash pad installation.
			Location: West Elevation Orientation: Observation: Drip edge metal rusting inside of gutter.
			Location: West Elevation Orientation: Typical / Throughout Observation: Slight damage to downspouts and gutters around building.
			Location: Core Sampling Orientation: Observation: Top to bottom: Coated spray foam with embedded granules. BUR with 3 plys of fiberglass matting. 1.5" Perlite insulation board. Metal decking with structural slope.

5201 W Kennedy Blvd, Suite 515 \\ Tampa, Florida 33609 \\ P 813-286-8206 \\ BEAMProf.com

Observation Date	OR# - item#	Photo(s)	Description
			Location: Core Sampling Orientation: Observation: Top to bottom: Coated spray foam with embedded granules. BUR with 3 plys of fiberglass matting. 1.5" Perlite insulation board. Metal decking with structural slope.
			Location: Core Sampling Orientation: Observation: Spray foam of various depths. 1 and 1.5-inch depths at sample locations (2).
			Location: Core Sampling Orientation: Observation: Patching of core samples.
			Location: Fieldhouse North Eave Orientation: Observation: Slope from bottom of north side fascia metal. Slope appears to be greater than 0.3/12 slope.

SECTION 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: SRO Offices - Warhawk Fieldhouse Modifications.

C. Project Location: 47 Lemon Street, McDonough, Georgia.

D. Owner: Henry County Schools.

1.2 ARCHITECT: PBK ARCHITECTS GEORGIA, P.C..

A. Architect Project Number: 250306.

1.3 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by PBK and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____Dollars ($_____) which sum is hereinafter called the base bid.

B. For and in consideration of the sum of $1.00, the receipt of which is hereby acknowledged, the undersigned agrees that this bid may not be revoked or withdrawn after the time set for the opening of bids, but shall remain open for acceptance for a period of sixty (60) days following such time.

1.4 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 5 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the bid bond.

1.5 CONTRACT AND PERFORMANCE AND PAYMENT BONDS

A. In case he be notified in writing by mail, telegraph, or delivery of the acceptance of this bid within sixty (60) days after the time set for opening of bids, the undersigned agrees to execute within five (5) days a Contract (AIA Standard Form of Agreement Between Owner and Contractor, A101-2017) for the work for the above stated compensation and at the same time to furnish and deliver to the Owner a Performance Bond and a Payment Bond as specified both in the amount of 100% of the Contract Sum.

1.6 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Owner, and to substantially complete all work on or before **October 11, 2027.** The undersigned further agrees that liquidated damages in accordance with the General Conditions of the Contract shall apply if substantial completion is not achieved by the date indicated above.

1.7 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of Addendum(a) No.(s) _____ in the preparation of this Bid:

1.8 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.

1.9 BID FORM SUPPLEMENT - BID BOND FORM (AIA DOCUMENT A310).

1.10 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, for this project.

1.11 SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 20_____.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

F. Witness By:_____(Handwritten signature).

G. Attest:_____(Handwritten signature).

H. By:_____(Type or print name).

I. Title:_____(Corporate Secretary or Assistant Secretary).

J. Street Address:_____.

K. City, State, Zip:_____.

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here).

END OF SECTION 004113

SECTION 004313 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the form for a bid bond. A bid bond as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; www.aia.org/contractdocs/purchase/index.htm; email: docspurchases@aia.org; (800) 942-7732.

END OF SECTION 004313

This page intentionally left blank

SECTION 004321 - ALLOWANCE FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: SRO Offices - Warhawk Fieldhouse Modifications.

C. Project Location: 47 Lemon Street,McDonough, Georgia 30253.

D. Owner: Henry County Schools.

E. Architect: PBK Architects Georgia, P.C..

F. Architect Project Number: 250306.

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. The undersigned Bidder certifies that Base Bid submission to which this Bid Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 012100 "Allowances."

1.3 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this _____ day of _____, 20_____.

B. Submitted By:_____(Insert name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF SECTION 004321

This page intentionally left blank

SECTION 004322 - UNIT PRICES FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: SRO Offices - Warhawk Fieldhouse Modifications

C. Project Location: 47 Lemon Street, McDonough, Georgia30253

D. Owner: Henry County Schools

E. Architect: PBK Architects Georgia, P.C.

F. Architect Project Number: 250306

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. The undersigned Bidder proposes the amounts below be added to or deducted from the Contract Sum on performance and measurement of the individual items of Work as required by Section 012200 “Unit Prices.”

1.3 UNIT PRICES

A. Unit Price No. 1: Remove and dispose of offsite 1 cubic yard of unsuitable soil or uncompacted earth.

1. _____ Dollars ($_____) per C.Y.

B. Unit Price No. 2: Remove and dispose of offsite 1 cubic yard of Mass Rock.

1. _____ Dollars ($_____) per C.Y.

C. Unit Price No. 3: Remove and dispose of offsite 1 cubic yard of Trench Rock.

1. _____ Dollars ($_____) per C.Y.

D. Unit Price No. 4: Furnish and place 1 ton of #57 stone.

1. _____ Dollars ($_____) per ton.

E. Unit Price No. 5: Furnish and place 1 ton of graded aggregate base (GAB).

1. _____ Dollars ($_____) per ton.

F. Unit Price 6: Furnish and place 1 ton of #4 stone.

1. _____ Dollars ($_____) per ton.

1.4 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this _____ day of _____, 20_____.

B. Submitted By:_____(Insert name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF SECTION 004322

SECTION 005213 - AGREEMENT BETWEEN OWNER AND CONTRACTOR

1.1 AGREEMENT FOR CONSTRUCTION

A. The Agreement for the Work will be written on AIA DOCUMENT A101-2017, Standard Form of Agreement Between Owner and Contractor, Stipulated Sum and is included following this Document.

END OF SECTION 005213

This page intentionally left blank

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Henry County Board of Education
33 North Zack Hinton Parkway
McDonough, Georgia 30253

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

SRO Offices - Warhawk Fieldhouse Modifications
47 Lemon Street
McDonough, GA 30253

The Architect:
(Name, legal status, address and other information)

PBK Architects Georgia, P.C.
525 East Taylor Street
Griffin, Georgia 30223

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. “The American Institute of Architects,” “American Institute of Architects,” “AIA,” the AIA Logo, and “AIA Contract Documents” are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[X] A date set forth in a notice to proceed issued by the Owner upon approval and execution of all contract documents.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of Notice to Proceed.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[X] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

Liquidated damages in accordance with the General Conditions of the Contract shall apply if substantial completion is not achieved by the date indicated above.

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

Payment period of one month may be adjusted to end on the twenty-fifth (25th) day of the month to allow receipt by Architect on the thirtieth day of the month.

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the Thirtieth (30th) day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the Fifteen (15th) day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Fifteen (15) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

Five Percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

Not Applicable

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

Reduction in retainage to be disbursed in accordance with the Official Code of Georgia Annotated, Code Section 13-10-80.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

Upon Substantial Completion of the Work, retainage to be dispersed in accordance with OCGA 13-10-80. See Specification Sections 007213, 012900, and 017700 for additional provisions required for further reduction in retainage and final acceptance.

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

Refer to Specification Section 007213, Article 13.5, of the Project Manual. %

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[X] Litigation in a court of competent jurisdiction
Refer to Specification Section 007213, Article 15.5.1 of the Project Manual.

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

Not Applicable

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Barry Miles Chief Operations Officer
Henry County Schools
396 Tomlinson Street
McDonough, GA 30253

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A201-2017, General Conditions of the Contract for Construction, Article 11, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A201-2017, General Conditions of the Contract for Construction, Article 11, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

Not Applicable

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
(Paragraphs deleted)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

(Table deleted)
(Paragraphs deleted)

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Contractor's Bid Form
Contractor's Bid Form Supplement, Allowances, if applicable
Contractor's Bid Form Supplement, Unit Prices, if applicable
Contractor's Bid Form Supplement, Alternates, if applicable

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

AIA Document A101 – 2017. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:02:56 on 03/19/2026 under Order No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (2003977319)

SECTION 006000 - PROJECT FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1.2 AIA DOCUMENT A101, "STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR, STIPULATED SUM."

a. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction," as edited.

2. The General Conditions are included in the Project Manual. See Document 007213 – "General Conditions."
3. The Supplementary Conditions for Project are incorporated into a modified copy of the General Conditions included in the Project Manual.

1.3 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:

1.4 FORM OF PERFORMANCE BOND AND LABOR AND MATERIAL BOND: OWNER'S FORMS INCLUDED IN THE PROJECT MANUAL. SEE DOCUMENT 006113 – "PERFORMANCE AND PAYMENT BONDS."

1. Form of Certificate of Insurance: Provide forms acceptable to the Owner in accordance with the "General Conditions of the Contract for Construction" Article 11.1.3.
2. Forms for Georgia Security and Immigration Compliance Act: Provide "GSIC Contractor Affidavit and Agreement" and GSIC Subcontractor Affidavit and Agreement" in accordance with the "General Conditions of the Contract for Construction," Article 3.44 Forms are included in the Project Manual. See Document 006127 "Georgia Security and Immigration Act."
3. Forms for Competitive Award: Provide "Competitive Award Affidavit" in accordance with the "General Conditions of the Contract for Construction," Article 3.20. Form is included in the Project Manual. See Document 006128 – "Competitive Award Affidavit."

B. Information and Modification Forms:

1. Form for Requests for Information (RFIs): Architect's form included in the Project Manual. See Document 006313 "Request for Information."
2. Form of Request for Proposal: Forms acceptable to Architect.
3. Change Order Form: AIA Document G701, "Change Order."
4. Form of Change Directive: AIA Document G714, "Construction Change Directive."

C. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION 006000

This page intentionally left blank

SECTION 006113 - PERFORMANCE AND PAYMENT BONDS

1.1 PERFORMANCE AND PAYMENT BOND FORMS

A. The Contractor shall provide Performance and Payment Bonds in accordance with Section 11.4 of the General Conditions of the Contract. The Performance and Payment Bonds furnished by the Contractor shall be on the forms incorporated herein.

END OF SECTION 006113

This page intentionally left blank

PERFORMANCE BOND (Contractor)

_____, a corporation duly
[Insert Proper Name of Surety]

organized and existing under the laws of the State of _____, and duly authorized to issue bonds in the State of Georgia, as surety ("Surety"), and _____

_____, as principal
[Insert Proper Name of Contractor]

("Contractor"), enter into, execute this bond ("Performance Bond"), and bind themselves in favor of the Henry County School District and the Board of Education as obligee ("Owner"), in the penal sum of _____dollars ($_____),
[Insert Penal Sum in words and numerals]

as of _____.
[Insert Date of Construction Contract]

WHEREAS, the Contractor has executed a contract with the Owner of even date herewith ("Construction Contract") for construction of:

_____

_____
[Insert Description and Location of the Project]

("Project"); and

WHEREAS, the Owner has required the Contractor to furnish this Performance Bond containing the terms and conditions set forth herein as a condition to executing the Construction Contract with the Contractor;

NOW, THEREFORE, the Surety and the Contractor, both jointly and severally, and for themselves, their heirs, administrators, executors and successors agree:

1.

The Construction Contract is hereby incorporated herein and by reference made a part hereof to the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are bound for the full performance of the Construction Contract, including, without exception, all of its terms and conditions, both express and implied.

2.

If the Contractor is in default of the Construction Contract and the Owner, by written notice to the Contractor and the Surety, declares the Contractor to be in default and terminates the right of the Contractor to proceed, the Surety shall thereupon give an unequivocal notice in writing to the Owner within fifteen (15) days after receipt of said notice as to which of the actions permitted to the Surety in Paragraph 3 it will take.

3.

Upon default and termination of the Contractor and notice to the Contractor and Surety as provided in Paragraph 2 above, the Surety shall, within fifteen (15) days, proceed to take one or, at its option, more than one of the following courses of action:

(A) Proceed itself, or through others acting on its behalf, to complete full performance of the Construction Contract including, without limitation, correction of defective and nonconforming work performed by or on behalf of the Contractor. During such performance by the Surety, the Owner shall pay the Surety from its own funds only such sums as would have been due and payable to the Contractor in the absence of the default and termination. If the Surety selects this course of action, the Surety shall cause the Project to be fully manned with competent supervision and skilled labor within fifteen (15) days from the date of its selection of this course of action and thereafter shall continue to keep the Project so fully supervised and manned until the Project is complete, all in such a manner as to achieve Substantial Completion of the project within the time provided in the Construction Contract for Substantial Completion.

(B) Applicable law permitting, and with the prior written consent of the Owner, obtain bids or proposals from contractors previously identified as being acceptable to the Owner, for full performance of the Construction Contract. The Surety shall furnish the Owner a copy of such bids or proposals upon receipt of same. The Surety shall promptly select, with the agreement of the Owner, the best responsive bid or proposal and shall promptly tender the contractor submitting it, together with a contract for fulfillment and completion of the Construction Contract executed by the completing contractor, to the Owner for the Owner's execution. Upon execution by the Owner of the contract for fulfillment and completion of the Construction Contract, the completing contractor shall furnish to the Owner a performance bond and a separate payment bond, each in the form of those bonds previously furnished to the Owner for the Project by the Contractor. Each such bond shall be in the penal sum of the (1) fixed price for completion, (2)

guaranteed maximum price for completion, or (3) estimated price for completion, whichever is applicable. The Owner shall pay the completing contractor from its own funds only such sums as would have been due and payable to the Contractor under the Construction Contract as and when they would have been due and payable to the Contractor in the absence of the default and termination. To the extent that the Owner is obligated to pay the completing contractor sums which would not have then been due and payable to the Contractor under the Construction Contract, the Owner shall notify the Surety of such payment(s) in writing, and the Surety shall reimburse the Owner for such sums within ten (10) days of receipt by the Surety of written notice from the Owner of such payment.

(C) Take any and all other acts, if any, mutually agreed upon in writing by the Owner and the Surety.

4.

In the event that the Surety fails to comply with Paragraph 3 within the time prescribed therein, the Owner, at its option, and without waiving any other rights it may have hereunder or otherwise, but expressly reserving same, may take possession of the Project and complete it by whatever method, including the acceleration of the Project if required in order to achieve timely Substantial Completion, that the Owner may deem expedient. If the Owner elects to take possession of the Project, the Owner may submit periodic claims for payment to the Surety for such sums as the Owner may be required to pay in excess of these sums it would have been required to pay to the Contractor under the Construction Contract in the absence of the default and termination. The Surety shall pay the Owner upon such periodic claims within twenty (20) days of the Surety's receipt thereof. Said payments by the Surety shall continue until the full Penal Sum of this Performance Bond has been paid in full. Any claims that are not paid within said period of time shall bear interest at the rate of twelve (12) percent per annum. All interest charged on said claims for late payment shall be in excess of the Penal Sum of the Performance Bond, and payments of such interest shall not be credited against such Penal Sum.

5.

In addition to those duties set forth hereinabove, the Surety shall promptly pay the Owner all loss, costs and expenses resulting from the Contractor's default(s), including, without limitation, fees, expenses and costs for architects, engineers, consultants, testing, surveying and attorneys fees, court costs, expert

witness fees, litigation expenses, liquidated or actual damages, as applicable, for delay in completion of the Project, and fees, expenses and costs incurred at the direction, request, or as a result of the acts or omissions of the Surety.

6.

Except as provided in Paragraph 5, in no event shall the Surety be obligated to the Owner hereunder for any sum in excess of the Penal Sum. As used in this Performance Bond, the term "Penal Sum" means the amount stated as the penal sum in the preamble of this Performance Bond, as that amount may be adjusted from time to time pursuant to Paragraph 7 below.

7.

No agreement, modification, omission, addition, or change in or to the Construction Contract, change in work covered by the Construction Contract, or extension of time for the completion of the Construction Contract shall impair, affect, or release the Surety of this Performance Bond. The Surety waives notice of any changes to the Construction Contract including, without limitation, changes in the contract time, the contract price, or the work to be performed. If the total amount payable by the terms of the Construction Contract is increased to an amount in excess of the then current Penal Sum, then, automatically and without notice to or any action required of any party, the Penal Sum shall be increased as the total amount payable by the terms of the Construction Contract is increased.

8.

This Performance Bond is provided by the Surety for the sole and exclusive benefit of the Owner, together with its successors or assigns. No other party, person or entity shall have any rights against the Surety hereunder.

9.

Any notice required to be given under the terms of this document shall be deemed to have been given on the date the same is hand-delivered to the parties of this document, deposited in the United States mail to the addresses hereinafter stated with sufficient postage affixed thereto to insure delivery or sent by Certified Mail, Return Receipt Requested:

Surety: _____

_____

_____

Attn: _____

Contractor:

_____

_____

Attn: _____

Owner: Henry County School District and the Board of Education
33 N. Zack Hinton Parkway
McDonough, Georgia 30253
Attn: Superintendent

10.

Any statutory limitation, which may be contractually superseded, to the contrary notwithstanding, any action hereon may be instituted so long as the applicable statute of limitations governing the Construction Contract has not run or expired.

[Signatures on next page]

CONTRACTOR:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

SURETY:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

ATTEST:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

ATTEST:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

(Performance Bond Contractor (2005)

PAYMENT BOND (Contractor)

_____, a corporation duly
[Insert Proper Name of Surety]

organized and existing under the laws of the State of _____, and duly authorized to issue bonds in the State of Georgia, as surety ("Surety"), and

_____, as principal ("Contractor"), enter
[Insert Proper Name of Contractor]

into, execute this bond ("Payment Bond"), and bind themselves, their heirs, executors, administrators, successors and assigns, both jointly and severally in favor of the Henry County School District and the Henry County Board of Education, as obligee ("Owner") in the penal sum of

_____dollars ($_____), as of _____.
[Insert Panal Sum in words and numerals] *[Insert Date of Construction Contract]*

WHEREAS, the Contractor has executed a contract with the Owner of even date herewith ("Construction Contract") for construction of:

_____

_____
[Insert Description and Location of the Project]

("Project"); and,

WHEREAS, the Owner has required the Contractor to furnish this Payment Bond containing the terms and conditions set forth herein as a condition to executing the Construction Contract with the Contractor;

NOW THEREFORE, the Surety and the Contractor, both jointly and severally, and for themselves, their heirs, administrators, executors and successors agree:

1.

The Construction Contract is hereby incorporated herein and by reference made a part hereof to the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are bound for the full performance of the Construction Contract including without exception all of its terms and conditions, both express and implied, and, without limitation, specifically including Contractor's obligation to pay for labor, materials, machinery, equipment and insurance provided in connection with the Construction Contract performance.

2.

For purposes of this Payment Bond, Beneficiary is defined as any subcontractor or other person supplying labor, materials, machinery, or equipment in the prosecution of the work provided for in the

Construction Contract, or any other person entitled to the protection of this Payment Bond pursuant to the provisions of Title 36, Chapter 91, Official Code of Georgia Annotated.

3.

Every Beneficiary who has not been paid in full for labor or material furnished in the prosecution of the work on the Project before the expiration of a period of ninety (90) days after the day on which the last of the labor was done or performed by such person or the material or equipment or machinery was furnished or supplied by such person for which such claim is made, or when he or she has completed his or her subcontract for which claim is made, shall have the right to bring an action on this Payment Bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgment for the sum or sums due such person; provided, however, that:

(A) Any person having a direct contractual relationship with a subcontractor but no contractual relationship, express or implied, with the Contractor where the Contractor has not complied with the notice of commencement requirements in accordance with Code Section 36-91-92, Official Code of Georgia Annotated, shall have the right of action upon this Payment Bond upon giving written notice to the Contractor within ninety (90) days from the day on which such person did or performed the last of the labor or furnished the last of the material or machinery or equipment for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or supplied or for whom the labor was performed or done; provided, however, that: (i) the Contractor's failure to supply a copy of the notice of commencement within ten calendar days of receipt of a written request from a subcontractor, materialman or person shall render the provisions of this paragraph 3(A) inapplicable to such subcontractor, materialman or person, and (ii) the Contractor's failure to file a notice of commencement shall render the notice to contractor requirements of this paragraph 3(A) inapplicable.

(B) Any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the Contractor where the Contractor has complied with the notice of commencement requirements in accordance with subsection (a) of Code Section 36-91-92, Official Code of Georgia Annotated, shall have the right of action on this Payment Bond provided such person shall, within thirty (30) days from the filing of the notice of commencement or thirty (30) days following the first delivery of labor, material, machinery or equipment, whichever is later, give to the Contractor a written notice setting forth:

(i) The name, address and telephone number of the person providing labor, material, machinery or equipment;

(ii) The name and address of each person at whose instance the labor, material, machinery or equipment is being furnished;

(iii) The name and the location of the Project; and

(iv) A description of the labor, material, machinery or equipment being provided and, if known, the contract price or anticipated value of the labor, material, machinery or equipment to be provided or the amount claimed to be due, if any; and

(C) Nothing contained in this Payment Bond shall limit the right of action of a Beneficiary to the ninety (90) day period referenced in paragraph 3(A) above.

The notice required under paragraph 3(A) of this Payment Bond may be served by registered or certified mail, postage prepaid, or statutory overnight delivery, duly addressed to the Contractor, at any place at which the Contractor maintains an office or conducts his or her business or at his or her residence, by depositing such notice in any post office or branch post office or any letter box under the control of the United States Postal Service; alternatively, notice may be served in any manner in which the sheriffs of the State of Georgia are authorized by law to serve summons or process.

4.

Contractor and Surety shall promptly make payments of all taxes, licenses, assessments, contributions, penalties, and interest thereon, when, and if, the same may be lawfully due the State of Georgia or any County, Municipality, or political subdivision thereof by reason of and directly connected with the performance of the contract, or any part thereof.

5.

The Surety's obligation hereunder shall not exceed the Penal Sum. As used in this Payment Bond, the term "Penal Sum" means the amount stated as the penal sum in the preamble of this Payment Bond, as that amount may be adjusted from time to time pursuant to paragraph 6 below plus the amount incurred by the Owner under paragraph 9 below.

6.

The Surety waives notice of any changes to the Construction Contract including, without limitation, changes in the contract time, the contract price, or the work to be performed. If the total amount payable by the terms of the Construction Contract is increased to an amount in excess of the then current Penal Sum, then, automatically and without notice to or any action required of any party, the Penal Sum shall be increased as the total amount payable by the terms of the Construction Contract is increased. No agreement, modification, omission, addition, or change in or to the Construction Contract, change in the work covered by the Construction Contract, or extension of time for the completion of the Construction Contract shall impair, affect, or release the Surety of this Payment Bond.

7.

No action can be instituted hereunder after one (1) year from the completion of the Construction Contract and the acceptance of the Project by the Owner and any other applicable public authorities.

8.

The Surety hereby agrees that no final settlement between the Owner and the Contractor shall abridge the right for any beneficiary hereunder whose claim may be unsatisfied.

9.

In the event that the Owner is required to enforce this Bond through any type of legal proceeding, the Contractor and Sureties shall pay all costs, including but not limited to attorney's fees, court costs, expert witness fees, litigation expenses, and any other cost incurred by the Owner in the enforcement of this Bond. Also, if the Owner is named in any type of legal proceeding concerning payment of any funds under the Contract or under this Bond, the Contractor and Sureties shall pay all costs, including but not limited to attorney's fees, court costs, expert witness fees, litigation expenses, and any other cost incurred by the Owner in the defense of such claim.

10.

Any Notice required to be given under the terms of this document shall be deemed to have been given on the date the same is hand-delivered to the parties to this document, deposited in the United States mail to the address hereinafter stated with sufficient postage affixed thereto to insure delivery, or sent by Certified Mail, Return Receipt Requested.

Surety: _____

_____

_____

Attn: _____

Contractor: _____

_____

_____

Attn: _____

Owner: Henry County School District and the Board of Education
33 N. Zack Hinton Parkway
McDonough, Georgia 30253
Attn: Superintendent

11.

Notwithstanding any provision herein that may be to the contrary, this Payment Bond is intended to be a statutory payment bond under applicable laws of the State of Georgia and shall be so construed.

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals the day and year first above written.

CONTRACTOR:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

ATTEST:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

SURETY:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

ATTEST:

_____
(Typed Name)

BY: _____(SEAL)
(Signature)

_____
(Printed Name, Title, Address)

_____

_____

Payment Bond Contractor. (February 2016)

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 006127 - GEORGIA SECURITY AND IMMIGRATION ACT

1.1 GEORGIA SECURITY AND IMMIGRATION ACT FORMS

A. The Contractor shall provide a copy of these forms in accordance with the “General Conditions of the Contract for Construction,” Article 3.4.4. Forms shall be provided for the contractor and each and every subcontractor on the project.

END OF SECTION 006127

This page intentionally left blank

SECTION 006127.10 - CONTRACTOR AFFIDAVIT AND AGREEMENT

CONTRACTOR AFFIDAVIT AND AGREEMENT

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm, or corporation which is contracting with (Henry County Board of Education) has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify, in acinformation of newly hird employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

The undersigned further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to this contract with (name of public employer), contractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01 .08 or a substantially similar form. Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the (name of the public employer) at the time the subcontractor(s) is retained to perform such service.

_____

EEV / Basic Pilot Program* User Identification Number

_____ _____

BY: Authorized Officer or Agent Date

(Contractor Name)

_____

Title of Authorized Officer or Agent of Contractor

_____

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN

BEFORE ME ON THIS THE

_____DAY OF_____, 202____

_____

Notary Public

My Commission Expires:

_____

* As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the “EEV / Basic Pilot Program” operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

(End of Form)

DOCUMENT 006127.20 GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT

SUBCONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with (name of contractor) on behalf of (Henry County Board of Education) has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security toverify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

_____

EEV / Basic Pilot Program* User Identification Number

_____ _____

BY: Authorized Officer or Agent Date

(Subcontractor Name)

_____

Title of Authorized Officer or Agent of Subcontractor

_____

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN

BEFORE ME ON THIS THE

____ DAY OF _____. 202___

_____

Notary Public

My Commission Expires:

_____

* As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the “EEV / Basic Pilot Program” operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

(End of Form)

END OF SECTION 006127.10

SECTION 006128 - COMPETITIVE AWARD AFFIDAVIT

1.1 COMPETITIVE AWARD AFFIDAVIT

A. The Contractor shall provide the “Competitive Award Affidavit” in accordance with the “General Conditions of the Contract for Construction,” Article 3.20.

END OF SECTION 006128

This page intentionally left blank

SECTION 006128.10 - COMPETITIVE AWARD AFFIDAVIT FORM

(This form to be executed in compliance with Official Code of Georgia Annotated Section 36-91-21(e). If the Contractor is a partnership, the Affidavit shall be executed by all of the partners and any officer, agent, or other person who may have represented or acted for them in bidding for or procuring the contract. If the contractor is a corporation, all officers, agents, or other persons who may have acted for or represented the corporation in bidding for or procuring the contract shall execute the Affidavit).

State of Georgia

County of _____

_____, being duly sworn, hereby deposes

(Insert name of Affiant)

and says that he/she has read, and is familiar with, the provisions of Official Code of Georgia Annotated Section 36-91-21 (d) which provide as follows:

> (d) Whenever a public works construction contract for any governmental entity subject to the requirements of this chapter is to be let out by competitive sealed bid or proposal, no person, by himself or herself or otherwise, shall prevent or attempt to prevent competition in such bidding or proposals by any means whatever. No person who desires to procure such work for himself or herself or for another shall prevent or endeavor to prevent anyone from making a bid or proposal therefor by any means whatever, nor shall such person so desiring the work cause or induce another to withdraw a bid or proposal for the work.

and that he/she has not directly or indirectly violated said provision of the law.

_____

Signature of Applicant

Further, Affiant saith not.

This _____day of _____, 20_____.

Sworn to and subscribed before me this _____ of _____ 20_____.

_____

Notary Public

END OF SECTION 006128.10

This page intentionally left blank

SECTION 006313 - REQUEST FOR INFORMATION

CONTRACTOR REQUEST FOR INFORMATION

Project:

Request for Information Number:

Date of Request:

Architect's Project Number:

To: PBK Architects Georgia, P.C.
P.O. Box 880
(525 East Taylor Street)
Griffin, Georgia 30223

Contractor:

Copies to:

Attention:

The Contractor shall notify the Architect, in writing, if any change in Contract Sum or Contract Time is necessary based on this Request for Information.

Question: (Number each question)

Answer: (Number to correspond to each question.)

Attachments:

By:

Date Returned:

This page intentionally left blank

SECTION 007213 - GENERAL CONDITIONS

1.1 GENERAL CONDITIONS OF THE CONTRACT

A. The General Conditions of the Contract for Construction, AIA DOCUMENT A201-2017, Articles 1 through 16 inclusive as edited is a part of this Contract, and is incorporated herein.

END OF SECTION (EXCEPT FOR THE FOLLOWING DOCUMENTS) 007213

This page intentionally left blank

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« SRO Offices - Warhawk Fieldhouse Modifications »
«47 Lemon Street »
« McDonough, GA 30253»

THE OWNER:
(Name, legal status and address)

«Henry County Board of Education »
«33 North Zack Hinton Parkway
McDonough, Georgia 30253 »

THE ARCHITECT:
(Name, legal status and address)

PBK Architects Georgia, P.C.
525 East Taylor Street »
Griffin, GA 30223 »

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. “The American Institute of Architects,” “American Institute of Architects,” “AIA,” the AIA Logo, and “AIA Contract Documents” are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

INDEX
(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6,

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. “The American Institute of Architects,” “American Institute of Architects,” “AIA,” the AIA Logo, and “AIA Contract Documents” are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ **1.1.1.1** The Owner makes no representation or warranty of any nature whatsoever to the Contractor concerning the Contract Documents. By the execution hereof, the Contractor acknowledges and represents that it has received, reviewed and carefully examined such documents, has found them to be complete, accurate, adequate, consistent, coordinated, and sufficient for construction and that the Contractor has not, does not, and will not rely upon any representations or warranties by the Owner concerning such documents as no such representations or warranties have been or are hereby made.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor shall, in accordance with the "Georgia Security and Immigration Compliance Act" of 2006, O.C.G.A. 13-10-90 and 13-10-91 and the Georgia Department of Labor, execute the "Contractor

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Affidavit and Agreement" in the "Project Forms" section of the Project Manual and provide a copy of this affidavit to the Owner through the Architect. Further, the Contractor shall have each and every subcontractor, regardless of tier, execute the "Subcontractor Affidavit" and provide a copy of this Affidavit to the Owner through the Architect. The Contractor and all subcontractors shall submit these affidavits prior to the initial application for payment. Any subcontractor retained after the initial application for payment shall provide affidavits prior to submitting any application for payment for work associated with their work. No payment will be made for any work done by any contractor or subcontractor prior to receiving said affidavits.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

3.7.6 Permits for Boilers and Pressure Vessels: The Contractor or Subcontractor responsible for the installation of the boiler, water heater, and all other equipment including Owner furnished equipment, having an input of 200,000 BTUH or Greater shall contact the Georgia Department of Labor, Safety Engineering Section and obtain and pay for a permit to install this equipment. This permit shall be obtained prior to any work being performed.

3.7.6.1 The Contractor or Subcontractor shall also make arrangements and pay for having the boiler, water heater, and other pressure vessels installations inspected by the Georgia Department of Labor. A copy of the inspections shall be submitted to the Architect and a copy shall be included in the operation and maintenance manuals.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. On request of the Owner, communications from the superintendent to the Owner shall be confirmed in writing.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed unless the superintendent ceases to be in the contractor's employ.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of 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 (other than the Work itself), but only to the extent caused by the 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 or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§3.19 NOTICE OF COMMENCEMENT

§**3.19.1** The Contractor shall file a NOTICE OF COMMENCEMENT with the Clerk of the Superior Court of Henry County, Georgia no later than fifteen (15) days after the Contractor physically commences work on the site. The Contractor shall furnish a copy of the NOTICE OF COMMENCEMENT to the Architect and to anyone else making a written request.

The NOTICE OF COMMENCEMENT shall contain the following information:

1. The name, address, and telephone number of the Contractor.
2. The name and location of the project being constructed and the legal description of the property upon which the improvements are being made.
3. The name and address of the true owner.
4. The name and address of the surety for the performance and payment bonds.
5. Any other requirements called for in the Official Code of Georgia Annotated - Sections 36-91-72 and 44-14-361.5.

§3.20 COMPETITIVE AWARD (OCGA 36-91-21(e)

§**3.20.1** The Contractor shall execute the Competitive Award Affidavit in accordance with OCGA 36-91-21(e) and convey it to the Owner prior to commencing any Work on this Project. The Owner's "officer whose duty it is to make the payment" shall maintain this Affidavit on file. Refer to "Project Forms" section of the Project Manual.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.14.1 Written request for interpretations (R.F.I.'s) required of the Architect received after noon on the last working day of the Architect's work week shall be acknowledged as received on the Architect's following normal working day.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and

.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 An allowance for overhead and profit shall be applied to the Net Additional Allowable Expenditures of a Change in Work and shall be included in the total cost to the Owner. These percentages shall be based on the following schedule:

For the Contractor, for Work performed by the Contractor's own forces, 15% for overhead and profit of the cost of Net Additional Allowable Expenditures.

For the Contractor, for Work performed by his Subcontractor, 7-1/2% for overhead and profit of the amount due the Subcontractor for Net Additional Allowable Expenditures.

For each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15% for overhead and profit for the Net Additional Allowable Expenditures. A Subcontractor shall receive no allowance for overhead and profit on work not performed by his own forces. Under this Contract, the forces of a Subcontractor of a Subcontractor are deemed to be and are the forces of the Subcontractor.

DEFINITION

The above percentage for overhead and profit shall be applied to the "net additional allowable expenditures," if any, as limited and defined herein. If the net difference between "allowable expenditures" and savings results in a decrease in expenditures, the amount of credit allowed the Owner shall be the net decrease without any credit for profit and overhead. "Net additional allowable expenditures" as used herein shall mean the difference between all "allowable expenditures" and savings. The term "allowable expenditures" is limited to and defined as items of labor or materials, the use of heavy construction equipment [such as scrappers, backhoes, excavators, bulldozers, draglines, motor graders, and like equipment], and all such items of cost as public liability and worker's compensation insurance, social security and old age and unemployment insurance, and (in cases where there is an extension of time) pro rata expenditures for time of foremen employed in the direct superintendence of productive labor in execution of changes. All expenditures not included in the term "allowable expenditures" as limited and defined in this article shall be considered as overhead, including, but, not limited to, insurance other than that which is mentioned in this article, bond premiums, supervision, travel (meals, transportation, and lodging) superintendence [except pro rata time of foremen as referred to herein], timekeepers clerks, watchmen, hand tools, small tools, incidental job burdens, engineering, drafting, and office expense including cost of preparing Change Proposal Estimates. Any other provisions in the contract documents to the contrary notwithstanding, only demonstrable, direct, out-of-pocket expenditures for the changes plus percentages as set forth hereinabove shall be allowable for Changes in the Work. No wages of a foreman shall be allowable for change carried on concurrently with contract work unless the claim includes a demand for extension of time caused by the authorizing or ordering of the change.

In order to facilitate the Architect's review of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner indicated in the attached example at the end of this section. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over $10.00 be approved without such itemization. No Proposal Request will be accepted unless it is in such detail as set forth in the attached example. (See Example of Method of Determining Adjustments to the Contract included at the end of this Section).

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.2** Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- **.3** Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- **.4** Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- **.5** Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

§ 8.3.4 In the event the Contractor shall be delinquent in respect to compliance with the time limits established in the Contractor's Construction Schedule (not due to any of the causes indicated in Subparagraph 8.3.1), he shall, within seven days after receipt of written demand of the Owner, provide whatever means necessary, including but not limited to, overtime, extra shifts, additional crews, more resources, etc., until such time as he shall have brought the amount of work in place into compliance with the Contractor's Construction Schedule. Fulfillment of these requirements above (hereinafter referred to as "recovery of lost time required of the Contractor for his breach of the covenant as to time") shall not relieve the Contractor from liability for breach of the covenant as to time (see Article 3.2 of the Form of Agreement Between Owner and Contractor). For account of recovery of lost time required of the

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Contractor for his breach of the covenant as to time, the Contractor shall be entitled to no claim against the Owner.

8.3.5 The Contractor agrees that Work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the Contract Time called for in the Contract Documents. It is expressly understood and agreed that the Contractor has considered all contingencies and factors affecting his ability to perform all the work within this time, including among others, delays caused by normal adverse weather conditions (as detailed in 8.3.6 below) and other possible delays caused by the industrial conditions prevailing in this locality, and after consideration of these factors, he has made an allowance for such factors before agreeing to completion date specified in the Contract Documents, and does further agree that all things considered, such completion date is a reasonable time for completion of all Work to be performed hereunder, without the need for any extension of time for any reasons than those specified in Subparagraph 8.3.1.

8.3.6 Contract Time will not be extended for normal adverse weather. The time for Substantial Completion as stated in the Contract Documents includes due allowance for calendar days which are considered normal adverse weather condition days.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect at least fifteen (15) days before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to the various portions of the Work, prepared on forms similar to those included at the end of Division 1 Section "Payment Procedures." The Architect shall review said schedule within fifteen (15) days after receipt. If the Architect determines that any item in this schedule contains an unjustified amount or value, the Architect shall have the right to modify any item to reflect an amount or value that the Architect deems appropriate and to be in the best interest of the Owner. Once said schedule of values has been reviewed and modified, if necessary, the Architect shall sign and return a copy thereof to the Contractor. This schedule shall be used as the basis for reviewing the Contractor's Application for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay ninety-five percent (95%) of the amount due the Contractor for work in place and material stored on site on account of progress payments. If the provisions of the Official Code of Georgia Annotated, Code Section 13-10-80 are in effect, the retainage shall be disbursed in accordance with this Code and Article 9.8 of the General Conditions of the Contract.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 9.3.1.4 If the Contractor's Application for Payment contains requests for payments for work in-place or for stored materials and the Architect determines that work in-place is not complete or material is not properly stored on site, the Architect shall reject the application in total, and Contractor shall resubmit a new application revised as per Architect's determinations.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon 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, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.5.5 After the issuance of a Certificate for Payment by the Architect, the Owner may withhold payment to the Contractor or, because of subsequently discovered evidence, may withhold partial payment, to the extent as may be necessary to protect the Owner from loss from which the Contractor is responsible because of:

.1 defective work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or another contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 persistent failure to carry out the Work in accordance with the Contract Documents.

.8 or other acts of default.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.1.1 Until Substantial Completion, the Owner shall pay ninety-five percent (95%) of the amount due the Contractor for work in place and material stored on site on account of progress payments. If the provisions of the Official Code of Georgia Annotated, Code Section 13-10-80 are in effect, the retainage shall be disbursed in accordance with this Code and Article 9.8 of the General Conditions of the Contract.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.8.5.1 The Owner will make payment within 30 days of the date of Substantial Completion of the amount requested by the Application for Payment that coincides with, or follows, the date the Contractor has achieved Substantial Completion, less the following amount of retainage:

Retainage shall be reduced to **not less than 5% of Contract Amount of the entire Project**.

The Reduction of Retainage established at Substantial Completion of the entire Project **will not** be further reduced until such standard of completion of work has been achieved so as to reduce the amount of incomplete work to a dollar value estimated by the Architect to be equal to or less than ½ of 1% of the Contract Amount.

At this time, the Architect will assign a value equal to 200% of the value of any remaining incomplete or unacceptable Punch List items. The Architect shall determine the value of any such items including appropriate value of any remaining final Close-Out Documents, Warranties, etc.

Note: A value of 5% of the Line Item amount on the CONTINUATION SHEET (G703) shall be assessed for each major warranty not furnished for the Project.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

9.11 LIQUIDATED DAMAGES

9.11.1 Time is of the essence to the Contract Documents and all obligations thereunder. The Contractor acknowledges and recognizes that the Owner is entitled to the full and beneficial occupancy and use of the completed Work following expiration of the Contract Time and that the Owner has binding agreements and public trust commitments based upon the Contractor achieving Substantial Completion of the Work within the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to achieve Substantial Completion of any portion of the Work within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure as well as potential breaches of its public trust. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and Contractor agree as follows:

If the Contractor fails to achieve Substantial Completion of the Work as defined in the Contract Documents within the Contract Time or as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, not as a penalty, but as liquidated damages representing an estimate of damages likely to be sustained by the Owner, estimated at or before the time of executing this Contract, the sum indicated in the following schedule based on Contract Price, per day for each and every calendar day of un-excused delay in achieving

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Substantial Completion beyond the date set forth herein for Substantial Completion of the Work. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of the delayed completion of the Work.

Liquidated damages applicable to this Contract shall be the amount stated in the right column below which is directly opposite the applicable Contract Price range stated in the left column below.

If The Original Contract Price Is:	Daily Liquidated Damages Shall Be:
Up to $49,999.99	$50
$50,000.00 to $99,999.99	$100
$100,000.00 to $299,999.99	$200
$300,000.00 to $599,999.99	$300
$600,000.00 to $999,999.99	$400
$1,000,000.00 to $1,999,999.99	$500
$2,000,000.00 to $4,999,999.99	$750
$5,000,000.00 to $9,999,999.99	$1,500
$10,000,000.00 to $14,999,999.99	$2,500
$15,000,000.00 to $19,999,999.99	$3,500
$20,000,000.00 or above	The product of .0002 multiplied by the Original Contract Price.

§ 9.112The Owner may deduct liquidated damages described above from any unpaid amounts then or thereafter due the Contractor under this Agreement. The Owner may also, when the Owner reasonably believes that Substantial Completion will be inexcusably delayed, withhold any amounts otherwise due to the Contractor an amount believed by the Owner to be adequate to recover liquidated damages applicable to such delays, If and when the Contractor overcomes the delay in achieving Substantial Completion, or any part thereof, for which the Owner has withheld payment, the Owner shall promptly release to the Contractor those funds withheld, but no longer applicable, as liquidated damages.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, 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 (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following, or greater if required by law:

Workers' Compensation:

State: Statutory

Applicable Federal (e.g., Longshoremen's): Statutory

Employer's Liability: Bodily Injury by Accident $100,000 each accident.

Bodily Injury by Disease $100,000 each employee with $500,000 Policy Limit.

Comprehensive General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations, Broad Form Property Damage):

$1,000,000.	Each Occurrence
$2,000,000.	Annual Aggregate Limit

Products and Completed Operations to be maintained for three (3) years after final payment, commencing with issuance of final Certificate for Payment.

Property Damage Liability Insurance will provide X, C, or U coverage as applicable.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Contractual Liability (Owner's Protective Liability - Furnished by Contractor under Separate Policy):

$1,000,000. Each Occurrence

Comprehensive Automobile Liability:

$1,000,000. Each Occurrence

§ **11.1.3** Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ **11.1.4** The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.5 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable cost properly attributable thereto.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 11.3.1.3 If by the terms of this insurance any mandatory deductibles are required, or if the Contractor should elect, with the concurrence of the Owner, to increase the mandatory deductible amounts or purchase this insurance with voluntary deductible amounts, the Contractor shall be responsible for payment of the amount of the deductible in the event of a paid claim.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.1.6 The insurance required by Paragraph 11.3 is not intended to cover machinery, tools or equipment owned or rented by the Contractor which are utilized in the performance of the work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment which shall be subject to the provisions of paragraph 11.3.7.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds. This coverage shall include testing of boiler, machinery, and similar equipment. The builders risk policy shall contain installation floater coverage.

§ 11.4 Waivers of Subrogation

§ 11.4.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.4.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.5 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§11.6 Adjustment and Settlement of Insured Loss

§ **11.6.1** A loss insured under this property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interest may appear, subject to requirements of any applicable mortgagee clause and Section 11.3.10. The Contractor shall pay subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written legally required for validity, shall require subcontractors to make payments to their sub-contractors in similar manner.

§ **11.6.2** If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement Between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a change in the Work in accordance with Article 7.

§ **11.6.3** The Contractor as Fiduciary shall have power to adjust and settle a loss with insurers unless one of the parities in interest shall object in writing within five days after occurrence of loss to the Contractor's exercise of this power; if such objection be made, settlement will be made in accordance with Paragraph 15.5.

§ 11.7 PERFORMANCE BOND AND PAYMENT BOND

§ 11.7.1 The Contractor shall furnish separate Bid, Performance and Payment Bonds to the Owner. The Bid Bond shall set forth a penal sum in an amount not less than 5% of the Contract Sum. Each Performance and Payment Bond shall set forth a penal sum in an amount not less than the Contract Sum. Each bond furnished by the Contractor shall incorporate by reference the terms of this Contract as fully as though they were set forth verbatim in such bonds. In the event the Contract Sum is adjusted by Change Order, the penal sum of both the performance bond and the payment bond shall be deemed increased by like amount. The Performance and Payment Bonds furnished by the Contractor shall be on forms included in Division 0, Section 006113 Performance and Payment Bonds.

§ 11.7.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.7.3 In the event that Owner finds it necessary to collect from any bond required by this Contract, Contractor and the Surety shall pay Owner all costs associated therewith, including but not limited to attorney's fees, court costs, filing fees and associated expenses.

§ 11.7.4 A surety, to be acceptable, will be required to meet the following criteria:

a. A Company holding a Certificate of Authority as an acceptable Surety on Federal Bonds, as published in the latest such listing in The Federal Register, Part II, U.S. Department of the Treasury Notices having an underwriting limitation equal to or greater than the amount of the bid, including any additive alternates which may be applicable to the bid, and an insurance company licensed to do business within the State of Georgia as a company writing policies of insurance and/or bid bonds, payment bonds and performance bonds, regulated as such by the Georgia Department of Insurance, and a participant in the State of Georgia Insurance and Solvency Pool, and meet the following additional criteria:

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

(**1**) A company with a rating in the A.M. Best Companies' most recent published rating of "A++ or A+: Class IV or Larger".

(**2**) A company with a rating in the A. M. Best Companies' most recent published rating of "A: Class V or Larger".

(**3**) A company with a rating in the A.M. Best Companies' most recent published rating of "A-: Class X or Larger".

(**4**) A company which can furnish an assumption certificate or cut through clause in a statement of coverage under which payment is guaranteed 100% to third-party claimants by a reinsurer with a rating in A. M. Best Companies' most recent published rating of "A or A+: Class V or Larger".

(**5**) In lieu of the A. M. Best Company Rating, insurers rated AAA, AA+, AA, AA- by Standard & Poors Insurance Rating Services will also be acceptable.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ **12.2.2** Upon written notice from the Architect or Owner, the Contractor shall correct any Work failing to conform to the requirements of the Contract Documents, including any Rejected Work Notices. The Contractor shall begin corrective work within seven days of the receipt of said notice and continue working, with diligence and promptness, until the deficiencies have been brought into compliance with the Contract Documents.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the terms of this Contract which remains unpaid after the due date will accrue interest at the rate of 7% per annum until payment has been made in full provided notice has been given as required by O.C.G.A. Section 13-11-7.

§ 13.6 GEORGIA PROMPT PAY

The terms and requirements of the Contract Documents shall supersede all provisions of the Georgia Prompt Pay Act (Code 1981. Section 13-11-1, enacted by GA. L.1994, p. 1398, Section 1)

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5: If the Owner has terminated the Contract as provided in Section 14.2, and if it is subsequently determined for any reason that the Owner was not authorized to terminate the Contract as provided in said Section, the rights and obligations of the parities shall be the same as if the Owner has issued a Notice of Termination to the Contractor as provided in Paragraph 14.4.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 14.4.1.1: Any such termination shall be effected by delivery to the Contractor of a written Notice of Termination specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

.4 Assign to the Owner, in the manner, at the times, and to the extent directed by the Owner, all of the right, title and interest of the Contractor under the orders and subcontracts so terminated. The Owner shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

.5 Settle all outstanding liabilities and all Claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner to the extent the Owner may require. Its approval or ratification shall be final for all the purposes of this Subparagraph 14.4.2.

.6 Transfer title to the Owner, and deliver in the manner, at the times, and to the extent, if any, directed by the Owner, (i) the fabricated or unfabricated parts, Work in progress, completed Work, supplies, and other material produced as a part of, or acquired in connection with the performance of the Work terminated by the Notice of Termination, and (ii) the completed or partially completed plans, drawings, information, and other property which, if the Contract had been completed, would have been required to be furnished to the Owner;

.7 Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices that the Owner directs or authorizes, any property of the types referred to in subparagraph **.6** above, but the Contractor (i) shall not be required to extend credit to any purchaser, and (ii) may acquire any such property under the conditions prescribed and at a price or prices approved by the Owner. The proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under this Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Owner may direct;

8. Complete performance of such part of the Work as shall not have been terminated by the Notice of Termination

§ **14.4.3** After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination claim, in the form and with the certification the Owner prescribes. Such claims shall be submitted promptly but in no event later than one (1) year from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such one (1) year period or authorized extension. However, if the Owner determines that the facts justify such action, it may receive and act upon any such termination claim at any time after such one (1) year period or extension. If the Contractor fails to submit his termination claim within the time allowed, the Owner may determine, on the basis of information available to it, the amount, if any, due to the Contractor because of the termination. The Owner shall then pay to the Contractor the amount so determined;

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ **14.4.4** Subject to the provisions of 14.4.3, the Contractor and the Owner may agree upon the whole or any part of the amount or amount to be paid to the Contractor because of the total or partial termination of Work under Section 14.4 The amount or amounts may include a reasonable allowance for profit on Work done. However, such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total Contract Sum as reduced by the amount of payments otherwise made and as further reduced by the Contract price of Work not terminated. The Contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph 14.4.5, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Owner to agree upon the whole amount to be paid to the Contractor because of the termination of Work under this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to this paragraph 14.4.4

§ **14.4.5** If the Contractor and the Owner fail to agree as paragraph 14.4.4 provides, on the whole amount to be paid to the Contractor because of the termination of Work under Section 14.4, the Owner shall determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amounts determined as follows:

(1) For all Work performed before the effective date of the Notice of Termination, the total (without duplication of any items) of:

(I) The cost of such Work;

(ii) The cost of settling and paying claims arising out of the termination of Work under subcontracts or others as paragraph 14.2.5 provides. This cost is exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the Subcontractor before the effective date of the Notice of Termination. These amounts shall be included in the cost on account of which payment is made under (I) above; and,

(iii) A sum, as profits on (I), above, that the Owner determines to be fair and reasonable. But, if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this subdivision (iii) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss.

(2) The reasonable cost of the preservation and protection of property incurred under subparagraph .2 of paragraph 14.4.2; and any other reasonable cost incidental to termination of Work under this Contract, including expense incidental to the determination of the amount due to the Contractor as a result of the termination of Work under this Contract. The total sum of this Section 14.4 shall not exceed the total Contract Sum as reduced by the amount of payments otherwise made and as further reduced by the Contract Price of Work not terminated. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amount payable to the Contractor under (1) above, the fair value, as determined by the Owner of property which is destroyed, lost, stolen, or damaged, to the extent that it is undeliverable to the Owner, or to a buyer under subparagraph 7 of paragraph 14.4.2;

§ **14.4.6** The Contractor shall have the right to make claim from any determination the Owner makes under paragraph 14.4.3 or paragraph 14.4.5. But, if the Contractor has failed to submit his claim within the time provided in paragraph 14.4.3 and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Owner has determined the

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

amount due under paragraph 14.4.3 or paragraph 14.4.5, the Owner shall pay to the Contractor the following: (1) the amount so determined by the Owner or (2) if an adverse proceeding is initiated, the amount finally determined in such proceeding;

§ **14.4.7** In arriving at the amount due the Contractor under this Section 14.4, there shall be deducted (1) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the termination portion of this Contract, (2) any claim which the Owner may have against the Contractor in connection with this Contract, and (3) the agreed price for, or the proceeds of sale of, any materials, supplies or other things kept by the Contractor or sold, under the provisions of this Section 14.4, and not otherwise recovered by or credited to the Owner;

§ **14.4.8** If the termination hereunder be partial, before the settlement of the termination portion of this Contract, the Contractor may file with the Owner a request in writing for an equitable adjustment of the price or prices specified in the Contract related to the continued portion of the Contract (the portion not terminated by the Notice of Termination). Such equitable adjustment as may be agreed upon shall be made in the price or prices. Nothing contained herein shall limit the right of the Owner and the Contractor to agree upon the amount or amounts to be paid to the Contractor for the completion of the continued portion of the Contract when the Contract does not contain an established contract price for the continued portion.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 7 days after occurrence of the event giving rise to such Claim or within 7 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. No increase in contract time shall be considered or granted for a change order issued for work that does not adversely impact the critical path of the work for the project.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. No increase in contract sum will be made for a claim accepted by the owner for an increase in the contract time due to abnormal adverse weather conditions.

§ **15.1.7 Claims for Delay Damages.** The Contractor is not entitled to recover damages for home office overhead; loss of efficiency; loss of bonding capacity; interest on money borrowed; loss of use of capital; or other consequential damages resulting from delays.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6. When a written decision of the Initial Decision Maker states that (1) the decision is final but subject to legal or equitable proceedings and (2) a demand for legal or equitable proceedings for a Claim covered by a decision must be made 30 days after the date on which the party making the demand receives the final written decision, then failure to demand legal or equitable proceedings within 30 days' period shall result in the Initial Decision Maker's decision becoming final and binding upon the Owner and Contractor. If the Initial Decision Maker renders a decision after legal or equitable proceedings have been initiated, such decision may be entered as evidence, but shall not supersede legal or equitable proceedings unless the decision is acceptable to all parties concerned.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

Article **15.3** entitled MEDIATION, along with any and all references to mediation throughout the General Conditions of the Contract, is stricken in its entirety. Refer to Article **15.5 DISPUTES, CLAIMS AND LITIGATION** for hearing and determining claims**.**

§ 15.4 Arbitration

Article 15.4 entitled ARBITRATION, along with any and all references to arbitration throughout the General Conditions of the Contract, is stricken in its entirety and the following is substituted in lieu thereof:

§ **15.5 DISPUTES, CLAIMS AND LITIGATION.**

§ **15.5.1** Any Claims arising out of or related to the Contract, except Claims relating to aesthetic effects and except those waived as provided for in paragraphs 9.10.4, and 9.10.5, shall be heard and determined by the Presiding Judge of the Superior Court of Henry County, Georgia. The Contractor and the Surety under the Payment Bond and Performance Bond do hereby consent to said Court having jurisdiction over the Contractor and the Surety under said bonds concerning all matters arising under the terms of said Contract and said bonds.

§ **ARTICLE 16 - MISCELLANEOUS ITEMS**:

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

§ **16.1** The architect and owner have entered into a Professional Services Agreement. If there are any discrepancies or differences between the Contract Documents and the Professional Services Agreement concerning the authority of the architect, the limitations of the architect, the responsibility of the architect, the payment for additional services and expenses to the architect, the administration of the contract by the architect, approvals to be made by the architect, the authority to reject work, copyright issues, decisions of the architects, inspections made by the architect, instructions given by the architect, interpretation of the contract documents and other related documents by the architect, project representation by the architect, the architect's relationship with the contractor and subcontractors, the architect's representations and site visits, the terms and conditions of the Professional Services Agreement shall control.

AIA Document A201 – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017. All rights reserved. "The American Institute of Architects," "American Institute of Architects," "AIA," the AIA Logo, and "AIA Contract Documents" are trademarks of The American Institute of Architects. This document was produced at 11:49:58 EST on 02/27/2026 under Subscription No.20240080105 which expires on 11/19/2026, is not for resale, is licensed for one-time use only, and may only be used in accordance with the AIA Contract Documents® Terms of Service. To report copyright violations, e-mail docinfo@aiacontracts.com.
User Notes: (69a1cb1cea10dcce98f36b86)

THIS PAGE INTENTIONALLY LEFT BLANK

EXAMPLE OF METHOD OF DETERMINING ADJUSTMENTS TO THE CONTRACT FOR CHANGES IN WORK (CHANGE ORDERS) SEE ARTICLE 7.2.2 OF GENERAL CONDITIONS

PROJECT: Office Bldg. For
ACME Machine Co.
27 10th Street
Atlanta, GA

DATE_____
CHANGE ORDER NO._____
ARCHITECTS JOB NO._____

FOR: Adding 15 Ceiling Fans, Etc. GENERAL CONTRACTOR: ABC CONSTRUCTION COMPANY

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
½" EMT CONDUIT	545	LF	1.05	572.25	0.23	125.35	
3/8" FLEX CABLE	70	LF	1.03	72.00	0.20	13.65	
NO. 1900 BOXES	20	EA	3.00	60.00	1.20	14.00	
4" OCTAGON BOXES	15	EA	2.00	30.00	0.95	14.25	
NO. 1900 BLANKS	20	EA	1.50	30.00	0.50	10.00	
SP SW	13	EA	20.00	260.00	12.00	156.50	
INDUS SW PLATES	6	EA	2.00	12.00	3.00	18.00	
NO. 12 THHW CON-DUCTOR	2900	LF	0.16	464.00	0.08	232.00	
TOGGLE BOLTS	100	EA	0.15	15.00	0.30	30.00	
WIRE NUTS	100	EA	0.05	5.00	0.10	10.00	
½" COMP COUPLINGS	60	EA	1.00	60.00	1.00	60.00	
½" COMP COUPLINGS	40	EA	2.00	80.00	1.00	40.00	
#10X1" SHEET MTL STRAPS	100	LF	0.18	18.00	0.09	9.00	
FAN STEMS	15	EA	5.00	75.00	12.00	180.00	
3/8" ANCHORS	30	EA	1.33	40.00	0.55	16.50	
2" X2" X 3/16" ANGLES	45	LF	1.50	68.00	1.00	45.00	
CADDY STRAPS	100	EA	0.60	60.00	0.59	59.00	

ITEM	QUANTITY		LABOR		MATERIAL		TOTAL COST
SPRAY TOUCH-UP PAINT	1 CAN		LS	10.00	3.00	3.00	
FANS	15	EA	25.00	375.00	159.00	2385.00	

SUBTOTAL	2306.00	3431.00	
Public Liability Insurance: =	100.00		
Workers Compensation Insurance: =	123.00		
Social Security and Old Age Insurance: =	350.00		
Unemployment Insurance =	50.00		
LABOR SUBTOTAL:=	$2929.00		
Sales Tax on Materials $3431 @ 4% =		137.00	
MATERIAL SUBTOTAL:=		$3568.00	
SUBTOTAL :	$2929.00 +	$3568.00 =	$6497.00
Subcontractor's Overhead & Profit $6497 @ 15% :			974.55
SUBTOTAL:			$7471.55
General Contractor's Overhead & Profit $7471.55 @ 7-1/2% :			560.37
TOTAL COST OF CHANGE ORDER :			$8031.92

The preceding is an example only, and the unit prices used are fictitious and shall not be used in preparing Change Proposals for this Project. This example is for a subcontractor Change in Work.

The itemized Change Proposal shall accompany a Standard AIA Document G701 and be attached thereto.

SECTION 011000 - SUMMARY

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:
1. Project information.
2. Work covered by Contract Documents.
3. Proof of purchase for long-lead items.
4. Owner-furnished products/contractor installed products.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.
9. Miscellaneous provisions.

B. Related Requirements:
1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 “Execution” for coordination of owner installed products.

1.3 PROJECT INFORMATION

A. Project Identification: SRO Offices - Warhawk Fieldhouse Modifications, Project No. 250306.
1. Project Location: 47 Lemon Street, McDonough, Georgia 30253

B. Owner: Henry County Schools.
1. Owner's Representative: Barry Miles.

C. Architect: PBK Architects Georgia, P.C.
1. Principal in Charge: Brett McIver
2. Project Manager: Kanda Way
3. Job Captain: Jada Harris
4. Construction Administration Coordinator: Turner Burson, 770-227-5473.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Civil Engineer: Carter Engineering Group, Bryan Simpson, 478-219-2600.
2. Structural Engineer: Kubala Engineers, Srikanth Bajaj, 770-227-5473.
3. Plumbing Engineer: Andrews, Hammock & Powell, John Cosey, 478-405-8301.
4. Mechanical Engineer: Andrews, Hammock & Powell, Jim Rice, 478-405-8301.
5. Electrical Engineer: Andrews, Hammock & Powell, Naeem Osmani, 478-405-8301.
6. Door Hardware Consultant: Assa Abloy, Evan Little, 505-274-0701.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. This project consists of modifications of the existing Warhawk Fieldhouse to a new SRO Office building. The area of the renovated building is approximately 7000 sq. ft. Exterior renovations include re-roofing, replacing metal fascia, soffit panels, gutters and downspouts and cleaning existing walls & canopy. The interior of the building will be demolished and a new office layout with metal stud gypsum walls, restrooms, kitchen areas, new storefront entry doors and new windows. Site work to include removal of existing football grandstands, new parking areas, dumpster pad, sidewalks, entry canopy,

fencing and landscaping improvements. Provide new plumbing, mechanical and electrical work to support the completed office.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 PROOF OF PURCHASE FOR LONG-LEAD ITEMS

A. Contractor shall submit to Owner proof of purchase of all mechanical units and any other long lead time items. This proof of purchase invoice shall be issued by the FACTORY and shall confirm that the order has been received from manufacturer's representative and shall be accompanied by copies of the mechanical units specifications, including make, size, voltage, model numbers, etc. and shall include anticipated shipping or delivery date. This submittal shall be issued to the General Contractor immediately after the Factory receives the Purchase Order from the Factory Representative so as not to delay the Work. Documents issued only by the Contractor as proof of purchase are not acceptable.

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

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:
   1. Soap Dispensers.

1.7 ACCESS TO SITE

A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to areas indicated on the Drawings.
   2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet (1219.2 cm) beyond building perimeter; 10 feet (304.8 cm) beyond surface walkways, patios, surface parking, and utilities less than 12 inches (304.8 mm) in diameter; 15 feet (457.2 cm) beyond primary roadway curbs and main utility branch trenches; and 25 feet (762 cm) beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
   3. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 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. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated.
1. Weekend Hours: At Contractor’s discretion to be coordinated with Owner for work in existing buildings.
2. Bus Traffic Interruption: Contractor shall not interrupt bus traffic and student loading and unloading for any reason. Approximate bus arrival and departure times/schedule will be provided by the owner.
3. Hours for Utility Shutdowns: Weekends and holidays or as approved otherwise by the Owner.
4. Hours for Core Drilling or other excessively noisy activities shall be performed after 4:00 p.m. during weekdays.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than five days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Architect and Owner not less than five days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Provide drug and background screening of Contractor personnel working on Project site.
   1. Maintain list of approved screened personnel with Owner's representative.

H. Obscene or otherwise inappropriate gestures, comments, graffiti, notations, etc., will not be tolerated. Any persons which are found or identified in relation to such acts shall be removed from the Project immediately.

1.10 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 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. 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.
   3. Keynoting: Materials and products are identified by reference keynotes on the Drawings.

1.11 MISCELLANEOUS PROVISIONS

A. Inspection and Testing for Asbestos Content of Building Materials: Building materials which are scheduled to be incorporated into the work under the agreement shall first either be certified by the Manufacturer to be asbestos free or be inspected and tested by accredited laboratories and certified to be free of asbestos content in accordance with EPA, and AHERA rules.
   1. Materials under the above classifications shall not be considered for approval, acceptance or otherwise incorporated into the work prior to the receipt of either manufacturer certification or accredited laboratory test results indicating the building material is asbestos free. Copies of the certification or test reports shall be furnished to the Owner at the end of the project with the Project Record Documents.

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.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and 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.

B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Quantity allowances.

C. Related Requirements:
   1. Section 004321 “Allowances Form” for form for allowances to be included with the Bid.
   2. Section 012200 "Unit Prices" for procedures for using unit prices.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed 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.

1.4 ACTION SUBMITTALS

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

1.5 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.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 ALLOWANCES, GENERAL

A. Owner reserves the right to use unused portions of Allowances for other Work required by the Project.
   1. The Owner or Architect shall direct the Contractor as to the use of any unused Allowances.

B. Allowances shown are generally for unforeseen conditions and are above and beyond any specific contract material and work requirements.

C. Allowance Log: Keep a log of all allowances used and unused. Submit log with each application of payment.

1.8 LUMP-SUM ALLOWANCES

A. Line items for each lump sum allowance scheduled shall be included on the “Schedule of Values” included with the Application for Lump Sum Payment.

B. Contractor’s costs associated with the allowances shall be based on the invoice amount from the subcontractor/utility company plus 7 ½ percent for Contractor’s handling. Contractor shall coordinate work with subcontractor/utility company, obtain written cost estimate from the subcontractor/utility company, and have estimate approved by Owner prior to beginning work.

C. Should the lump sum allowances be exceeded, change orders authorizing additional costs shall be executed using the same basis of the original allowance (subcontractor/utility company invoice plus 7 ½ percent for Contractor’s handling).

D. At project closeout, credit all unused allowances remaining in the Schedule of Values to Owner by Change Order.

1.9 QUANTITY ALLOWANCES

A. Use quantity allowances as scheduled in this section in conjunction with unit prices as scheduled in Section 012200 “Unit Prices” to determine line item values associated with the quantity allowances schedule.

B. All costs associated with Quantity Allowances are above and beyond quantities required to construct project as indicated on the Drawings.

C. Line items for each quantity allowance scheduled shall be included on the “Schedule of Values” included with application for payments.

D. Contractors costs associated with these line item values shall include all cost necessary, including but not limited to materials, delivery, installation, insurance, applicable taxes, overhead and profit, labor burden, etc.

E. Should the quantity allowances be exceeded, change orders authorizing additional quantities shall use the same unit price as scheduled in Section 012200 ”Unit Prices” for additional cost.

F. At project closeout, credit all unused allowances remaining in the Schedule of Values to Owner by change order.

PART 2 PRODUCTS

2.1 PRODUCTS AND OR MATERIALS USED IN ALLOWANCES SHALL BE AS DEFINED OR APPROVED ELSEWHERE IN THE CONTRACT DOCUMENTS.

PART 3 EXECUTION

3.1 EXAMINATION

A. If unsuitable soils or rock are encountered during the Project, the Project Testing Company and the Engineer of Record shall be notified immediately.

3.2 UNSUITABLE SOILS AND ROCK

A. Removal, disposal and placement of unsuitable soils materials and any rock shall be at the recommendation of the Project’s Testing Company and as approved by the Engineer of Record.
   1. Removal shall include removal by acceptable methods and equipment of the minimum quantities deemed necessary by the Project’s Testing Company
   2. Disposal shall include disposal of materials either on site or off site as indicated. Disposal of materials on site shall be at the direction of the Engineer of Record. Rock materials disposed of on site shall be placed in fill slopes as directed by the Engineer of Record. Disposal of materials off site shall be in accordance with applicable laws and regulations. It shall be the responsibility of the Contractor to dispose of off site materials accordingly.
   3. Place shall include obtaining suitable backfill and or fill materials or stone obtained from on-site or off-site sources as indicated and placing materials and compacting to Project

requirements. Materials obtained from on-site sources shall be obtained from on site locations as directed by the Engineer of Record.

4. No allowances shall be paid unless all quantities are qualified, quantified and approved by the Projects Testing Company and the Engineer of Record.

3.3 REMOVAL & RELOCATION OF EXISTING UTILITIES

A. Removal or relocation of utilities shall be coordinated by the Contractor.

3.4 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.

3.5 SCHEDULE OF ALLOWANCES

A. Lump Sum Allowances

1. Include the lump sum amount of $100,000 to cover the cost charged by any utility provider for removing or relocating any existing utility lines, mains or poles that conflict with new construction and to cover work to extend utility conduit from pull box to final utility termination point.

B. Quantity Allowances

1. Include in the Base Bid an amount to remove and dispose of offsite 250 cubic yards of unsuitable soil or uncompacted earth.

2. Include in the Base Bid an amount to remove and dispose of offsite 100 cubic yards of Mass Rock.

3. Include in the Base Bid an amount to remove and dispose of offsite 100 cubic yards of Trench Rock.

4. Include in the Base Bid an amount to furnish and place 100 tons of #57 stone.

5. Include in the Base Bid an amount to furnish and place 200 tons of graded aggregate base (GAB).

6. Include in the Base Bid an amount to furnish and place 150 tons of #4 stone.

END OF SECTION 012100

This page intentionally left blank

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 004322 “Unit Prices Form” for form for unit prices to be included with the Bid.
   2. Section 012200 “Allowances” for allowances associated with unit prices.
   3. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
   4. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in 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 quantity allowances 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 Section 012100 “Allowances” and 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 1:
   1. Include in the Base Bid an amount to remove and dispose of offsite one cubic yard of unsuitable soil or uncompacted earth as indicated in Specification Section 012100 - Allowances.

B. Unit Price 2:
   1. Include in the Base Bid an amount to remove and dispose of offsite one cubic yard of Mass Rock as indicated in Specification Section 012100 - Allowances.

C. Unit Price 3:
   1. Include in the Base Bid an amount to remove and dispose of offsite one cubic yard of Trench Rock as indicated in Specification Section 012100 - Allowances.

D. Unit Price 4:
   1. Include in the Base Bid an amount to furnish and place one ton of #57 stone as indicated in Specification Section 012100 - Allowances.

E. Unit Price 5:
   1. Include in the Base Bid an amount to furnish and place one ton of graded aggregate base (GAB) as indicated in Specification Section 012100 - Allowances.

F. Unit Price 6:
   1. Include in the Base Bid an amount to furnish and place one ton of #4 stone as indicated in Specification Section 012100 - Allowances.

END OF SECTION 012200

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.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

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 Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within 20 days, 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 Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   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. 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.

B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Work 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 Work 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction 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. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than 15 days before the date scheduled for submittal of initial Applications for Payment.
   3. The Schedule of Values must be approved by the Owner and Architect prior to submission of the initial application for proposal.

B. Format and Content: Use Project Manual table of contents and the Summary section from each specification section as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section and one line for each product listed in the Summary section where applicable. Refer to the example found at the end of this section.
   1. When the project contains more than one facility or school, provide a full breakdown for each facility/school with the total of each facility/school added together to equal the base bids.
      a. Breakdown for each facility/school shall include labor, material, allowances, etc., as indicated below
   2. 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.
   3. Arrange schedule of values consistent with format of AIA Document G703.

4. Arrange the schedule of values with separate line items to indicate the following for each item listed:
   a. Dollar value of the following:
      1) Labor.
      2) Materials. (including quantities)
5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
6. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
7. Allowances (if applicable): Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. 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 shall be shown as separate line items in the schedule of values.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
   1. Contractor shall also submit Georgia Department of Education DOE Form 0263 to accompany each application for payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored on site, but not yet installed. Owner will not pay for items stored off-site.
   1. Payment for materials and equipment stored on site is subject to the approval of the Architect.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials on the form at the end of this section:
   a. Stored materials shown on “Schedule of Values/Continuation Sheet” in the stored materials column as a line item shall be broken down in detail in the “Type of Materials” column in the “Summary of Materials Stored” form.
      1) As an example:
      The line item in the stored materials column on Schedule of Values/ Continuation Sheet for HVAC might be $96,877. This figure shall be entered in the “Type of Materials” column on the Summary of Materials Stored” form as follows:

Type of Materials	Quantity	Amount
HVAC Pipe	7,196 Feet	$59,295.00
Pipe Fittings	1,364 Each	19,259.00
Hangers	775 Each	7,293.00
HVAC Valves	60 Each	8,850.00
Gauges & Thermometer	30 Each	2,130.00

      The figures add up to $96,877.00 – the same amount as shown on line item on Schedule of Values/Continuation Sheet.

F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. All copies shall include waivers of lien and similar attachments if required. At least one copy shall be an original AIA Document.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner. An example of which is included at the end of this section.

H. 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.
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal suppliers and fabricators.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Schedule of pre-installation conferences required by the contract documents.
17. Initial damage report (if any).

I. Application for Payment at Substantial Completion: After Architect issues 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 Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
   3. Administrative actions and submittals that shall proceed or coincide with this application include:
      a. Occupancy permits and similar approvals.
      b. Warranties (guarantees) and maintenance agreements.
      c. Test/adjust/balance records.
      d. Maintenance instructions.
      e. Meter readings.
      f. Start-up performance reports.
      g. Change-over information, including door lock change over, related to Owner’s occupancy, use, operation and maintenance.
      h. Final cleaning.
      i. Application for reduction of retainage and consent of surety.
      j. Advice on shifting insurance coverage.
      k. Final progress photographs.
      l. List of incomplete work, recognized as exceptions to Architect’s Certificate of Substantial Completion.
   4. After the Certificate of Substantial Completion has been executed by all parties concerned and before payment is made the Contractor shall submit the following documents:
      a. Submit CONSENT OF SURETY TO FINAL REDUCTION IN OR PARTIAL RELEASE OF RETAINAGE, A.I.A. Document G707A, if not previously submitted.

J. Final Payment Application: After completing Project closeout requirements, 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, including punch lists, required training, and removal of surplus materials, rubbish, and similar materials from the Owner’s property.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.

4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900 (WITH THE EXCEPTION OF THE ATTACHED FORMS)

AFFIDAVIT AND WAIVER OF LIEN

_____being first duly sworn, says that he/she makes this affidavit on behalf of _____ having entered into an agreement with _____, the Owner for _____, on the premises of the Owner located at _____; that all labor material and services committed for have been fully paid and indebtedness discharged to the date of this affidavit. Furthermore, for and in considerations of $_____, the undersigned does hereby waive, release and relinquish all claims for right of lien which the undersigned may now have upon the premises above described, for labor and material, general supervision of construction or alteration, and/or otherwise except for claims or right of lien for contract and/or change order work performed to extent that payment is being retained or will subsequently become due.

_____
Name of Firm

_____

_____
Title of Officer

Subscribed and sworn to before me,

This _____day of _____.

_____
Notary

SCHEDULE OF VALUES/CONTINUATION SHEET
IN TABULATIONS BELOW AMOUNTS ARE STATED TO THE NEAREST DOLLAR

Application No:
Application Date:
Period To:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
1.00	GENERAL CONDITIONS								
1.02	Supervision Quantity/Month								
1.03	Assistant Superintendent Quantity/Month								
1.06	Temporary Utilities Quantity/Month								
1.07	Temporary Office Quantity/Month								
1.08	Insurance & Bonds Lump Sum								
1.15	Equipment Lump Sum								
Etc.	**Etc.**								
2.00	Site Work								
2.01	Utility Allowance (L.S.)								
2.02	Temp. Vegetative Cover (Acre)								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
2.03	Unsuitable Soils (C.Y.)								
2.04	Mass Rock (C.Y.)								
2.05	Trench Rock (C.Y.)								
2.06	Rip Rock (C.Y.)								
2.07	Demolition - Line Item for Each Sector/Phase (Unit as Applicable)								
2.08	Site Clearing (Acre)								
2.09	Top Soil								
2.10	Rough Grade (C.Y.)								
2.11	Final Grade (S.Y.)								
2.12	Excavation/Backfill (C.Y.)								
2.13	Soil Treatment (S.F.)								
2.14	Erosion Control (L.S.)								
2.15	NDPES (Monthly)								
2.16	Site Water (L.F.)								
2.17	Fire Protection (L.F.)								
2.18	Irrigation Systems (L.F.)								
2.19	Sanitary Sewer (L.F.)								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
2.20	Storm Drainage (L.F.)								
2.21	Asphalt Pavement (S.Y.)								
2.22	Pavement Striping (L.F.)								
Etc.	**Etc.**								
3.00	CONCRETE								
3.01	Excavate Footings Quantity/CY								
3.02	Pour Footings Quantity/CY								
3.03	Prep SG Quantity/SF								
4.00	MASONRY								
4.01	Brick (labor) Lump Sum								
4.02	Block (labor) Lump Sum								
4.03	Brick (material) Quantity/Each								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
4.06	Block (material) Quantity/Each								
4.11	Clean Brick Quantity/SF								
Etc.	**Etc.**								
7.00	Thermal & Moisture Protection								
7.01	Composite Sheet Waterproof-ing (S.F.)								
7.02	Bituminous Dampproofing (S.F.)								
7.03	Water Repellents (S.F.)								
7.04	Building Insulation (S.F.)								
7.05	Exterior Insulation & Finish Systems (S.F.)								
7.06	Vapor Barrier (S.F.)								
7.07	Conceal Fire Proofing (S.F.)								
7.08	Exposed Fire Proofing (S.F.)								
7.09	Firestopping (L.F.)								
7.10	Asphalt Shingles (S.Q.)								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
7.11	Insulation Metal Wall Panels (S.F.)								
7.12	Flat Metal Wall Panels (S.F.)								
7.13	Metal Roof Panels (S.F.)								
7.14	Wood Siding (S.F.)								
7.15	Vinyl Siding (S.F.)								
7.16	Modified Bituminous Sheet Roofing (S.Q.)								
7.17	Sheet Metal Flashing & Trim (L.F.)								
7.18	Roof Expansion Assemblies (L.F.)								
7.19	Roof Accessories (EA)								
7.20	Metal Framed Skylights (EA)								
7.21	Plastic Skylights (EA)								
7.22	Joint Sealants (L.F.)								
15.00	MECHANICAL								
15.01	PLUMBING								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
15.02c	PVC PIPE (Outside) Quantity/LF								
15.03c	DI Pipe Quantity/LF								
15.04c	Fittings & Valves (Outside) Quantity/Each								
15.05c	Fire Hydrants Quantity/Each								
15.06c	Post Indicator Valves Quantity/Each								
15.10c	Manholes (Storm Sewer) Quantity/Each								
Etc.	**Etc.**								
15.40	HVAC								
15.41	Water Source Heat Pumps Quantity/Each								
15.42	Roof Top Units Quantity/Each								
15.46	Cool Towers & Heat Exchanger Quantity/Each								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
15.47	Boilers Quantity/Each								
15.52	Kitchen Ventilation System Quantity/Each								
16.00	Electrical								
16.01	Conduit (LF)								
16.02	Surface Raceway (LF)								
16.03	Cable Tray (LF)								
16.04	Building Wire (LF)								
16.05	Device Boxes (EA)								
16.06	Wiring Devices (EA)								
16.07	Electrical Identification (EA)								
16.08	Switch Boards (EA)								
16.09	Disconnect Switches (EA)								
16.10	Dry Type Transformers (EA)								
16.11	Panel Boards (EA)								
16.12	Motor Control (EA)								
16.13	Transfer Switch (EA)								

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G) C)	BALANCE TO FINISH © - G)	RETAINAGE (IF VARIABLE) RATE)
			FROM PREVIOUS APPLICA-TION (D + E)	THIS PERIOD					
16.14	Luminaries (EA)								
16.15	Flood Lighting Poles (EA)								
16.16	Packaged Generator Systems (EA)								
16.17	Fire Alarm Smoke Rough-In (LF)								
16.18	Fire Alarm & Smoke Devices (EA)								
16.19	Security System Rough-In (LF)								
16.20	Telephone & Computer Rough-In								
16.21	Intercom, Telemedia, & Clock System Rough-In								
16.22	Intercom, Telemedia & Clock System Devices								
16.23	Public Address System Rough-In								

SUMMARY OF MATERIALS STORED

In support of Application for Payment No._____

(Project Improvement No.)_____ Period Ending: _____

Contractor: _____

ITEM NO	NAME (Contractor or Sub-Contractor)	TYPE OF MATERIAL	QUANTITY	AMOUNT (Dollars)
		TOTALS		

Prepared by _____ for _____
Contractor

Date _____ and certified by him to be true and accurate statement.

Date:_____

THIS PAGE INTENTIONALLY LEFT BLANK

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Project meetings.

B. Related Requirements:
   1. Section 012900 "Payment Procedures" for submittals associated with this section that are required prior to application for payments.
   2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. 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.

B. Key Personnel Names: Within 15 days of Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office, and cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where existing conditions provide for tight spaces, coordinate installation for efficient use of space.

B. 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 if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.
8. Startup and adjustment of systems.
9. Demonstration and training of Owner’s employees.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

E. Equipment other than that on which the Drawings are based:
1. The structural, mechanical and electrical requirements for certain items of equipment are based on a particular manufacturer. However, other manufacturers may have also been approved for use. It shall be the Contractor’s responsibility to provide for any changes in structural, mechanical and electrical requirements for equipment other than that on which the Drawings and Specifications are based at no cost to the Owner. The Contractor shall give special attention to coordinating the location of the required electrical connections of equipment and coordinating the ampacity, voltage, and phase characteristics of the equipment furnished with the design ampacity, voltage, and phase of the specific electrical circuit indicated on the shop drawings for this equipment.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to the coordination drawings by subcontractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Electrical Work: Show the following:
a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
b. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
c. Location of pull boxes and junction boxes, dimensioned from column center lines.
3. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
4. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form bound in Project Manual. See Document 006313 “Request for Information.”
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. RFIs received by Architect after 12:00 p.m. (noon) will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Contractor shall schedule and conduct meetings and conferences at Project site unless otherwise indicated.
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: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. 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 and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. Testing and quality requirements.
      y. Security.
      z. Progress cleaning.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site 2 weeks before each construction activity that requires coordination with other construction.
   1. List of Conferences:
      a. Prior to or coinciding with the initial application for payment, submit a list of all project required pre-installation conferences. List shall include applicable specification section number and name.
      b. Additional pre-installation conferences: Owner reserves the right to require additional pre-installation conferences as necessary.
   2. 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.
   3. 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 RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. 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: Conduct progress meetings at monthly intervals.
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 meeting 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.
1) Review schedule for next period.
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) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items and rejections of work (if any).
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.
19) Any necessary information from the Owner or Architect that may affect project schedule or work.

3. Minutes: Contractor shall record and distribute the meeting minutes to each party present and to parties requiring information.
   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

This page intentionally left blank

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. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Site condition reports.
   6. 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 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
   1. Float time belongs to Owner.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Where work involves more than one school facility, contractor shall provide separate schedules for each facility.

B. Format for Submittals: Submit required submittals in the following format:
   1. PDF electronic file.
   2. Three paper copies, in color, on 11 x 17 unless requested otherwise.

C. Startup construction schedule.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

E. 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.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

A. 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 the Notice to Proceed to date of final 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 or phase as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   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 days for startup and testing.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   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 by Owner: Include a separate activity for each portion of the Work performed by Owner.

3. Owner-Furnished Products: Include a separate activity for each product. Contractor shall determine dates needed for Owner furnished products.
4. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. 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. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. 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. Completion of electrical installation.
    b. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. 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.

F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules and that is acceptable to Owner and Architect.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 14 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. 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 the initial application for payment. The initial application for payment will not be processed until the contractor’s construction schedule is received.
      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. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
   3. 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.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using a 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. Purchase of materials.
      d. Delivery.
      e. Fabrication.
      f. Utility interruptions.
      g. Installation.
      h. Work by Owner that may affect or be affected by Contractor's activities.
      i. Testing.
      j. Punch list and final completion.
      k. 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.

D. 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.

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.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow including amounts.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (see special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.
   14. Change Orders received and implemented.
   15. Construction Change Directives received and implemented.
   16. Services connected and disconnected.
   17. Equipment or system tests and startups.
   18. Partial completions and occupancies.
   19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(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 at 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, 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
   1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.

c. Submittal category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Architect's final release or approval.
g. Scheduled date of fabrication.
h. Scheduled dates for purchasing.
i. Scheduled dates for installation.
j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. 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.

B. Processing Time: Allow time for submittal review, including time for resubmittals. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow sufficient time for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If an intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow sufficient time for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow sufficient time for initial review of each submittal.

C. Electronic submittals are preferred where practical.

D. Electronic Submittals (e-mail): Contractor may send submittals by e-mail. E-mails shall be submitted to submittals@PBK.com. All e-mailed submittals shall be returned via e-mail.
1. Do not follow up e-mailed submittals with hard copy submittals.

E. Highlighter Pens: Refrain from using highlighter pens for marking submittals. Highlight pens do not reproduce when submittals are scanned or copied.

F. Bound Submittals: Submittals provided in a bound form shall use 3-ring binders or some form of binding that is easily taken apart. Submittals are scanned as a part of the submittal processing and must be able to take apart and put back together easily.

G. Architect's Digital Data Files: At the request of the Contractor, Electronic digital data files of the base floor plans will be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the base floor plans for use in preparing Shop Drawings.
a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Contractor shall execute a data licensing agreement, digital data release form as required by the architect.

H. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
   4. Transmittal Form for Electronic Submittals: Use portable document format (PDF) containing the following information:
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name of Contractor.
      e. Name of firm or entity that prepared submittal.
      f. Names of subcontractor, manufacturer, and supplier.
      g. Category and type of submittal.
      h. Submittal purpose and description.
      i. Specification Section number and title.
      j. Drawing number and detail references, as appropriate.
      k. Location(s) where product is to be installed, as appropriate.
      l. Related physical samples submitted directly.
      m. Transmittal number numbered consecutively.
      n. Submittal and transmittal distribution record.
      o. Other necessary identification.
      p. Remarks.

I. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
   1. Indicate the name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 4 x 5 inches (127 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 for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Name of subcontractor.
      f. Name of supplier.
      g. Name of manufacturer.
      h. Submittal number or other unique identifier, including revision identifier.
         1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
      i. Number and title of appropriate Specification Section.
      j. Drawing number and detail references, as appropriate.
      k. Location(s) where product is to be installed, as appropriate.
      l. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as a final submittal.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Name and address of Architect.
        6) Name of Contractor.
        7) Name of firm or entity that prepared submittal.
        8) Names of subcontractor, manufacturer, and supplier.
        9) Category and type of submittal.
        10) Submittal purpose and description.
        11) Specification Section number and title.
        12) Drawing number and detail references, as appropriate.
        13) Indication of full or partial submittal.
        14) Transmittal number numbered consecutively.
        15) Submittal and transmittal distribution record.
        16) Remarks.
        17) Signature of transmitter.

J. Options: Identify options requiring selection by Architect.

K. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

L. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

M. 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.

N. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
1. Project Record Documents: The submittals maintained on site shall become part of the “Project Record Documents” as described in Section 017839 “Project Record Documents.” These documents shall be accessible to the owner, Architect, and their consultants on site during construction.
2. Project Record Documents:
    a. Color Selections: No color selections will be made until all submittals requiring color selection are submitted and approved.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit electronic submittals via email as PDF electronic files.
      a. The architect will return the annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Action Submittals: Submit one copy of each submittal unless otherwise indicated. The architect will return one copy.
   3. Informational Submittals: Submit one paper copy of each submittal unless otherwise indicated. Architect will not return copies.
   4. Certificates and Certifications Submittals: Provide a 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.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
      b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

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 published 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 catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Wiring diagrams showing factory-installed wiring.
      b. Printed performance curves.
      c. Operational range diagrams.
      d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data before or concurrent with Samples.
   6. Submit Product Data in one of the following format:
      a. PDF electronic file.
      b. One paper copy of Product Data unless otherwise indicated. The architect will return one copy.
   7. MEP and Fire Protection Binders: Submit two (2) copies of binders. The architect will return only the Engineer’s comments by e-mail.

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**, unless submittal based on Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (279.4 mm) but no larger than 30 by 42 inches (1066.8 mm).
3. Submit Shop Drawings in one of the following format:
   a. PDF electronic file.
   b. One opaque copy of each submittal. The architect will return one electronic copy.
   c. Prepare Shop Drawings in the following format: Portable Document Formats (PDF), if submitted electronically.
   d. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Color samples shall be original hard copies. Electronic samples are not acceptable.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package. Samples shall be submitted separately for each specification section.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in 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.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit one set of Samples. Architect will mark up and return Sample set as a project record sample.
    1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
    1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
    2. Manufacturer and product name, and model number if applicable.
    3. Number and name of room or space.
    4. Location within room or space.
    5. Submit product schedule in one of the following format:
        a. PDF electronic file.
        b. One paper copy of product schedule or list unless otherwise indicated. The architect will return one electronic copy.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other specified information.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit 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.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit 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.

Y. **Safety Data Sheets (SDSs): Submit SDSs at Project Closeout along with Project Record Documents. SDSs sheets shall be bound in a three-ring binder.**

2.2 DELEGATED DESIGN SERVICES

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 the criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file or one paper copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include a list of codes, loads, and other factors used in performing these services.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting it to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. 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. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Approved: Fabrication/installation may be undertaken. Approval does not authorize changes in the contract sum or contract time.
   2. Approved as Noted: Fabrication/installation may be undertaken subject to compliance with the noted comments. Approval does not authorize changes in the contract sum or contract time.
   3. Revise and resubmit: Fabrication/installation may not be undertaken. Revise submittals in accordance with the noted comments. In resubmittal, limit corrections to the items marked and comments noted.
   4. Rejected: Fabrication/installation may not be undertaken. See noted reason(s) for rejection.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

This page intentionally left blank

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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-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 Contract 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.
   4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:
   1. Section 013200 "Construction Progress Documentation" for developing the construction schedule to include necessary testing and inspections.

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 substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: 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.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: 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 conflicting requirements that are different, but apparently equal, to Architect 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 Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: 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.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. 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. Record of temperature and weather 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 reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical 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.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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, as well as sufficient production capacity to produce required units.

C. 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.

D. 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.

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 in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. Testing agencies must be approved in writing by the Architect before Contractor engages the agency for services.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. 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.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow seven days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 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 engage a testing agency to perform all construction materials testing and NDPES testing for the project both within the building and on the site. This will not include any tests and inspections associated with plumbing, mechanical or electrical systems.
   2. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   3. Costs for retesting and reinspecting 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. The Owner will be responsible for the following quality-control testing services and inspections:
   1. All Construction Materials Testing including Special Inspections.

C. The Owner will NOT provide for the following quality-control testing services and inspections. The Contractor shall include testing and inspection services for the following:
   1. Any and all testing and inspections (other than those that may be associated with Special Inspections) associated with plumbing, mechanical, and electrical systems.
   2. Any and all testing and inspection services associated with elevators.

D. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

E. 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 as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

H. 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. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.
8. Provide a rain gauge on site acceptable to the testing agency and log daily rainfall. Copies of log shall be made to testing agency and local authorities upon demand.

I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -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.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency/special inspector to conduct special tests and inspections required by Chapter 17 of the International Building Code as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
   1. Special Test and Inspections shall be in accordance with the “Schedule of Special Inspection Services,” form included at the end of this section.
      a. All testing/inspections indicated as applicable to this Project shall be performed in accordance with and to the extent indicated on the “Schedule of Special Inspections.”
      b. These forms shall be maintained in a central location at the Project Site. These forms will need to be accessed on a regular basis by the Agent (Special Inspector(s) for the Project.
      c. When an individual Special Inspection task in the Schedule is completed for the last time on the Project and the Special Inspector has performed their final review, inspection, or test of that item for the Project, the Special Instructor shall initial and date the cell in the completed column on the forms adjacent to the task.
   2. Special Inspectors shall keep records of all tests and inspections. The Special Inspector shall provide copies of Inspection Reports to the Contractor, Architect, Engineer of Record, and the Building Official.
      a. Reports shall indicate that the Work inspected was done in conformance to the Contract Documents. Work not in conformance with the Contract Documents shall be brought to the attention of the Contractor for immediate correction. Retesting/inspection shall be performed to insure compliance with Contract Documents.
      b. Reports shall be submitted on a monthly basis.
   3. A “Final Report of Special Inspections” shall be provided for the Project at the completion of all Special Inspections and Testing required for this Project.
      a. Each Special Inspector corresponding to an Agent in the “Schedule of Special Inspections” shall be required to complete a copy of this form.
      b. Copies of all “Final Report(s) of Special Inspections” shall be provided to the Contractor, Architect, Engineer of Record, and the Building Official.

B. Special Inspections will not be considered complete until all forms from all Agents (Special Inspector(s)) have been received.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible

as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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

This page intentionally left blank

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 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

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

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": 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. Copies of Standards: Each entity engaged in construction on Project should 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.

1.4 ABBREVIATIONS AND ACRONYMS

A. 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's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
4. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
5. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
6. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
7. AF&PA - American Forest & Paper Association; www.afandpa.org.
8. AGA - American Gas Association; www.aga.org.
9. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
10. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
11. AI - Asphalt Institute; www.asphaltinstitute.org.
12. AIA - American Institute of Architects (The); www.aia.org.
13. AISC - American Institute of Steel Construction; www.aisc.org.
14. AISI - American Iron and Steel Institute; www.steel.org.
15. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
16. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
17. ANSI - American National Standards Institute; www.ansi.org.
18. APA - APA - The Engineered Wood Association; www.apawood.org.
19. APA - Architectural Precast Association; www.archprecast.org.
20. API - American Petroleum Institute; www.api.org.
21. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
22. ARI - American Refrigeration Institute; (See AHRI).
23. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
24. ASCE - American Society of Civil Engineers; www.asce.org.
25. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
26. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
27. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
28. ASSE - American Society of Safety Engineers (The); www.asse.org.
29. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
30. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
31. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
32. AWI - Architectural Woodwork Institute; www.awinet.org.
33. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
34. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
35. AWS - American Welding Society; www.aws.org.
36. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
37. BIA - Brick Industry Association (The); www.gobrick.com.
38. BICSI - BICSI, Inc.; www.bicsi.org.
39. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
40. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
41. CDA - Copper Development Association; www.copper.org.
42. CEA - Consumer Electronics Association; www.ce.org.

43. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
44. CGA - Compressed Gas Association; www.cganet.com.
45. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
46. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
47. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
48. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
49. CPA - Composite Panel Association; www.pbmdf.com.
50. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
51. CRRC - Cool Roof Rating Council; www.coolroofs.org.
52. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
53. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
54. CSI - Construction Specifications Institute (The); www.csinet.org.
55. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
56. CWC - Composite Wood Council; (See CPA).
57. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
58. DHI - Door and Hardware Institute; www.dhi.org.
59. ECA - Electronic Components Association; www.ec-central.org.
60. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
61. EIA - Electronic Industries Alliance; (See TIA).
62. EIMA - EIFS Industry Members Association; www.eima.com.
63. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
64. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
65. ESTA - Entertainment Services and Technology Association; (See PLASA).
66. FM Approvals - FM Approvals LLC; www.fmglobal.com.
67. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
68. FSA - Fluid Sealing Association; www.fluidsealing.com.
69. FSC - Forest Stewardship Council U.S.; www.fscus.org.
70. GA - Gypsum Association; www.gypsum.org.
71. GANA - Glass Association of North America; www.glasswebsite.com.
72. GS - Green Seal; www.greenseal.org.
73. HI - Hydraulic Institute; www.pumps.org.
74. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
75. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
76. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
77. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
78. IAS - International Approval Services; (See CSA).
79. ICBO - International Conference of Building Officials; (See ICC).
80. ICC - International Code Council; www.iccsafe.org.
81. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
82. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
83. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
84. IEC - International Electrotechnical Commission; www.iec.ch.
85. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
86. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
87. IESNA - Illuminating Engineering Society of North America; (See IES).
88. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
89. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
90. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.

91. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
92. ISO - International Organization for Standardization; www.iso.org.
93. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
94. LMA - Laminating Materials Association; (See CPA).
95. LPI - Lightning Protection Institute; www.lightning.org.
96. MBMA - Metal Building Manufacturers Association; www.mbma.com.
97. MCA - Metal Construction Association; www.metalconstruction.org.
98. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
99. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
100. MHIA - Material Handling Industry of America; www.mhia.org.
101. MIA - Marble Institute of America; www.marble-institute.com.
102. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
103. MPI - Master Painters Institute; www.paintinfo.com.
104. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
105. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
106. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
107. NADCA - National Air Duct Cleaners Association; www.nadca.com.
108. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
109. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
110. NCMA - National Concrete Masonry Association; www.ncma.org.
111. NEBB - National Environmental Balancing Bureau; www.nebb.org.
112. NECA - National Electrical Contractors Association; www.necanet.org.
113. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
114. NEMA - National Electrical Manufacturers Association; www.nema.org.
115. NETA - InterNational Electrical Testing Association; www.netaworld.org.
116. NFHS - National Federation of State High School Associations; www.nfhs.org.
117. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
118. NFPA - NFPA International; (See NFPA).
119. NFRC - National Fenestration Rating Council; www.nfrc.org.
120. NHLA - National Hardwood Lumber Association; www.nhla.com.
121. NLGA - National Lumber Grades Authority; www.nlga.org.
122. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
123. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
124. NRCA - National Roofing Contractors Association; www.nrca.net.
125. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
126. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
127. NSPE - National Society of Professional Engineers; www.nspe.org.
128. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
129. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
130. NWFA - National Wood Flooring Association; www.nwfa.org.
131. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
132. PDI - Plumbing & Drainage Institute; www.pdionline.org.
133. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
134. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
135. RFCI - Resilient Floor Covering Institute; www.rfci.com.
136. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
137. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.

138. SDI - Steel Deck Institute; www.sdi.org.
139. SDI - Steel Door Institute; www.steeldoor.org.
140. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
141. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
142. SJI - Steel Joist Institute; www.steeljoist.org.
143. SMA - Screen Manufacturers Association; www.smainfo.org.
144. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
145. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
146. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
147. SPIB - Southern Pine Inspection Bureau; www.spib.org.
148. SPRI - Single Ply Roofing Industry; www.spri.org.
149. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
150. SSINA - Specialty Steel Industry of North America; www.ssina.com.
151. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
152. STI - Steel Tank Institute; www.steeltank.com.
153. SWI - Steel Window Institute; www.steelwindows.com.
154. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
155. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
156. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
157. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
158. TMS - The Masonry Society; www.masonrysociety.org.
159. TPI - Truss Plate Institute; www.tpinst.org.
160. TRI - Tile Roofing Institute; www.tileroofing.org.
161. UBC - Uniform Building Code; (See ICC).
162. UL - Underwriters Laboratories Inc.; www.ul.com.
163. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
164. USAV - USA Volleyball; www.usavolleyball.org.
165. USGBC - U.S. Green Building Council; www.usgbc.org.
166. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
167. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
168. WDMA - Window & Door Manufacturers Association; www.wdma.com.
169. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
170. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
171. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
   1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   2. ICC - International Code Council; www.iccsafe.org.
   3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
   1. COE - Army Corps of Engineers; www.usace.army.mil.

2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. OSHA - Occupational Safety & Health Administration; www.osha.gov.
12. SD - Department of State; www.state.gov.
13. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
14. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
15. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
16. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
   2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
   3. DSCC - Defense Supply Center Columbus; (See FS).
   4. FED-STD - Federal Standard; (See FS).
   5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
      a. Available from Defense Standardization Program; www.dsp.dla.mil.
      b. Available from General Services Administration; www.gsa.gov.
      c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
   6. MILSPEC - Military Specification and Standards; (See DOD).
   7. USAB - United States Access Board; www.access-board.gov.
   8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
   2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
   3. CDHS - California Department of Health Services; (See CDPH).
   4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
   5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
   6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
   7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

ABBREVIATIONS:

AB ANCHOR BOLT
ABV ABOVE
AC ACOUSTICAL
ACT ACOUSTICAL TILE
ACU AIR CONDITIONING UNIT
ADD ADDENDUM
ADH ADHESIVE
ADJ ADJACENT
ADJT ADJUSTABLE
AGG AGGREGATE
AHU AIR HANDLING UNIT
AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AL ALUMINUM
ALT ALTERNATE
ANOD ANODIZED
APC ACOUSTICAL CEILING PANEL SYSTEM
ARCH ARCHITECT
ASB ASBESTOS
ASPH ASPHALT
ASTM AMERICAN SOCIETY FOR TESTING MATERIALS
AUTO AUTOMATIC
A.F.F. ABOVE FINISHED FLOOR
A.F.S. ABOVE FINISHED SLAB
A/C AIR CONDITIONING
BC BASE CABINET
BD BOARD
BEL BELOW
BIT BITUMINOUS
BLDG BUILDING
BLK BLOCK
BLKG BLOCKING
BM BEAM
BOT BOTTOM
BRG BEARING
BRK BRICK
BSMT BASEMENT
BVL BEVELED
B.C. BOTTOM OF CURB
B.U.R. BUILT-UP ROOF

CB CATCH BASIN
CEM CEMENT
CER CERAMIC
CFL COUNTERFLASHING
CFT CUBIC FOOT
CHAM CHAMFER
CHBD CHALK BOARD
CHT CEILING HEIGHT
CIPC CAST-IN-PLACE CONCRETE
CIR CIRCLE
CIRC CIRCUMFERENCE
CJT CONTROL JOINT
CLG CEILING
CLR CLEAR
CMT CERAMIC MOSAIC TILE
COL COLUMN
COMB COMBINATION
COMP COMPRESS
COMPO COMPOSITE, COMPOSITION
CONC CONCRETE
CONST CONSTRUCTION
CONT CONTINUOUS
CONTR CONTRACT(OR)
CORR CORRUGATED
CPT CARPET
CRS COURSE(S)
CSMT CASEMENT
CST CAST STONE
CTR CENTER
CTR COUNTER
CTSK COUNTERSUNK SCREW
CY CUBIC YARD
C.I. CAST IRON
C.M.U. CONCRETE MASONRY UNITS
C.O. CASED OPENING
C.R. CLASS ROOM
C.T. CERAMIC TILE
D DRAIN
DBL DOUBLE
DEM DEMOLISHED

DEP DEPRESSED
DF DRINKING FOUNTAIN
DH DOUBLE HUNG
DIAM DIAMETER
DIM DIMENSION
DIV DIVISION
DL DEAD LOAD
DN DOWN
DP DAMPPROOFING
DPR DAMPER
DR DOOR
DSHW DISH WASHER
DT DRAIN TILE
DTL DETAIL
DWG DRAWING
DWR DRAWER
D.S. DOWN SPOUT
E EAST
EA EACH
EB EXPANSION BOLT
EGR ENGINEER
EL ELEVATION
ELEC ELECTRICAL
ELEV ELEVATOR
EMER EMERGENCY
ENC ENCLOSURE
ENG ENGLISH
EP ELECTRIC PANELBOARD
EQ EQUAL
EQPT EQUIPMENT
EST ESTIMATE
EXCA EXCAVATE
EXIST. EXISTING
EXH EXHAUST
EXP EXPANSION
EXPO EXPOSED
EXT EXTERIOR
E.F. EXHAUST FANS
E.I.F.S. EXTERIOR INSULATION & FINISH SYSTEM
E.J. EXPANSION JOINT

FA FIRE ALARM
FAS FASTEN(ER)
FB FACE BRICK
FBD FIBERBOARD
FBO FURNISHED BY OTHERS
FDN FOUNDATION
FF FACTORY FINISH
FFE FINISHED FLOOR ELEVATION
FFL FINISHED FLOOR LINE
FIN FINISH
FIX. FIXTURE
FLCO FLOOR CLEANOUT
FLG FLASHING
FLR FLOOR
FLUR FLUORESCENT
FOM FACE OF MASONRY
FP FIREPROOF
FR FRAME
FRT FIRE RETARDANT
FS FULL SIZE
FT FEET OR FOOT
FTG FOOTING
FUR FURR(ED) (ING)
FUT FUTURE
F.D. FLOOR DRAIN
F.E. FIRE EXTINGUISHER
F.E.C. FIRE EXTINGUISHER CABINET
F.O.F. FACE OF FINISH
GA GAGE
GB GRAB BAR
GC GENERAL CONTRACT(OR)
GD GRADE
GEN GENERAL
GL GLASS
GLB GLASS BLOCK
GND GROUND
GP GALVANIZED PIPE
G.W.B. GYPSUM WALL BOARD OR GYPSUM BOARD
GT GROUT
GTR GUTTER

GV GALVANIZED
GYP GYPSUM
G.I. GALVANIZED IRON
HB HOSE BIBB
HBD HARDBOARD
HC HOLLOW CORE
HDR HEADER
HDW HARDWARE
HOR HORIZONTAL
HT HEIGHT
HTG HEATING
HVAC HEATING, VENTILATING, & AIR CONDITIONING
HWD HARDWOOD
HWH HOT WATER HEATER
H.M. HOLLOW METAL
H.R. HAND RAIL
INCAN. INCANDESCENT
INCL INCLUDE
INS INSULATE
INSC INSULATING CONCRETE
INSUL INSULATION
INT INTERIOR
INTM INTERMEDIATE
INV INVERT
IPS IRON PIPE SIZE
I.D. INSIDE DIAMETER
JT JOINT
KIT KITCHEN
KO KNOCKOUT
KPL KICKPLATE
L LENGTH
LAB LABORATORY
LAD LADDER
LAM LAMINATE
LAV LAVATORY
LB LAG BOLT
LBL LABEL
LC LIGHT CONTROL
LH LEFT HAND
LL LIVE LOAD

LP LIGHTPROOF
LPT LOW POINT
LT LIGHT
LTL LINTEL
LVR LOUVER
LW LIGHTWEIGHT
LWC LIGHTWEIGHT CONCRETE
MAS MASONRY
MAX MAXIMUM
MBR MEMBER
MECH MECHANICAL
MED MEDIUM
MET METAL
MFR MANUFACTURER
MIN MINIMUM
MIR MIRROR
MISC MISCELLANEOUS
MLD MOLDING
MM MILLIMETER
MMB MEMBRANE
MOV MOVABLE
MRD METAL ROOF DECKING
MT MOUNTING
MTD MOUNTED
MTHR METAL THRESHOLD
MTL MATERIALS
MULL MULLION
MWK MILLWORK
M.B. MARKER BOARD
M.B.R. MODIFIED BITUMEN ROOFING
M.H. MANHOLE
M.O. MASONRY OPENING
N NORTH
NAT NATURAL
NO OR # NUMBER
NOM NOMINAL
NR NOISE REDUCTION
NRC NOISE REDUCTION COEFFICIENT
N.I.C. NOT IN CONTRACT
N.T.S. NOT TO SCALE

N/A NOT APPLICABLE
OA OVERALL
OH OVERHEAD
OPG OPENING
OPH OPPOSITE HAND
OPP OPPOSITE
O.C. ON CENTER
O.D. OUTSIDE DIAMETER
PAR PARALLEL
PART PARTITION
PBD PARTICLE BOARD
PCC PRECAST CONCRETE
PCF POUNDS PER CUBIC FOOT
PERF PERFORATED
PERI PERIMETER
PFB PREFABRICATED
PFL POUNDS PER LINEAL FOOT
PFN PREFINISHED
PL PLATE
PLAS PLASTER
PLUMB. PLUMBING
PLWD PLYWOOD
PNL PANEL
PORC PORCELAIN
PR PAIR
PRF PREFORMED
PSC PRESTRESSED CONCRETE
PSF POUNDS PER SQUARE FOOT
PSI POUNDS PER SQUARE INCH
PT POINT
PT PRESSURE TREATED
PTN PAINTED
PVC POLYVINYL CHLORIDE
PVMT PAVEMENT
PWD PLYWOOD
P.C.M.T. PORCELAIN CERAMIC MOSAIC TILE
P.LAM PLASTIC LAMINATE
Q.R.T. QUARRY TILE
RA RETURN AIR
RAD, R RADIUS

RB RUBBER BASE
RBT RABBET, REBATE
RBT RUBBER TILE
RCP REINFORCED CONCRETE PIPE
RE REINFORCED, REINFORCING
REC RECESSED
REF REFERENCE
REFR REFRIGERATOR
REG REGISTER
REM REMOVE
REQ REQUIRED
RES RESILIENT
RET RETURN
REV REVISION(S)
RFG ROOFING
RFH ROOF HATCH
RFL REFLECTED(ED)
RH RIGHT HAND(ED)
RL RAIL(ING)
RM ROOM
RNGE RANGE (ELECTRIC)
RNGG RANGE (GAS)
ROW RIGHT OF WAY
RST RESISTANT
RVS REVERSE (SIDE)
R.D. ROOF DRAIN
R.O. ROUGH OPENING
R.T.U. ROOF TOP UNIT
S SOUTH
SC SOLID CORE
SCH SCHEDULE
SCN SCREEN
SCT STRUCTURAL CLAY TILE
SD STORM DRAIN
SEC SECTION
SHT SHEET
SHV SHELVING
SHTH SHEATHING
SIM SIMILAR
SP SOUNDPROOF

SPC SPACER
SPEC SPECIFICATION
SPK SPEAKER
SPL SPECIAL
SQ SQUARE
ST STEEL
STD STANDARD
STG SEATING
STO STORAGE
STR STRUCTURAL
SUSP. SUSPENDED
SYM SYMMETRICAL
SYS SYSTEM
S.C. SOLID CORE
S.F. SQAURE FEET
S.T.C. SOUND TRANSMISSION COEFFICIENT
T TREAD
T.B. TACKBOARD
TDE TURNED DOWN EDGE
TEL TELEPHONE
TEMP TEMPERATURE
THK THICK
THR THRESHOLD
TKBD TACK BOARD
TKS TACK STRIP
TOL TOLERANCE
T.O.M. TOP OF MASONRY
TR TRANSOM
TSL TOP OF SLAB
TST TOP OF STEEL
TV TELEVISION
TYP TYPICAL
T&B TOP & BOTTOM
T&G TONGUE & GROOVE
T.C. TOP OF CURB
T.O.C. TOP OF CONCRETE
T.O.F. TOP OF FLOOR
T.P. TOP OF PAVEMENT
T.W. TOP OF WALL
UC UNDERCUT

UNF UNFINISHED
UR URINAL
U.N.O. UNLESS NOTED OTHERWISE
VB VAPOR BARRIER
VB VINYL BASE
VERT VERTICAL
VIN VINYL
VJ V-JOINT(D)
VNR VENEER
VOL VOLUME
V.C.T. VINYL COMPOSITION TILE
W WEST
WB WOOD BASE
WC WALL CABINETS
WD WOOD
WG WIRED GLASS
WH WALL HUNG
WI WROUGHT IRON
WIN WINDOW
WM WIRE MESH
WO WITHOUT
WP WATERPROOF
WR WATER REPELLENT
WRS WATER RESISTANT
WS WATERSTOP
WSCT WAINSCOT
WT WEIGHT
WTW WALL TO WALL
W.C. WATER CLOSET
W.F. WIDE FLANGE
W.S.H.P. WATER SOURCE HEAT PUMP
W.W.F. WELDED WIRE FABRIC
W/ WITH
W/D WASHER/DRYER
W/O WITHOUT
PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROL

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.

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.

B. 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.

C. 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 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.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Department of Justice, 2010 ADA Standards for Accessible Design.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Living Quarters: No temporary living quarters of any kind will be permitted on the project site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (182.88 cm) 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 rails.

B. 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 (182.88 cm) 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 concrete or galvanized-steel bases for supporting posts.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
   3. Drinking water and private toilet.
   4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
   5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

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.
   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

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. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

B. Telephone Service: Provide a cellular telephone for the superintendent.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction for temporary sheds located within construction area or within 30 feet (914.4 cm) of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Provide temporary parking areas for construction personnel. At existing facilities, location of personnel parking shall be coordinated with and approved by the owner.

D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

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. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 011000 "Summary."

C. Security Enclosure and Lockup: Install temporary enclosure around areas of construction and partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
   1. Security enclosure shall be by means of chain like fence or portable chain link fence. Fence shall be provided with fence privacy screen.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 012100 "Allowances" for products selected under an allowance.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process 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. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request.
      a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time required for installation.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "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, select product 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 and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   4. Manufacturers:
      a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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 requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
      a. Where Basis-of-Design products are specified and “or equal” or “comparable products” by another manufacturer are allowed, Contractor shall provide the basis-of-design product specified or an “or equal” or “comparable product by another manufacturer, “or equal” or “comparable products” must meet specified qualities, function, dimensions, in-service performance, physical properties, appearance, and other characteristics of the basis-of-design product specified. Comply with requirements of “comparable products” article for consideration of an unnamed product by another manufacturer.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
   1. Where specifications include the phrase “as selected by Architect from custom colors,” Architect will select from custom colors that may be different than manufacturer’s standard or premium items. Contractor will be expected to match that color.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require 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.

2.3 SUBSTITUTIONS

A. Substitutions are not acceptable. Provide only products and manufacturers specified. No substitutions will be considered.

PART 3 EXECUTION (NOT USED)

END OF SECTION 016000

SECTION 017300 - EXECUTION

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 general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Installation of the Work.
   2. Cutting and patching.
   3. Coordination of Owner-installed products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.

B. Related Requirements:
   1. Section 011000 "Summary" for limits on use of Project site.
   2. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding.

Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Mechanical systems piping and ducts.
   f. Control systems.
   g. Communication systems.
   h. Fire-detection and -alarm systems.
   i. Conveying systems.
   j. Electrical wiring systems.
   k. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: 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, mechanical and electrical systems, 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; underground electrical services, and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. 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 local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

E. Surface and Substrate Preparation: Comply with manufacturer's recommendations for preparation of substrates to receive subsequent work.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2438.4 mm) in occupied spaces and in unoccupied spaces.

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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect and in accordance with the U.S. Department of Justice, ADA Standards for Accessible Design.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints. Joints indicated to receive joint sealants shall not exceed ½” unless noted otherwise.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three 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.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 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.

END OF SECTION 017300

This page intentionally left blank

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Section 017300 "Execution" for progress cleaning of Project site.
   2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
      a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
   3. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Perform preventive maintenance on equipment used prior to Substantial Completion.
   3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

4. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
6. Complete final cleaning requirements, including touchup painting.
7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion prior to date the work will be completed and ready for final inspection and tests. 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.
3. Warranties for any items listed as incomplete on the punch list will begin at acceptance of final completion.

1.4 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. "Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
5. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
6. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine 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. Contractor shall reimburse the Owner for final reinspections for time incurred for reinspection at the rate of $95.00 per hour for each inspector of the team.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization 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.
4. Submit list of incomplete items in both of the following formats:
   a. MS Excel or Word electronic file.
   b. PDF electronic file.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: 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, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-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.
   4. Submit two hard (paper) copies and one digital copy on a portable hard drive or use storage device suitable to owner and architect.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 MATERIALS

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

PART 3 EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated 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. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Sweep concrete floors broom clean in unoccupied spaces.
e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
f. Remove labels that are not permanent.
g. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
h. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
2. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

B. Related Requirements:
   1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. Submit two hard (paper) copies and one digital copy on a portable hard drive or use storage device suitable to owner and architect.

C. Corrections: Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem

into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor or construction manager.
   6. Name and contact information for Architect.
   7. Name and contact information for Commissioning Authority.
   8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
   1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
   2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
   3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Power failure.
   4. System, subsystem, or equipment failure.
   5. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Precautions against improper use.
   9. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   6. Normal shutdown instructions.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 017823

SECTION 017839 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 017700 "Closeout Procedures" for general closeout procedures.
   2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Submit one paper-copy set of marked-up record prints.
   2. Submit PDF electronic files of scanned record prints on portable hard drive or other USB storage device acceptable to owner and architect.
   3. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

D. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   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 provide information for preparation of corresponding 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 acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding photographic documentation.
   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. Depths of foundations.

d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at 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. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

1.5 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 manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as one paper copy and scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.6 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.

B. Format: Submit miscellaneous record submittals as two paper copies and canned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents 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.

PART 2 PRODUCTS

PART 3 EXECUTION

END OF SECTION 017839

This page intentionally left blank

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 CLOSEOUT SUBMITTALS

A. At completion of training, submit complete training manual(s) for Owner's use.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

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

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Operations manuals.
      c. Maintenance manuals.

d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

This page intentionally left blank

SECTION 024119 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

B. Related Requirements:
   1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

C. Predemolition Photographs: Submit before Work begins.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction. Owner/Architect does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed. Where an entire wall or partition is indicated to be removed, existing services/systems within the wall/partition shall also be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove and salvage refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.
   1. Turn refrigerant over to owner unless noted otherwise.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area to be designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19.05 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Contract Documents for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate/deck unless noted otherwise.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

This page intentionally left blank

SECTION 03 05 80 - UNDER-SLAB VAPOR BARRIER

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. Products Supplied Under This Section
   1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. Related Sections
   1. Section 03 30 00 Cast-in-place Structural Concrete

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Barriers Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154-88 (2005) Standard Test Methods for Water Vapor Barriers Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Barriers Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.4 SUBMITTALS

A. Quality Control / Assurance
   1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s samples, literature
   3. Manufacturer’s installation instructions for placement, seaming and pipe boot installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Barrier (Performance based specification). When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision. Vapor Barrier membrane must have the following properties.

1. Permeance as tested after mandatory conditioning (ASTM E 154 sections 8,11,12,13) less than 0.01 Perms [grains/(ft2 *hr. * in. Hg)]
2. Other performance criteria
    a. Strength: ASTM E 1745 Class A
    b. Thickness: 15 mils minimum

2.2 ACCESSORIES

A. Seam Tape
1. Tape must have the following qualities:
    a. Water Vapor Transmission Rate ASTM E 96, 0.3 perms or lower
2. Seam Tape
    a. Manufacturer's standard seam tape.
    b. Stego Crete Claw (for slabs on void boxes).

B. Vapor Proofing Mastic
1. Mastic must have the following qualities:
    a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower

C. Pipe Boots
1. Construct pipe boots from Vapor Barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
1. Level and tamp or roll aggregate, sand, or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Barrier:
1. Installation shall be in accordance with manufacturer's written instructions and ASTM E 1643-09.
    a. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
    b. Lap Vapor Barrier over footings or seal to foundation walls.
    c. Overlap joints 6 inches and seal with manufacturer's tape.
    d. Seal all penetrations (including pipes) per manufacturer's instructions.
    e. No penetration of the Vapor Barrier is allowed except for reinforcing steel and permanent utilities.
    f. Repair damaged areas by cutting patches of Vapor Barrier, overlapping damaged area 6 inches, and taping all four sides with tape.

END OF SECTION 03 05 80

SECTION 03 10 00 - CONCRETE FORMING 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 cast-in-place concrete formwork, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.

B. Related Sections:
   1. Section 03 30 00 “Cast In Place Concrete”.
   2. Section 03 20 00 “Concrete Reinforcing”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. American Concrete Institute (ACI):
      a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials
      b. ACI 301 – Specifications for Structural Concrete for Buildings
      c. ACI 318 – Building Code Requirements for Structural Concrete
      d. ACI 347 – Guide to Formwork for Concrete
      e. ACI SP-4 – Formwork for Concrete.

1.4 PERFORMANCE REQUIREMENTS

A. Design and engineering of formwork, including shores, reshores, false work, bracing, and other temporary supports as well as determining when temporary supports and bracing can safely be removed after the specified curing time is the Contractor’s responsibility.

B. All components of the formwork shall be designed to support all loads imposed during construction including weight of construction equipment, live loads, and lateral loads due to wind and imbalance or discontinuity of building components.

C. If any post tensioned members exist on the project, the formwork supporting those elements shall:
   1. It is essential to take into account the stressing sequence of post-tensioned concrete in the design of the formwork. Any concrete element which is stressed can transfer its weight off the form work to the supporting concrete element in which case the forms for the supporting concrete element must be designed to support the entire load tributary of that element.

2. Forms shall be designed and constructed to permit movement during stressing, both lifting and shortening of the concrete elements.
3. Formwork supporting beams and girders shall be designed to support the weight of the beam or girder's entire tributary area.
4. Formwork supporting post tensioned concrete elements shall not be removed until all concrete supported by the formwork has been fully stressed, but in no case shall the curing time before form removal be less than specified herein.
5. Design, engineering, and production of shop drawings for the form work shall be performed under the supervision of a professional engineer.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Shop drawings for layout of pan type forms, if they exist on the project. Layout only - information and details about the support of these forms is not required, as it is the responsibility of the Contractor and his registered engineer
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

C. Manufacturer's product data and installation instruction for propriety materials used in exposed concrete work including form liners, release agents, form systems, ties, and accessories.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver form materials in manufacturer's packaging with installation instructions.

B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician. An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

B. Testing Agency Qualifications: Refer to Section 01 45 23.

C. Layout and measurement of concrete forms and embedment's, required for work, performed by a licensed surveyor employed by the contractor.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete."
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. 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 concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.

PART 2 - PRODUCTS

2.1 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. 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. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Permanent Metal Forms for Slabs: Deck material, gauge and rib pattern shall be as noted on Drawings.

E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
   1. Pans shall be free of dents, irregularities, sag, rust or other deterioration.
   2. In areas permanently exposed to view, provide one piece units, manufactured to length between beams or ribs, or segmented units with reinforced butt-joint splices.

F. Load-bearing Rigid Board Insulating Fill Under Slabs:
   1. Extruded Polystyrene Board Insulation: Comply with ASTM C 578, Type X, 15 psi minimum compressive strength, 1.30 lb./cu. ft. (21 kg/cu. m) .
      a. Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com.

b. Thermal Resistance: (180-day real-time aging as mandated by ASTM C578, measured per ASTM C 518 at mean temperature of 75F): R-5.0 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.
c. Blowing Agent Formulation: Zero ozone depleting.
d. Install according to manufacturer's recommended instructions.

2. Expanded Polystyrene Board Insulation: Un-faced Flat Board Stock: Rigid, closed cell, expanded polystyrene (EPS) boards, UL certified, complying with ASTM C 578 Type VIII, 15 psi minimum compressive strength .
   a. Insulfoam, a Carlisle Company, which is located at: 6004 N. Westgate Blvd. Suite 120 ; Tacoma, WA 98406; Toll Free Tel: 800-248-5995; Tel: 253-572-5111; Email: request info (info@insulfoam.com); Web: www.insulfoam.com
   b. Blowing Agent Formulation: Zero ozone depleting.
   c. Install according to manufacturer's recommended instructions.

G. Formwork Accessories
1. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
2. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
3. Expansion-Contraction Joint Filler Material: Bonded fabric of thickness indicated on Drawings composed of cellular fibers securely bonded together and uniformly saturated with asphalt complying with ASTM D 1751.
4. 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.
   a. Formulate form-release agent with rust inhibitor for steel form-facing materials.
5. 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.
   a. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   b. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
   c. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

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 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch

3. Class C, 1/2 inch
4. Class D, 1 inch for rough-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. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. 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. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts that are attached to the formwork.
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."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

4. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

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. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be 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.
   3. Determine compressive strength of in place concrete by testing representative field-cured test specimens according to ACI 301.

B. Obtaining concrete compressive strength tests for the purposes of form removal shall be the responsibility of the Contractor.

C. In the absence of cylinder tests, formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit (10 degrees Celsius) for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. When the surrounding air temperature is below 50 degrees Fahrenheit (10 degrees Celsius), that time period shall be added to the minimum listed time period.

D. Formwork for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span. Two-way conventionally reinforced slabs shall then be reshored until they attain the specified 28 day strength.

E. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems that allow form removal without displacing shores. However, the Contractor must demonstrate, to the satisfaction of the Architect, that the early removal of forms will not result in excessive sag, distortion or damage to the concrete elements.

F. 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.

G. 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 Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 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. The Contractor shall be solely responsible for proper shoring and reshoring. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

C. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement. Reshores shall be located in the same position on each floor. No construction loads shall be placed on the new construction until all supporting reshores have been installed.
   1. Extend shores or reshores from ground to top level in structure three stories or less in height, unless noted otherwise.
   2. In structures over three stories in height, extend shores or reshores at least three levels under the level being placed. Extend shores beyond the minimum number of levels if required to ensure proper distribution of loads throughout the structure.
   3. In crawl spaces or basement, shores or reshores shall extend to mud pads seated firmly on the soil or to on grade construction.

D. 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.

E. Bottom tier of reshores shall remain in place until the supported concrete has attained at least 85 percent of the specified 28-day compressive strength and construction loads in excess of 20 psf have been removed but not less than 14 days.

3.5 REUSE OF FORMS

A. Clean and repair surfaces of forms to be used in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.

B. 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 Architect.

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 Architect.
   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.

5. Space vertical joints in walls as indicated. Otherwise, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: 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.
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 are to be installed.
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: 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.

3.7 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, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

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.

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.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated or to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. 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.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment

END OF SECTION 03 10 00

This page intentionally left blank

SECTION 03 20 00 - CONCRETE REINFORCING

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 cast-in-place concrete reinforcement, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.

B. Related Sections:
   1. Section 03 10 00 “Concrete Forming and Accessories”.
   2. Section 03 30 00 “Cast In Place Concrete”.
   3. Section 04 22 00 “Concrete Unit Masonry”.
   4. Section 31 20 00 "Earth Moving".

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. American Concrete Institute (ACI)
      a. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
      b. ACI 301 – Specifications for Structural Concrete for Buildings
      c. ACI 315 – Details and Detailing of Concrete Reinforcement
      d. SP-66 ACI Detailing Manual
   2. American Welding Society (AWS)
      a. AWS D1.1 – Structural Welding Code
   3. Concrete Reinforcing Steel Institute (CRSI)
      a. CRSI – Manual of Standard Practice
      b. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
      c. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
   4. American Society of Testing Materials (ASTM)
      a. ASTM-A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
      b. ASTM-A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties.
      c. ASTM-A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      d. ASTM-A675: Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.

e. ASTM-A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
f. ASTM-A775: Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
g. ASTM-A884: Standard Specification for Epoxy-Coated Wire and Welded Wire Reinforcement.

B. In the case of conflict between the Contract Documents and a reference standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. 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, according to ACI 315 “Details and Detailing of Concrete Reinforcement.”
1. Do not reproduce the structural drawings for use as shop drawings.

C. Bar Supports: Submit manufacturer’s product information for bolsters, chairs, spaces, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency, installer, and fabricator as indicated herein.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Steel reinforcement and accessories.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Refer Section 01 45 23.

B. Installer Qualifications: An experienced installer who has completed reinforcing installation work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

C. Fabricator Qualifications: An experienced fabricator who has completed reinforcing fabrication work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.

D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. 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 concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60 or Grade 75 as indicated on Drawings, deformed.

C. Low-Alloy-Steel Reinforcing Bars for bars to be welded: ASTM A 706, Grade 60 for #6 and smaller bars, Grade 75 for #7 and larger bars, deformed.

D. Add the following paragraph below for stainless-steel reinforcement. Retain one of two options for reinforcement type.

E. Stainless-Steel Reinforcing Bars: ASTM A 955, Grade 60, [Type 304] [Type 316L], deformed.

F. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60 or ASTM A 706, deformed bars, assembled with clips.

G. Plain-Steel Wire: ASTM A 82, as drawn.

H. Deformed-Steel Wire: ASTM A 496.

I. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

J. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, 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. 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 support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, or other unacceptable materials.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Combined tolerances for formwork, reinforcing fabrication, and reinforcing placement shall not permit a reduction in specified concrete cover of reinforcing steel. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material. Bars used for concrete reinforcement shall meet following requirements for fabricating tolerances:

1. Sheared length: Plus or minus 1 inch.
2. Overall dimensions of stirrups, ties, and spirals: Plus or minus ½ inch.
3. Other bends: Plus or minus 1 inch.

B. For bars with end bearing splice couplers, bar ends shall terminate in flat surfaces, within 1.5 degrees of a right angle to axis of bars and shall be fitted within 3 degrees of full bearing after assembly.

2.4 DOWEL BAR ANCHORS/SPLICERS

A. Provide dowel bar anchors and threaded dowels designed to develop, both in tension and compression, 125% of the minimum ASTM specified yield strength of the dowel bars, as evidenced by published I.C.B.O. test reports. Unless otherwise indicated, anchors shall be furnished with ACI standard 90 degree hooks. Dowels shall be furnished by anchor supplier. The following dowel splicing systems are acceptable.

1. Richmond Screw Anchor “Dowel Bar Splicer”
2. Erico “Lenton Form Saver”
3. Dayton Barsplice “Grip-Twist”

2.5 MECHANICAL SPLICES

A. A. Provide mechanical splices designed to develop, both in tension and compression, 125% of minimum ASTM yield strength of the smaller bar being coupled, as evidenced by published I.C.B.O test reports. The following bar splicing systems are acceptable.

1. Erico “Cadweld C-Series”
2. Erico “Lenton”
3. Dayton Barsplice “Bar Grip”
4. Dayton Barsplice “Grip Twist”

2.6 METAL ANCHORAGE AND EMBEDDED METAL ASSEMBLIES

A. Steel Shapes and Plates: Conform to ASTM A36, “Specification for Structural Steel”.

B. Headed Stud Anchors: Headed studs welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

C. Welding Electrodes: AWS 5.5, Series E70.

D. Welded Deformed Bar Anchors: Welded by full fusion process, as furnished by TRW Nelson Stud Welding Division.

E. All metal assemblies exposed to earth, weather, or moisture, including exposure to a crawl space environment, shall be hot dip galvanized.

2.7 FABRICATION OF METAL ACCESSORIES AND EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of metal and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Welded construction shall conform to AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings,” and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full fusion process equal to that of TRW Nelson Stud Welding Division of KSM Welding Services Division, Omark, Ind. A minimum of two headed studs shall be tested at start of each production period for proper quality control. Studs shall be capable of being bent 45 degrees without weld failure.

C. Welding of reinforcement shall be done in strict accordance with AWS requirements, using recommended preheat temperature and electrode for type of reinforcement being welded. Bars larger than No. 9 shall not be welded. Welding shall be performed subject to the observance and testing laboratory. Under no circumstances is ordinary reinforcing (ASTM A615) to be welded.

D. Coatings, where required, shall be applied after fabrication and prior to casting concrete.

PART 3 - EXECUTION

3.1 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."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.2 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.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Provide minimum concrete covering for reinforcement as shown in the Structural General Notes.

G. Place bars to following tolerances:
   1. Clear distance to formed surfaces: Plus or minus 1/4 inch.
   2. Minimum spacing between bars: Minus 1/4 inch.
   3. Top bars in slabs and beams:
      a. Members 8 inches deep or less: Plus or minus 1/4 inch.
      b. Members between 8 and 24 inches deep: Plus or minus 1/2 inch.
      c. Members more than 24 inches deep: Plus or minus 1 inch.
   4. Crosswise of members: Spaced evenly within 2 inches.
   5. Length of members: Plus or minus 2 inches.

H. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter, or enough to exceed above tolerances, resulting arrangement of bars subject to approval.

I. Support reinforcement and fasten together to prevent displacement by construction loads or placing concrete beyond tolerances indicated.

J. Unless permitted by Engineer, do not bend reinforcement after embedding in hardened concrete.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.

B. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.

B. Related Sections:
   1. Section 03 20 00 "Concrete Forming and Accessories".
   2. Section 03 10 00 "Concrete Reinforcing".
   3. Section 03 05 80 “Under-slab Vapor Barrier – Retarder”.

1.3 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. ACI 301 – Specification for Structural Concrete.
   2. ACI 302 – Guide for Concrete Floor Slab Construction.
   3. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete.
   4. ACI 305 – Hot Weather Concreting.
   5. ACI 306 – Cold Weather Concreting.
   6. ACI 308 – Guide to Curing Concrete.
   7. ACI 309 – Guide for Consolidating Concrete.
   8. ACI 311 – ACI Manual for Concrete Inspection.
   9. ACI 318 – Building Code Requirements for Reinforced Concrete.
   10. ACI 347 – Guide to Concrete Formwork.
   11. ACI 207 – Mass Concrete.
   12. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   13. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
   14. ACI 212.3 – Chemical Admixture for Concrete.
   15. ACI 212.4 – Guide for the use of High Range Water Reducing Admixtures in Concrete.
   16. ACI 214 – Evaluation of Strength Test Results of Concrete.
   17. ACI 303 – Guide to Cast in Place Architectural Concrete Practice.
   18. Concrete Reinforcing Steel Institute, “Manual of Standard Practice”.

B. In the case of conflict between the Contract Documents and a referenced standard, the Contract Documents shall govern. In the case of a conflict between the Contract Documents and the Building Code, the more stringent shall govern.

1.4 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture include the following information. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Each proposed mix design shall be accompanied by a complete standard deviation analysis based on at least 30 consecutive strength tests, or by three laboratory trial mixtures with confirmation tests.
2. Proportions of cement, fine, and coarse aggregate, and water.
3. Design strength.
4. Maximum slump.
5. Air Content.
6. Maximum water / cement ratio.
7. Maximum and minimum concrete temperature that is acceptable at time of placement for which the manufacturer can guarantee the strength of the concrete.
8. Type cement and aggregates.
9. Type and quantities of all admixtures.
10. Air dry density and splitting tensile strength for lightweight concrete determined in accordance with ASTM 330.
11. Type, color, and quantities of integral coloring compounds, where applicable.
12. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Refer Section 03 20 00.

D. Formwork Shop Drawings: Refer Section 03 10 00.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Semi rigid joint filler.
9. Joint-filler strips.
10. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: See Section 01 45 23.
   1. Contractor’s responsibility to testing laboratory.
      a. Furnish all labor and materials as required to assist testing agency in obtaining, making and handling samples at the jobsite.
      b. Advise the Owner’s Testing Laboratory sufficiently in advance of operations to allow adequate time for the assignment of testing personnel.
      c. Furnish and maintain adequate facilities for proper curing of concrete test specimens on the project site in accordance with ASTM C31.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete."
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
   1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.

H. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. 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 concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete subcontractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings, if any, on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. See Section 03 10 00.

2.2 STEEL REINFORCEMENT

A. See Section 03 20 00.

2.3 REINFORCEMENT ACCESSORIES

A. See Section 03 20 00.

2.4 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 Type I/II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C. Carbon content shall not exceed 3 percent by volume.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 1-1/2 inches, 1 inch, or 3/4 inch nominal as indicated on Drawings for specific uses.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

D. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that contain not more than 0.05 percent water soluble chloride ions. Do not use calcium chloride or admixtures containing calcium chloride (except the chemical admixture Xypex).
1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
7. Waterproofing Admixture: Xypex Admix C-1000

2.6 CONCRETE MIX DESIGNS

A. Selection of Proportions: Proportions of ingredients for concrete mixes shall be determined by a qualified concrete supplier in accordance with the requirements of ACI 301.

B. Required average strength above specified strength: Determination of required average strength above specified strength shall be based on the standard deviation record of the production facility in accordance with ACI 301. Calculation of standard deviation of compressive strength results shall be made in accordance with ACI 214. If a suitable record of strength tests is not available, proportions shall be selected on the basis of laboratory trial batches to produce an average strength greater than the strength f’c by the amount defined in ACI 301.

2.7 VAPOR RETARDERS

A. See Section 03 05 80.

2.8 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ChemMasters; Chemisil Plus.
      b. ChemTec Int'l; ChemTec One.
      c. Conspec by Dayton Superior; Intraseal.
      d. Curecrete Distribution Inc.; Ashford Formula.
      e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
      f. Edoco by Dayton Superior; Titan Hard.
      g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      h. Kaufman Products, Inc.; SureHard.
      i. L&M Construction Chemicals, Inc.; Seal Hard.
      j. Meadows, W. R., Inc.; LIQUI-HARD.
      k. Metalcrete Industries; Floorsaver.
      l. Nox-Crete Products Group; Duro-Nox.
      m. Symons by Dayton Superior; Buff Hard.
      n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
      o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
      b. ChemMasters; SprayFilm.
      c. Conspec by Dayton Superior; Aquafilm.
      d. Dayton Superior Corporation; Sure Film (J-74).
      e. Edoco by Dayton Superior; BurkeFilm.
      f. Euclid Chemical Company (The), an RPM company; Eucobar.
      g. Kaufman Products, Inc.; Vapor-Aid.
      h. Lambert Corporation; LAMBCO Skin.
      i. L&M Construction Chemicals, Inc.; E-CON.
      j. Master Builders Solutions; MasterKure ER 50 (Pre-2014: Conflim).
      k. Meadows, W. R., Inc.; EVAPRE.
      l. Metalcrete Industries; Waterhold.
      m. Nox-Crete Products Group; MONOFILM.
      n. Sika Corporation; SikaFilm.
      o. SpecChem, LLC; Spec Film.
      p. Symons by Dayton Superior; Finishing Aid.
      q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
      r. Unitex; PRO-FILM.

s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

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. Products: Subject to compliance with requirements, provide one of the following:
a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; W.B. Resin Cure.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; Res X Cure WB.
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
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; Resin Cure E.
l. Right Pointe; Clear Water Resin.
m. SpecChem, LLC; Spec Rez Clear.
n. Symons by Dayton Superior; Resi-Chem Clear.
o. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, provide one of the following:
a. ChemMasters; Polyseal WB.
b. Conspec by Dayton Superior; Sealcure 1315 WB.
c. Edoco by Dayton Superior; Cureseal 1315 WB.
d. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
f. Lambert Corporation; UV Safe Seal.
g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
h. Master Builders Solutions; MasterKure CC 1315WB (Pre 2014: Kure1315).
i. Meadows, W. R., Inc.; Vocomp-30.
j. Metalcrete Industries; Metcure 30.
k. Right Pointe; Right Sheen WB30.
l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.10 RELATED MATERIALS

A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 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.

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 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.

2.12 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: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, as indicated in Structural General Notes.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 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.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 NON-SHRINK GROUT

A. Grout shall be prepackaged, non metallic, and non gaseous. It shall be non-shrink when tested in accordance with ASTM-C1107 Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Thirty-minute-old grout shall flow through the flow cone after slight agitation, in temperatures of 40 degrees to 90 degrees Fahrenheit. Grout shall be bleed free and attain 7,500 psi compressive strength in 28 days at fluid consistency. Certified independent test data required. Approved products include the following:
   1. “Euco NS” by Euclid Chemical Company
   2. “Masterflow 713” by Master Builders.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as indicated in Structural General Notes:

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 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. See Section 03 10 00.

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."
   2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. See Section 03 10 00.

3.4 SHORES AND RESHORES

A. See Section 03 10 00.

3.5 VAPOR RETARDERS/BARRIERS

A. See Section 03 05 80.

3.6 STEEL REINFORCEMENT

A. See Section 03 20 00

3.7 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 Architect.
   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.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: 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.
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 are specified or otherwise 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: 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.

3.8 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 unless approved by Architect.

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. Do not permit concrete to drop freely any distance greater than 10'-0" for concrete containing a high range water reducing admixture or 5'-0" for other concrete. Provide chute or tremie to place concrete where longer drops are necessary. Do not place concrete into excavations with standing water. If place of deposit cannot be pumped dry, pour concrete through a tremie with its outlet near the bottom of the place of deposit.

F. 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 bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. 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.

H. Hot-Weather Placement: Comply with ACI 305 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.

3.9 FINISHING FORMED SURFACES

A. See Section 03 10 00.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and/or to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated and/or to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and/or 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.
2. Finish surfaces according to ASTM E 1155, for a randomly trafficked floor surface.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 CONCRETE FLOOR FINISH TOLERANCES

A. Interior Finish Floor surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System." The following values apply before removal of shores. Levelness values F(L) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.
   1. Exposed, vinyl tiled, or thin-set tiled floors: Specified overall values of flatness, Ff =35; and levelness, Fl =25; with minimum local values of flatness, Ff =24; and levelness, Fl =17.
   2. Carpeted floors, floors under concrete toppings, thickset tile and terrazzo: Specified overall values of flatness, Ff =25; and levelness, Fl = 20; with minimum local values of flatness, Ff =17; and levelness, Fl =15.

B. Floor Elevation Tolerance Envelope:
   1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:
      a. Slab-on-Grade, or Slab-on-Void Construction: +/- 3/4"
      b. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"
      c. Top surfaces of all other slabs: +/- 3/4"
      d. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'-0" at any point, up to 3/4" from theoretical elevation at any point.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. 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.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 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. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. 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.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. 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. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
   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.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer’s written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 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 six 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.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect'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 to solid concrete. Limit cut depth to 3/4 inch. 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 Architect.

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 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.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: See Section 01 45 23.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
2. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
NOTE: Add articles for flowable fill in products and execution. NEEDS RESEARCH.

END OF SECTION 03 30 00

SECTION 033519 - STAINED CONCRETE FINISHING

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 concrete finishing, including staining.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product requiring color selection.

C. Samples for Verification: For each type of exposed color.

1.4 FIELD CONDITIONS

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

B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 PRODUCTS

2.1 DYE:

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ameripolish Surelock Concrete Dye or a comparable product by another manufacturer.

2.2 DENSIFIER:

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ameripolish 3DHS Hybrid Densifier or a comparable product recommended by the dye manufacturer.

2.3 STAIN PROTECTOR/SEALER:

A. Basis-of-Design Product: Subject to compliance with requirements, provide Ameripolish 3DSP Stain Protector or a comparable product recommended by the dye manufacturer.

2.4 ACCESSORIES:

A. Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.

B. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
   1. Epoxy, urethane, polyurea, or polyaspartic resins.
   2. Latex or acrylic binders mixed with cement dust from previous grinding steps.
   3. Silicate binders mixed with cement dust from previous grinding steps.

2.5 DYEING EQUIPMENT:

A. Spray Equipment:
   1. Provide a low pressure sprayer with tips and floor finish applicator pads recommended by dye manufacturer.

2.6 POLISHING EQUIPMENT:

A. Field Grinding and Polishing Equipment:

1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.
2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments to meet OSHA requirements.
3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.

B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces the same results, without noticeable differences, as field grinding and polishing equipment.

C. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.
1. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.
2. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.
3. Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, and thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.
4. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.
5. Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.
6. Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Newly placed concrete shall be at least 28 days old before staining.

B. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

3.2 PREPARATION

A. Cleaning Concrete Surfaces:
1. Prepare and clean concrete surfaces.
2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

3.3 POLISHING AND DYEING CONCRETE FLOORS

A. Grind up to minimum of 100-grit resin bond diamonds.

B. Remove all dust and debris. If wet cleaning is performed, allow surfaces to dry. Vacuum surface thoroughly.

C. Dyeing: After initial grinding, apply dye according to manufacturer's recommendations allowing surface to dry before proceeding.

D. Densifier Application: After dyeing per manufacturer's recommendations, apply to point of rejection, remove excess liquid, and allow curing according to manufacturer's instructions.

E. Honing:
   1. Use grinding equipment with hybrid or resin bonded tooling.
   2. Hone concrete in one direction with 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass.

F. Dyeing: After honing, apply dye again per manufacturer's instructions to maximize color.

G. Stain Protector: After dyeing, apply stain protection in accordance with manufacturer's requirements.

3.4 PROTECTION

A. Protect polished concrete floors from damage during remainder of construction. Any damage to floor shall be repaired by the contractor to satisfaction of owner.

END OF SECTION 033519

This page intentionally left blank

SECTION 040110 - MASONRY CLEANING

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 cleaning the following:
   1. Existing unit masonry surfaces.

B. Related Sections:
   1. Section 042000 “Unit Masonry” for cleaning of new masonry surfaces.

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (689.48 kPa).

B. Low-Pressure Spray: 100 to 400 psi (2757.90 kPa); 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to cleaning masonry including, but not limited to, the following:
      a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
      b. Materials, material application, and sequencing.
      c. Cleaning program.
      d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:
   1. Remove plant growth.
   2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
   3. Remove paint.
   4. Clean masonry surfaces.
   5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include material descriptions and application instructions.
   2. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paint-remover manufacturer and chemical-cleaner manufacturer.

B. Preconstruction Test Reports: For cleaning materials and methods.

C. Cleaning program.

1.8 QUALITY ASSURANCE

A. Cleaning Specialist Qualifications: Engage an experienced masonry cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.

B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection, preconstruction product testing, and on-site assistance.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.
   1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.

D. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.
      a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
      b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
   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.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage paint-remover manufacturers to perform preconstruction testing on masonry surfaces.
   1. Use test areas as indicated and representative of proposed materials and existing construction.
   2. Propose changes to materials and methods to suit Project.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 PRODUCTS

2.1 PAINT REMOVERS

A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation, for removing paint from masonry; containing no methylene chloride.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ABR Products, Inc.; 800 Brush Grade.
      b. Diedrich Technologies Inc., a division of Sandell Construction Solutions; 606 Multi-Layer Paint Remover or 606X Extra Thick Multi-Layer Paint Remover.
      c. EaCo Chem, Inc.; Stripper Cream.
      d. Hydrochemical Techniques, Inc.; HydroClean HT-716 Heavy Duty Paint Remover.
      e. PROSOCO, Inc.; Sure Klean Heavy Duty Paint Stripper or Sure Klean Heavy Duty Paint Stripper D.
      f. Shore Corporation; 2200 Alka Strip.

2.2 CLEANING MATERIALS

A. Water: Potable.

B. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

C. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

D. Chemical Cleaners: It is the intent of this project to use only water and detergents and mold, mildew, and algae removers to clean the masonry. However, the owner may approve the use of chemical cleaners proposed by the cleaning specialists if water and detergents are insufficient. Should the cleaning specialist propose chemical cleaners, it will be up to the cleaning specialist to confirm any proposed chemicals will not damage masonry or surrounding materials.
   1. Proposed chemical cleaners shall be applied and rinsed as recommended by the manufacturers.

2.3 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

PART 3 EXECUTION

3.1 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
   1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
   2. Do not apply solutions during winds of enough force to spread them to unprotected surfaces.
   3. Neutralize alkaline and acid wastes before disposal.
   4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet (609.6 cm) away by Architect.

B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.
   1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
   2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

a. Equip units with pressure gages.
b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

F. Water Application Methods:
1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (152.4 mm) from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.
1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint with alkaline paint remover.
a. Comply with requirements in "Paint Removal" Article.
b. Repeat application up to two times if needed.

3.4 PAINT REMOVAL

A. Paint-Remover Application, General: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

B. Paint Removal with Alkaline Paste Paint Remover:
1. Remove loose and peeling paint using low-pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply paint remover to dry, painted surface with brushes.
3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
5. Repeat process if necessary to remove all paint.
6. Apply acidic cleaner or manufacturer's recommended afterwash to surface, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended in writing by chemical-cleaner or afterwash manufacturer.

7. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.

3.5 CLEANING MASONRY

A. Cold-Water Soak:
   1. Apply cold water by intermittent spraying to keep surface moist.
   2. Use perforated hoses or other means that apply a fine water mist to entire surface being cleaned.
   3. Apply water in cycles of five minutes on and 20 minutes off.
   4. Continue spraying until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests for 72 hours.
   5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by low-pressure spray.

C. Detergent Cleaning:
   1. Wet surface with cold water applied by low-pressure spray.
   2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
   3. Rinse with cold water applied by low-pressure spray to remove detergent solution and soil.
   4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

D. Mold, Mildew, and Algae Removal:
   1. Wet surface with cold water applied by low-pressure spray.
   2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
   3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
   4. Rinse with cold water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
   5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage paint-remover manufacturer's and service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's factory-authorized service representatives visit Project site not less than once to observing progress and quality of the work.

3.7 FINAL CLEANING

A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040110

This page intentionally left blank

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 047200 "Cast Stone Masonry" for cast stone set in masonry.
2. Section 047314 "Manufactured Architectural Stone Masonry" for Architectural stone masonry veneer units.
3. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
4. Section 055000 “Metal Fabrications” for steel lintels and shelf angles set in unit masonry.
5. Section 072726 "Fluid Applied Membrane Air Barriers" for air barriers installed in cavity walls.
6. Section 077100 "Roof Specialties" 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. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:
1. Clay face brick, in the form of straps of five or more bricks.
2. Colored mortar.

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. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.5 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type of the following:
   1. Masonry units.
      a. Include data on material properties and 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.

C. 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.

D. 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.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.7 MOCKUPS

A. Wall Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution and to set quality standards for installation.
   1. Build mockups for typical exterior wall in sizes approximately 48 inches (1219.2 mm) long by 48 inches high by full thickness, including face and backup wythes and accessories.
      a. Include a sealant-filled joint at least 16 inches (406.4 mm) long in exterior wall mockup.

b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches (406.4 mm) down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
c. Where applicable, include metal studs, sheathing, sheathing joint-and-penetration treatment, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations by Change Order.

1.8 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.

1.9 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 (609.6 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 (609.6 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 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. 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 unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 602.

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 and will be within 20 feet (609.6 cm) vertically and horizontally of a walking surface.

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. If size and aggregate type fail to meet equivalent thickness required, U.L. certified rated CMU shall be provided.

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 bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90, lightweight.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13100.04 kPa) unless noted otherwise.
   a. At all 12” CMU wall/partitions, provide units with minimum average net-area compressive strength of 2800 psi (19305.33 kPa).
2. Size (Width): Manufactured to dimensions 3/8 inch (9.52 mm) less than nominal dimensions.
   a. Units shall be 8” x 16” face dimensions and 4 inch (101.6 mm), 6 inch (152.4 mm), 8 inch (203.2 mm) and 12 inch (304.8 mm) thicknesses as shown on drawings.

2.5 LINTELS

A. Masonry Lintels: 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. Temporarily support built-in-place lintels until cured.

B. Precast-U-Lintels:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Cast Crete; U-Lintels or a comparable product by another manufacturer.
   2. Size: Provide lintels to match thickness of CMU partition in lengths required for opening and bearing required by manufacturer.
   3. Lintels to be constructed of 6000 psi (41368.56 kPa) concrete, rebar complying with ASTM 615, Grade 60, wire per ASTM A510.
   4. Units shall be grey, smooth formed.

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 and where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216, Grade SW, Type FBS.
   1. Brick shall match existing as approved by Architect.
   2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20684.28 kPa).
   3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M.
   4. 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.
   5. Application: Use where brick is exposed unless otherwise indicated.
   6. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
      a. Brick :
         1) Triangle Brick Red Common Prod. No. 100
         2) North Georgia Brick MS Columbus Select Smooth Red

C. Building (Common) Brick: ASTM C62, Grade SW.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23097.45 kPa).
   2. Size (Actual Dimensions): Match size of face brick.
   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. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

E. 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. Argos USA LLC
      b. Cemex S.A.B. de C.V.D.
      c. Holcim (US) Inc.
      d. National Cement; A Vicat Company.
   2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   3. Pigments do not exceed 5 percent of masonry cement by weight.
   4. Color: As selected by architect from manufacturer's full range.
      a. Architect may select separated colors to match each brick color and/or stone color.

F. Aggregate for Mortar: ASTM C144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch (6.35 mm) thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.

G. Aggregate for Grout: ASTM C404.

H. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

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 steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
   1. Interior Walls: Mill- galvanized carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: 0.148-inch diameter.
   4. Wire Size for Cross Rods: 0.148-inch diameter.
   5. Wire Size for Veneer Ties: 0.187-inch diameter.
   6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (406.4 mm) o.c.
   7. Provide in lengths of not less than 10 feet (304.8 cm) , with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

E. Masonry-Joint Reinforcement for Multiwythe Masonry:
   1. 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 (1.59 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 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 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. Mill-Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A641/A641M, Class 1 coating.

2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
3. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
5. 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- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick steel sheet, galvanized after fabrication.
a. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

E. Partition Top Anchors: See structural drawings for anchoring tops of partitions to structure.

F. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.59 mm).
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.0785-inch- thick steel sheet, galvanized after fabrication.
3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
4. Masonry-Veneer Anchors; Double-Pintle Plate: Rib-stiffened, sheet metal anchor section with screw holes at top and bottom, projecting horizontal leg with slots for vertical legs of double pintle wire tie. Projecting horizontal leg length shall be coordinated with specified insulation thickness.
5. Contractor’s option: Anchors, ties, and metal accessories.
a. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours in accordance with ASTM B117.
b. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.10 EMBEDDED FLASHING

A. Flexible Flashing: Use the following unless otherwise indicated:
1. Stainless Steel Fabric Flashing: Composite, flashing product consisting of minimum 2-mil of Type 304 stainless steel sheet, bonded to a layer of polymeric fabric.

B. Flashing Corners and End Dams: Provide 304 stainless steel soldered corners and end dams by same manufacturer as stainless steel flashing to seal off corners and ends of flashing.

C. Drip Edge: Provide 304 stainless steel drip plate (flat) with factory hemmed edge for thru-wall applications of flashing.

D. Sealants for Sheet Metal Flashings:
   1. Elastomeric Sealant: ASTM C920, chemically curing sealant; of type, grade, class, and use classifications required by manufacturer to seal joints in sheet metal flashing and remain watertight.

E. Termination Bars for Flexible Flashing, Flanged: Stainless steel sheet 0.019 inch (0.48 mm) by 1-1/2 inches (38 mm) with a 3/8-inch flange at top.

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 urethane or PVC.

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: Use the following unless otherwise indicated:
   1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (9.52 mm) in diameter, in length required to produce 2-inch exposure on exterior and 18 inches (457.2 mm) in cavity. Use only for weeps.

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.

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.

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. Use portland cement-lime mortar unless otherwise indicated.
   3. For masonry veneer, use masonry cement mortar.

B. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For masonry below grade or in contact with earth, use Type M.
   2. For CMU masonry, use Type S.
   3. For brick or stone veneer, use Type N.

C. Pigmented Mortar: Use colored cement product. Do not add pigments to colored cement products.
   1. Pigments do not exceed 5 percent of masonry cement by weight.
   2. Mix to match Architect's approved sample(s).
   3. Application: Use pigmented mortar for exposed mortar joints with the following units:

a. Decorative CMUs.
b. Clay face brick.
c. Cast-stone trim units.
d. Stone masonry.

D. 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, Table 1 or paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 3000 psi (20684.28 kPa).
3. Provide grout with a slump of 8 to 11 inches (279.4 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 walls and other masonry construction to full thickness shown. Build single-wythe 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. 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 (12.7 mm) or minus 1/4 inch (6.35 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12.7 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6.35 mm) in a story height or 1/2 inch (12.7 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 (6.35 mm) in 10 feet (304.8 cm), or 1/2-inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
   3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), 3/8 inch (9.52 mm) in 20 feet (609.6 cm), or 1/2-inch 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 (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
   5. For lines and surfaces, do not vary from straight by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), 3/8 inch (9.52 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
   6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), or 1/2-inch maximum.
   7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.59 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 (3.18 mm), with a maximum thickness limited to 1/2 inch (12.7 mm).
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3.18 mm).
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9.52 mm) or minus 1/4 inch (6.35 mm).
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.18 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
   5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.59 mm) from one masonry unit to the next.

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 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 (101.6 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

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 (609.6 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 roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition.
   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. Set stone and cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
   2. Allow cleaned surfaces to dry before setting.
   3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

F. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, and air barriers unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together as follows:
   1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
   2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

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. Apply air barrier to face of backup wythe to comply with Section 072726 "Fluid-Applied Membrane Air Barriers."

3.7 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406.4 mm) o.c. vertically and 24 inches (609.6 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches (304.8 mm) of openings and at intervals, not exceeding 8 inches (203.2 mm), around perimeter.

B. Match existing airspace size between back of masonry veneer and face of interior wall.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (15.88 mm) on exterior side of walls, 1/2 inch (12.7 mm) elsewhere. Lap reinforcement a minimum of 6 inches (152.4 mm).
1. Begin joint reinforcement at first joint above finished floor elevation.
2. Space reinforcement not more than 16 inches (406.4 mm) o.c.
3. Space reinforcement not more than 8 inches (203.2 mm) o.c. in foundation walls and parapet walls.
4. Provide reinforcement not more than 8 inches (203.2 mm) above and below wall openings and extending 12 inches (304.8 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.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 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 1/2 inch (12.7 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 16 inches (406.4 mm) o.c. vertically and 24 inches (609.6 mm) o.c. horizontally.

3.10 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.

C. Form expansion joints in brick as follows:
1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (9.52 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (9.52 mm).
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry or precast U-lintels where indicated and where openings of more than 12 inches (304.8 mm) for brick-size units and 24 inches (609.6 mm) for block-size units are indicated without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (203.2 mm) at each jamb unless otherwise indicated.

3.12 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. At masonry-veneer walls, extend flashing through veneer, across airspace and up face of CMU or sheathing at least 18 inches (457.2 mm). Fasten upper edge of flexible flashing to CMU or sheathing through termination bar.
   2. At lintels and shelf angles, extend flashing 6 inches (152.4 mm) minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches minimum, to edge of next full unit and terminate with premanufactured end dams.
   3. At inside and outside corners, terminate flashings with pre-manufactured soldered corners as specified.
   4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (12.7 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge. Metal drip edge shall be flush with outside face of veneer.

C. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
   1. Use specified weep products to form weep holes.
   2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
   3. Space weep holes formed from wicking material 16 inches (406.4 mm) o.c.
   4. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.

3.13 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 48 inches (1219.2 mm).

3.14 FIELD QUALITY CONTROL

A. Testing Agency: 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 Section 014000 “Quality Requirements.”
   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.

3.15 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 strippable 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.

3.16 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.

END OF SECTION 042000

SECTION 047200 - CAST STONE MASONRY

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.
      b. Column covers.

B. Related Sections:
   1. Section 042000 "Unit Masonry" for installing cast stone units in unit masonry and for mortar and grout materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   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 Initial Selection: For colored mortar.

D. Samples for Verification:
   1. For each color and texture of cast stone required, 10 inches (254 mm) square in size.
   2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

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.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

C. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.

D. 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.

E. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."

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 ACI 530.1/ASCE 6/TMS 602.
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 ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.1 CAST STONE MATERIALS

A. General: Comply with ASTM C1364 and the following:

B. Reinforcement: Deformed steel bars complying with ASTM A615/A615M, 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 A775/A775M.
2. Galvanized Coating: ASTM A767/A767M.

C. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A 666, Type 304.

2.2 CAST STONE UNITS

A. Provide cast stone units complying with ASTM C1364 using either the vibrant dry tamp or wet-cast method.
1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C1364.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. 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 (3.18 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 (3.18 mm), whichever is greater, but in no case by more than 1/4 inch (6.35 mm).
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3.18 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 (3.18 mm) on formed surfaces of units and 3/8 inch (9.52 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.
   b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
   c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
   d. No fewer than eight days at mean daily temperature of 45 deg F (7 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.

2.3 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

2.4 ACCESSORIES

A. Anchors: Type and size recommended by manufacturer for conditions indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A 666.

B. Dowels: 1/2-inch- (12-mm-) diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A 666.

2.5 MORTAR MIXES

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

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 work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Install cast stone units to comply with requirements in Section 042000 "Unit Masonry."

B. 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.

C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

D. 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. Fill collar joints solid as units are set.
   5. Build concealed flashing into mortar joints as units are set.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Provide sealant joints at 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 (9.52 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 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2 inch (12.7 mm) maximum.

B. Variation from Level: Do not exceed 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2 inch (12.7 mm) maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch (3.18 mm) in 36 inches (914.4 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 (1.59 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 by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

END OF SECTION 047200

SECTION 047314 - MANUFACTURED ARCHITECTURAL STONE MASONRY

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. Architectural stone masonry veneer units for full-bed masonry installations.

B. Related Sections include the following:
   1. Section 042000 "Unit Masonry" for installing units in unit masonry, including ties and anchors, cavity insulation, and drainage materials.
   2. Section 055000 “Metal Fabrications” for loose steel lintels and shelf angles for supporting masonry.
   3. Section 072726 “Fluid Applied Membrane Air Barriers” for air barriers applied to cavity face of backup wythe of cavity walls.

1.3 PERFORMANCE REQUIREMENTS

A. Provide architectural stone masonry veneer that meets the following test results:
   1. Compressive Strength, ASTM C 140: 2,000 psi (13789.52 kPa).
   2. Absorption, ASTM C 140: 13 lbs/cu. ft. by wt.
   3. Density, ASTM C 140: 125 lbs/cu ft. or greater.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for masonry units.

B. Samples for Initial Selection: For colored mortar and architectural stone masonry units.

C. Samples for Verification:
   1. For each color and texture of units required, 10 inches (254 mm) square in size.
   2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.

D. Mockup Samples: Furnish full-size sample units for each color and texture of units required, for installation in mockups.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

F. Mortar: Provide mortar submittals in accordance with Section 4 “Unit Masonry Assemblies.”

G. Ties and Reinforcement: Provide submittals for ties and reinforcement in accordance with Section 4, “Unit Masonry Assemblies.”

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of architectural stone masonry units meeting the requirements indicated for this Project, with sufficient production capacity to manufacture required units.

B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations for Architectural Stone Masonry Units: Obtain units through one source from a single manufacturer.

D. 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.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of typical wall area as indicated in Section 042000 “Unit Masonry.”

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of architectural stone masonry units with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

B. Pack, handle, and ship units in suitable packs or pallets.
   1. Lift skids with proper and sufficient long slings or forks with protection to prevent damage to units. Protect edges and corners.
   2. Store units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store installation materials on elevated platforms, under cover, and in a dry location.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

A. Protect materials and comply with project conditions indicated in Section 4 “Unit Masonry Assemblies.”

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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 ARCHITECTURAL STONE MASONRY UNITS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Old Castle; Echelon Waterford Stone manufactured architectural stone masonry units.

B. Colors: Waterford Pewter by Echelon Masonry.

C. General: Comply with ASTM C90:

D. Shapes: Provide special shapes for corners, jambs, movement joints, headers, bonding, and other special shapes and conditions indicated on Drawings.

E. Sizes: Provide units in the following size:
   1. 4 inches (101.6 mm) in depth with face dimensions selected from a minimum of 15 face sizes to match Ashlar pattern approved in mock-up

F. Tolerances: Fabricate units to the following tolerances:
   1. Unit Length: +/- 1/16”
   2. Unit Height: +/- 1/16”
   3. Deviation from square with the measurement taken using longest as the base: +/- 1/16”

2.3 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."
   1. Color: To be selected from manufacturer’s full range. Color will not be the same as for unit masonry.

2.4 ACCESSORIES

A. Anchors and Ties: Provide anchors and ties in accordance with Section 4 “Unit Masonry Assemblies.”

B. Cleaner: Provide a cleaner recommended by unit manufacturer for cleaning new masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by unit manufacturer and expressly approved by cleaner manufacturer for use on calcium silicate units and adjacent masonry materials.

2.5 MORTAR MIXES

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

B. Comply with ASTM C270, Proportion Specification.
   1. For setting mortar, use Type N.
   2. For pointing mortar, use Type N.

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 architectural stone masonry units.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install architectural stone masonry units to comply with requirements in Division 4 Section "Unit Masonry Assemblies."

B. Placing and Bonding: Lay masonry in full bed of mortar with full head joints, properly jointed with other work. Buttering corners of joints, deep or excessive furrowing of mortar joints is not permitted. Back-bevel bed joints to remove excess mortar droppings in cavity as work progresses. Fully bond intersections and external corners. Isolate masonry partitions from vertical structural framing members with a control joint as indicated. Provide for expansion and control joints as indicated on the drawings. Do not adjust masonry units after placing. Where resetting of masonry is required, remove clean units and reset in new mortar. Leave joints under shelf angles and elsewhere as indicated or required open to receive sealant.

C. Coursings: Install masonry construction anchored solidly to backing, properly aligned, plumb, and true in required layout, making straight, level courses, unless otherwise indicated. Place varying sizes of stones to provide a random Ashlar pattern as approved. Maintain mortar joint thickness of 3/8 inch (9.52 mm) to 3/4 inch (19.05 mm) either horizontally or vertically.

D. Tool exposed joints recessed when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated. Keep joints free of mortar and other rigid materials.
   1. Form open joint of width indicated, but not less than 3/8 inch (9.52 mm).

F. Prepare joints indicated to receive sealant and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples.

B. In-Progress Cleaning: Clean units as work progresses.
   1. Remove mortar fins and smears before tooling joints.
   2. Remove excess sealant immediately, including spills, smears, and spatter.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed units 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 units.
3. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
4. Clean units as recommended by manufacturer.

END OF SECTION 047314

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior non-load-bearing wall framing.
2. Ceiling joist framing.
3. Soffit framing.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Vertical deflection clips.
4. Single deflection track.
5. Double deflection track.
6. Drift clips.
7. Ceiling joist framing.
8. Soffit framing.
9. Post-installed anchors.
10. Power-actuated anchors.
11. Sill sealer gasket.

B. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated Design Submittal: For cold-formed steel framing.

1.4 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.

D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.5 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, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, 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."

1.6 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 cold-formed metal framing by one of the following:
   1. Allsteel & Gypsum Products, Inc.
   2. Clark Dietrich
   3. Consolidated Fabricators Corp.
   4. Craco Manufacturing
   5. Formetal Co., Inc.
   6. Southeastern Stud & Components, Inc.
   7. Steel Construction Systems
   8. United Metal Products

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 required by local codes applicable to project location and conditions shown.
   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 1/360 of the wall height.
      b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
   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.

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 3/4 inch (19.05 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 S240.

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 COLD-FORMED STEEL FRAMING MATERIAL

A. Framing Members, General: Comply with AISI S240 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: As required by structural performance.
2. Coating: G60 , A60 , AZ50 , or GF30.

C. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. 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: 0.0329 inch (0.84 mm).
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips, Exterior: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

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: 0.0538 inch (1.37 mm).
2. Flange Width: 1 inch (25.4 mm) plus the design gap for one-story structures and 1 inch 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.

2.5 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, 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.

2.6 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.

2.7 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. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Joist hangers and end closures.
   10. Hole-reinforcing plates.
   11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; 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 AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.
   1. Uses: Securing cold-formed steel framing to structure.
   2. Type: Torque-controlled expansion anchor, Torque-controlled adhesive anchor, or adhesive anchor.
   3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
   4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

D. 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.

E. 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.

F. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch (6.35 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.10 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 (3.18 mm) in 10 feet (304.8 cm) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3.18 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 (3.18 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 load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6.35 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. 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 (1.59 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 NON-LOAD-BEARING 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 bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches (406.4 mm).

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single 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 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 (1219.2 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 18 inches (457.2 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 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 OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches (50.8 mm) from abutting walls, and as follows:
   1. Joist Spacing: 16 inches (406.4 mm) unless indicated otherwise.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
   1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
   1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
   2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch (3.18 mm) in 10 feet (304.8 cm) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3.18 mm) from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 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.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

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.

3.9 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:
   1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   2. Metal downspout boots.
   3. Loose bearing and leveling plates and lintels for applications where they 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 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

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 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. 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. Provide Shop Drawings for the following:
   1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   2. Metal downspout boots.
   3. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following, if applicable:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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 A 666, Type 304.

D. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

E. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

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 F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. 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 1 (A1).

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Anchors 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 according to ASTM E488/E488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded type 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 F 2329.

G. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F 1941 (ASTM F 1941M), 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))).

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 Interior Painting."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20684.28 kPa).

2.5 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 (0.79 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 (38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (203.2 mm) from ends and corners of units and 24 inches (609.6 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where exposed to exterior and where indicated.

2.7 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from stainless steel in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Piedmont Manufacturing; downspout boots or a comparable product by another manufacturer.
   2. Provide optional clean-out above grade.
   3. Outlet: Coordinate with installation of discharge plumbing.
   4. Height: 30 inches (762 mm) unless noted otherwise.
   5. Primed: Prime boots for field painting.

B. Coordinate quantities with downspouts shown on project. Provide a boot for each downspout unless noted otherwise.

2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.9 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 (203.2 mm) unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

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.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 099113 "Exterior Painting" and/or primers specified in Section 099123 "Interior Painting" unless indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No.3, "Commercial Blast Cleaning."

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 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING METAL DOWNSPOUT BOOTS

A. Install metal downspout boots at each downspout shown to be connected to storm drain system. Anchor to building with expansion anchors. Seal joint at downspout and boot connection with elastomeric sealant complying with Division 7 Section “Joint Sealants.”

B. Coordinated outlet height with storm drain system.

C. Set downspout boots in concrete as detailed on Drawings.

D. Remove all rust from boots and prepare for painting in accordance with Section 099113 “ Exterior Painting.”

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting." And/or Section 099123 "Interior Painting."

C. 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel tube railings.

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 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.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

B. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls 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 railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand 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.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.3 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed).
   1. Thickness: As required to meet structural design but not less than 0.125 inches (3.18 mm).
   2. Provide galvanized finish for exterior installations and where indicated.

B. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F 2329 for zinc coating.
   3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

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. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   3. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
   1. Material for Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (((ASTM F738M))), and nuts, ASTM F594 (((ASTM F836M))).

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting".

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 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. Shop assemble railings 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 (0.79 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 are exposed to weather in a manner that excludes 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 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 welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds (weld of good appearance used tin areas of traffic) unless noted otherwise.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

J. Form Changes in Direction as Follows:
   1. By bending.

K. For changes in direction made by bending, use 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. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6.35 mm) or less.

M. For railing posts set in concrete, provide steel sleeves not less than 6 inches (152.4 mm) long with inside dimensions not less than 1/2 inch (12.7 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

N. Anti-Skate Board devices: Provide anti-skate board devices on exterior rails as indicated on drawings. (Henry County)

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
   2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
   3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
   4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No.3, "Commercial Blast Cleaning."

E. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 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.
   1. Shop prime uncoated railings with primers specified in Section 099113 "Exterior Painting" unless indicated.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. 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 are 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 (1.59 mm) in 3 feet (91.44 cm).
   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 (6.35 mm) in 12 feet (365.76 cm).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. 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: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50.8 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (152.4 mm) of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (127 mm) deep and 3/4 inch (19.05 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 nonshrink, nonmetallic grout

B. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

C. Weld posts to metal surfaces where possible, if not, anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.6 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.

END OF SECTION 055213

This page intentionally left blank

SECTION 061000 - ROUGH CARPENTRY

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. Rooftop equipment bases and support curbs.
   2. Wood blocking, cants, and nailers.
   3. Plywood backing panels.

B. Related Requirements:
   1. Section 061600 "Sheathing."
   2. Section 313116 "Termite Control" for site application of borate treatment to wood framing.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches (50.8 mm) nominal (1.5 inch (38 mm) actual) or greater but less than 5 inches (127 mm) nominal (4.49 inch (114 mm) actual) in least dimension.

C. Lumber grading agencies, and the 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.

1.4 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 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 Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: 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.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.

2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber 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: 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. 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 lumber.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches (457.2 mm) above the ground in crawlspaces or unexcavated areas.
   5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. 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.

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 (320.04 cm) beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry with the exception of the following:
   1. All wood in out buildings such as concession buildings are not required to be fire retardant treated.
   2. Interior floor finish and interior trim and millwork.
   3. Finished wood flooring and associated wood sleepers that are firestopped in accordance with the International Building Code, Section 716.2.7.
   4. Blocking such as for handrails, millwork, cabinets and window and door frames.
   5. Nailing or furring strips. For wall and ceiling finishes not exceeding 1 ¾" thickness. Furring and nailing strips receiving finishes shall be fireblocked at 8 feet (243.84 cm) in any direction in accordance with the International Building Code Section 716.
   6. Wood blocking at roof edges and curbs. (NOT IN FORSYTH COUNTY)

2.4 MISCELLANEOUS LUMBER

A. General: 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.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber and any of the following species:
   1. Mixed southern pine; SPIB.
   2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine; No. 3 grade; SPIB.
   2. Spruce-pine-fir (south) or spruce-pine-fir; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. 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.

E. 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.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies 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 and inspecting agency.
   1. Material for Interior Construction Use: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
   2. Material for Exterior Construction Use: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (((ASTM F738M)) and ASTM F836M, Grade A1 or A4).

2.7 MISCELLANEOUS MATERIALS

A. 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. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

E. 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 (2438.4 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 (2438.4 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 (609.6 cm) o.c.

F. Sort and select lumber so that natural characteristics will 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.

G. Comply with AWPA 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.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

I. 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.

J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or 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. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 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, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

This page intentionally left blank

SECTION 061600 - SHEATHING

PART 1 GENERAL

0.1 RELATED DOCUMENTS

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

0.2 SUMMARY

A. Section Includes:
   1. Wall/soffit sheathing.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for plywood backing panels.
   2. Section 072726 "Fluid-Applied Membrane Air Barrier" for air-barriers applied over wall sheathing.

0.3 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 D5516.
   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.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

0.4 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.

0.5 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

1.1 WALL/SOFFIT SHEATHING

A. General: Provide glass-mat wall sheathing unless noted otherwise.

B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation; GlasRoc.
      b. G-P Gypsum Corporation; Dens-Glass Fire Guard.
      c. National Gypsum Company; Gold Bond eXP.
      d. United States Gypsum Co.; Securock.
   2. Type and Thickness: Type X, 5/8 inch (15.88 mm) thick.

3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

1.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. 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, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
   1. For steel framing less than 0.0329 inch (0.84 mm) thick, use screws that comply with ASTM C1002.
   2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C954.

PART 3 EXECUTION

2.1 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. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. 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 and roof 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.

2.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to wood framing with screws.
   2. Fasten gypsum sheathing to cold-formed metal framing with screws.
   3. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
   4. Install boards 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. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
   1. Space fasteners approximately 8 inches (203.2 mm) o.c. and set back a minimum of 3/8 inch (9.52 mm) from edges and ends of boards.

END OF SECTION 061600

This page intentionally left blank

SECTION 062023 - INTERIOR FINISH CARPENTRY

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 wood window sills.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification:
   1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished, 50 sq. in. (300 sq. cm) for lumber.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: 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 American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's 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.

2.2 INTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):
   1. Species and Grade: Yellow poplar, B Finish; NHLA.
   2. Maximum Moisture Content: 15 percent.
   3. Finger Jointing: Not allowed.
   4. Face Surface: Surfaced (smooth).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Multipurpose Construction Adhesive: Formulation complying with ASTM D3498 that is recommended for indicated use by adhesive manufacturer.

2.4 FABRICATION

A. Ease edges of lumber less than 1 inch (25.4 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25.4 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
   3. Install to tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
   4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install full-length pieces from maximum lengths of lumber available.

1. Install trim after gypsum-board joint finishing operations are completed.
2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

This page intentionally left blank

SECTION 064113 - WOOD-VENEER-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. Architectural wood cabinets and shelves.
   2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
   3. Shop finishing of architectural wood cabinets.

B. Related Requirements:
   1. Section 123623.13 “Plastic-Laminate-Clad Countertops” for countertops installed on cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, cabinet hardware and accessories, and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:
   1. Shop-applied transparent finishes.

D. Samples for Verification:
   1. Lumber for transparent finish, not less than 5 inches (127 mm) wide by 12 inches (304.8 mm) long, for each species and cut, finished on one side and one edge.

1.4 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.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of the following:
      a. Mock-up Cabinet: Construct one base and wall cabinet as shown on Drawings. Cabinets shall be complete including finishes, hardware, etc. Do not proceed with any other cabinet fabrication until approval of sample cabinet is obtained. After approval, this sample shall be installed in location indicated.
   2. Approved unit may be incorporated into work as long as it is maintained without damage.

1.5 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.

1.6 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. 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.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 PRODUCTS

2.1 ARCHITECTURAL WOOD CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
   2. Product design numbers shown on drawings are based on AWI Cabinet Design Series.

2.2 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Type of Construction: Frameless unless shown otherwise.

C. Cabinet and Door and Drawer Front Interface Style: Reveal overlay.

D. Reveal Dimension: 3/8 inch (9.52 mm) unless noted otherwise.

E. Wood for Exposed Surfaces:
   1. Species: Grade “A” White birch.
   2. Cut: Rotary cut.
   3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
   4. Matching of Veneer Leaves: Book match.
   5. Edge Band: ¼” solid wood matching exposed face species.

F. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
   2. Drawer Subfronts, Backs, and Sides: ½ inch thick, solid-hardwood lumber.
   3. Drawer Bottoms: ¼” thick hardwood plywood.

G. 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.

2.3 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: 5 to 10 percent.

B. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware."

B. Hardware Standard: Subject to compliance with requirements, provide Hardware as indicated.

C. Frameless Concealed Hinges (European Type): Blum, clip, self-close, screw-on. Similar hinges manufactured by Glass, Salice, or Stanley are acceptable.

D. Wire Pulls: Back mounted:
   1. Stanley No. 4483-1/2 solid, satin finish anodized alum.
   2. Ives No. 37 solid, satin finish anodized alum.
   3. Epco No. MC-4023.5 solid, satin finish anodized alum.

E. Catches: Magnetic catches: Where indicated on drawings.
   1. Stanley No. SP41
   2. Ives No. 326
   3. Knape & Vogt. No. 918

F. Adjustable Shelf Standards and Supports:
   1. Grant No. 120
   2. Knape & Vogt 255
   3. Sigatune SPH-1820
      a. All standards shall be flush mounted with snap-in clips (Multiple holes with plastic pins will not be allowed.) All standards shall be steel.

G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings and rated for the following loads:
   1. Box Drawer Slides: 100 lbf (440 N).
      a. Knape and Vogt No. 8400, full extension 100 lbs.
      b. Blum No. BS430E, full extension 100 lbs.
      c. Accuride 3832, full extension 100 lbs

H. Door and Drawer Locks:
   1. National Cabinet Lock: C8053-14A for drawers and cabinet doors.
   2. C2001-14A strikes.
   3. Similar locks manufactured by Grass Olympus Locks or Sugatsune are acceptable.
   4. Keying
      a. All cabinet locks within any one room or space shall be keyed alike.
      b. Provide a minimum of three keys for each room.
   5. Provide locks where indicated on drawings.

I. Exposed Hardware Finishes: For exposed hardware, provide satin anodized finish.

J. For concealed hardware, provide manufacturer's standard finish.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Pressure treated lumber, use Category UC2, Softwood or hardwood lumber, kiln dried to less than 19 percent moisture content after treating.

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.

2.6 FABRICATION

A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of Cabinets: 1/16 inch (1.59 mm) unless otherwise indicated.

B. Complete fabrication, including assembly, finishing, 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. Maximum scribe/filler shall be 2” each side.

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.
   1. Coordinate locations of plumbing cleanouts within cabinets and cut opening for access.

D. Provide closures on tops and bottoms of cabinets in corners.

2.7 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

C. Transparent Finish:
   1. Grade: Custom.
   2. Finish: System - 11, catalyzed polyurethane.
   3. Staining: Match approved sample for color.
   4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. 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 or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. For shop finished items use filler matching finish of items being installed.

F. 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.
   1. Install cabinets with no more than 1/8 inch (3.18 mm) in 96-inch (0.12 inch (3 mm) in 2400-mm) sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten base cabinets and shelves through back, near top and bottom, at ends and not more than 16 inches (406.4 mm) o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing or blocking. Use masonry screws (Hilti: Kwick-Con or equal) at cmu walls.
   4. Fasten overhead cabinets to walls using metal “Z” clips as manufactured by Monarch Metal Fabrications, Inc., or equal. Continuous Z clip shall be anchored to masonry construction at 16” o.c. using masonry screws (Hilti: Kwick-Con or equal). Mating “Z” clip to be attached to cabinet frame at 16” o.c. but not less than 3 fastening minimum per cabinet section. Once cabinet is hung on “Z” clips, fasten in place by masonry screws at 16” o.c. through cabinet frame at bottom.

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
   1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

H. Refer to Section 123623.13 “Plastic-Laminate-Clad Countertops” for installation of countertops on cabinets.

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. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064113

This page intentionally left blank

SECTION 070150.19 - PREPARATION FOR REROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Full tear-off of roof areas indicated.
   2. Removal of base flashings.
   3. Temporary roofing.

B. Related Requirements:
   1. Section 011000 "Summary" for use of the premises and phasing requirements.
   2. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
   3. Section 075423 “Thermoplastic Polyolefin (TPO) Roofing” for new roof membranes and roof insulation and associated pre-installation meetings.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

B. Full Roof Tear-Off: Removal of existing roofing system from deck.

1.4 REFERENCE STANDARDS

A. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2026b.

1.5 INFORMATIONAL SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of demolished roofing materials by a landfill facility licensed to accept them.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Reroofing Conference: Conduct conference at Project site in accordance with Section 075423 “Thermoplastic Polyolefin (TPO) Roofing”.

1.7 FIELD CONDITIONS

A. Existing Roofing System: SBS-modified bituminous roofing with foam.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways and other adjacent occupied or used facilities.

D. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
   1. Remove only as much roofing in one day as can be made watertight in the same day.

F. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 PRODUCTS

2.1 INFILL AND REPLACEMENT MATERIALS

A. Wood blocking, curbs, and nailers are specified in Section 061000 "Rough Carpentry."

2.2 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 EXECUTION

3.1 PREPARATION

A. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

3.2 ROOF TEAR-OFF

A. Full Roof Tear-Off: Remove existing roofing and other roofing system components down to the deck.
   1. Remove wood blocking, curbs, and nailers where deteriorated or as necessary for new work.
   2. Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

D. Provide additional deck securement as required.

3.4 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
   1. Installation of wood blocking, curbs, and nailers is specified in Section 061000 "Rough Carpentry."

3.5 BASE FLASHING REMOVAL

A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated. Replace with wood materials as specified.

3.6 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

This page intentionally left blank

SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board insulation.
   2. Glass-fiber blanket insulation.
   3. Mineral-wool blanket insulation.

B. Related Requirements:
   1. Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Extruded polystyrene foam-plastic board insulation.
   2. Glass-fiber blanket insulation.

1.3 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.

1.4 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 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than specified when tested in accordance with ASTM E84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; 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 listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (304.8 mm) and wider in width.

E. Thermal-Resistance Value (R-Value): R-value as indicated for each product in accordance with ASTM C518.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Location: To be used only in cavity wall construction with masonry veneer.

B. Extruded Polystyrene Board Insulation, Type X: ASTM C578, Type X, 15-psi minimum compressive strength; unfaced.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Kingspan Insualtion
      b. Owens Corning.
      c. DuPont

C. Surface Burning Characteristics: Not less than 75 and 450.

D. Thickness: 2” unless noted otherwise.

E. R-Value: Not less than R7.6 continuous.

2.3 GLASS-FIBER BLANKET INSULATION

A. Location: Use faced insulation at all stud framed exterior walls. Use unfaced insulation at all interior walls where indicated. Use unfaced insulation above ceilings where sound attenuation is indicated.

B. 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 Corporation.
      b. Johns Manville.
      c. Knauf Insulation.
      d. Owens Corning

C. Glass-Fiber Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation.
      b. Johns Manville.
      c. Knauf Insulation.
      d. Owens Corning

D. Surface Burning Characteristics: Not less than 25 and 450.

E. Thickness: Glass-fiber blanket insulation thickness shall match cavity thickness of studs they are installed in unless noted otherwise.

F. R-Value: R-Value for exterior walls shall be R-13 minimum as required by the energy code.

2.4 MINERAL-WOOL BLANKET INSULATION

A. Location: Use in exterior and interior voids and joints between different construction materials and interior rated or sound proofing partitions unless noted otherwise.

B. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johns Manville; a Berkshire Hathaway Co.
      b. Owens Corning
      c. Rockwool

2.5 INSULATION FASTENERS

A. Anchor Adhesive: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation or substrates.

B. For Mineral-wool Board Insulation: Provide fasteners recommended by insulation manufacturer for substrates indicated on drawings.
   1. Adhesives shall not be used with mineral-wool insulations.

2.6 ACCESSORIES

A. Adhesive for Bonding Plastic-Board 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.

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 CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (609.6 mm) o.c. both ways on inside face and as recommended by manufacturer.
   1. Cavity wall insulation shall be installed after air barriers have been installed on cavity wall back-up.
   2. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
   3. Press units firmly against inside substrates.

3.4 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 clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438.4 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
      a. Exterior Walls: Set units with facing placed toward interior of construction.

3.5 MISCELLANEOUS VOIDS

A. Miscellaneous Voids: Install mineral wool insulation in miscellaneous voids and cavity spaces where indicated and as follows:
   1. Stuff mineral wool insulation in head joints of interior partitions between roof/floor deck above unless walls are rated or smoke resistant.
   2. Stuff mineral wool insulation in joints in exterior wall between differing materials prior to installing air barriers.

3.6 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-permeable membrane air barriers.

B. Related Requirements:
   1. Section 042000 “Unit Masonry” for installing air barriers in cavity walls.

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.

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.

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.

B. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build integrated mockups of exterior wall assembly 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 Architect 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 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.

1.9 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.

B. EIFS Installations: Do not apply air-barriers to sheathing surfaces receiving EIFS finishes unless approved by EIFS manufacturer.

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.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable 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 ASTM E783 or ASTM E2357.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Elastomeric, Modified Bituminous Membrane:
1) Meadows, W. R., Inc.; Air-Shield LMP.
2) Tremco Incorporated, an RPM company; ExoAir 220R.
b. Synthetic Polymer Membrane:
1) Carlisle Coatings & Waterproofing Inc.; Barritech VP.
2) Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
3) Henry Company; Air-Bloc 17MR.
4) Hohmann & Barnard, Inc.; Enviro-Barrier.
5) Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.

6) Tremco Incorporated, an RPM company; ExoAir 230.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 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 E2178.
   b. Vapor Permeance: Minimum 5.5 perms (320 ng/Pa x s x sq. m); ASTM E96/E96M.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.

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 primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8128 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.

D. Modified Bituminous Strip: Vapor retarding, 40 mils (1.016 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9144 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

E. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

F. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch (0.47 mm) thick, and Series 300 stainless-steel fasteners.

I. 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 E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.016 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9144 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43-mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).

L. Elastomeric Flashing Sheet: ASTM D2000, 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, aluminum termination bars and stainless-steel fasteners, or galvanized-steel termination bars and fasteners.

M. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

N. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated and as recommended by air barrier manufacturer.

O. 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 D4263.
   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, grout, and fill joints and cracks in substrate according to ASTM C1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 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 (76.2 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 (6.35 mm) with sealant according to ASTM C1193 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.
   2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (76.2 mm) of coverage is achieved over each substrate.

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 flashing strips, sheets, or extrusions so that a minimum of 3 inches (76.2 mm) of coverage is achieved over each substrate. Maintain 3 inches (76.2 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25.4 mm) of full contact.
   1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
   2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
   3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches (152.4 mm) o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
   4. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

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, flashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings 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 (152.4 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. Unless noted otherwise, install air barrier assembly from top of footings to roof membrane with no gaps in assembly.
   2. Apply primer to substrates at required rate and allow it to dry.
   3. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
   4. 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.

1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in one or more equal coats.

C. Apply strip and transition strip a minimum of 1 inch (25.4 mm) onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches (76.2 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 reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. 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.

B. Air barriers will be considered defective if they do not pass 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 as specified above.

C. Repair damage to air barriers; 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

This page intentionally left blank

SECTION 074293 - METAL SOFFIT PANELS

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 metal soffit panels.

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 each type of panel and accessory.

B. Shop Drawings:
   1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches (38 mm) per 12 inches (304.8 mm).

C. Samples for Initial Selection: For each type of metal panel 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. Metal Panels: 12 inches (304.8 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal 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. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
   1. Wind Loads: As indicated on Drawings.
   2. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
   1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
   1. Products: Subject to compliance with requirements, provide one of the following products:
      a. Berridge Manufacturing Company; FW12
      b. Dimensional Metals, Inc.; Flush FP1012

c. Fabral; Décor Flush.
d. IMETCO; FW-120
e. MBCI; a division of NCI Building Systems, L.P.; Artisan
f. McElroy Metal, Inc.; FW Smooth
g. Metal Sales Manufacturing Corporation; Soffit Flat pan.
h. Pac-Clad Petersen; Soffit Flush.

2. Metallic-Coated: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
   a. Nominal Thickness: 24 ga., 0.028 inch (0.71 mm).
   b. Width: 12 inches (304.8 mm).
   c. Exterior Finish: Two-coat fluoropolymer.
   d. Color: As selected by Architect from custom colors.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. 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 panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (12.7 mm) wide and 1/8 inch (3.18 mm) thick.
   2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. General: 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. Provide panel profile, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

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.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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 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. Steel Panels and Accessories:
1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. 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 (0.0127 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
   6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
   7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
   1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
   1. Apply panels and associated items true to line for neat and weathertight enclosure.
   2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
   3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
   4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Accessory Installation: 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 panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. 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 as indicated. Install work with laps, joints, and seams that are permanently watertight.
   1. Install exposed flashing and trim that is without 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 achieve waterproof performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (304.8 cm) with no joints allowed within 24 inches (609.6 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25.4 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

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. Adhered thermoplastic polyolefin (TPO) roofing system.
   2. Roof insulation.
   3. Cover board.
   4. Walkways.

B. Related Requirements:
   1. Section 070150.19 “Preparation for Reroofing” for removal of existing membrane and preparation of deck for reroofing.
   2. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
   3. Section 077100 "Roof Specialties" for manufactured copings and roof edge flashings.
   4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
   1. Layout and thickness of insulation including tapered insulation slopes.
   2. Base flashings and membrane termination details.
   3. Flashing details at penetrations.
   4. Tie-in with adjoining air barrier.

C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates:
   1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
      a. Submit evidence of compliance with performance requirements.
   2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
   2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form following this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, and cover boards for the following warranty period:

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
   1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
   2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to local building code requirements using ASCE 7-16:
   1. Risk Category: II
   2. Exposure Rating: C
   3. Building Category: Enclosed

D. Energy Performance: Where membrane is used in low slope application, roofing system shall have a minimum three-year aged solar reflectance of 0.70 and a three-year aged thermal emittance of 0.86 when tested in accordance with ANSI/CRRC-1 standards.
   1. This requirement does not apply to roof systems over unenclosed unconditioned spaces or any other roofs meeting the exceptions of the energy code.

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville; Adhered, Reinforced, JM TPO-60 mil (1.524 mm) roofing membrane systems or a comparable product by one of the following:
   1. Carlisle
   2. GAF Materials Corp.
   3. Johns Manville

B. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

C. Thickness: 60 mils (1.524 mm) nominal

D. Exposed Face Color: White)

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 60 mils 0.06 inch (1.5 mm) thick, minimum, of same color as TPO sheet.

C. Liquid Flashing: Manufacturer’s standard liquid flashing with scrim sheet reinforcing.

D. Bonding Adhesive: Manufacturer's standard.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25.4 mm) wide by 0.05 inch (1.27 mm) thick (0.98 inch (25 mm) wide by 0.05 inch (1.3 mm) thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
   1. Compressive Strength: 20 psi (137.90 kPa).
   2. Size: 48 by 96 inches (1219 by 2438 mm).
   3. Thickness:
      a. Insulation: 4 ½” min. thickness at sloped roofs with no tapered insulation.

C. Tapered Insulation: Provide factory-tapered insulation boards.
   1. Material: Match roof insulation.
   2. Minimum Thickness: 1/4 inch (6.35 mm).
   3. Slope:
      a. Saddles and Crickets: 1/2 inch (12.7 mm) per foot (1:24) unless otherwise indicated on Drawings.

2.5 ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Cover Board: Subject to approval by roof membrane manufacturer, provide one of the cover boards listed.

C. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, glass mat, water-resistant gypsum board.
   1. Thickness: ½ inch.
   2. Surface Finish: Factory primed.

D. High Density, Polyisocyanurate Insulation Cover Board: ASTM C1289, Type II, Class 4, Grade 1.
   1. Thickness: ½ inch.
   2. Compressive Strength: Not less than 100 psi (689.48 kPa).

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 1/8 inch (3.18 mm) thick and acceptable to roofing system manufacturer.
   1. Size: Approximately 30 by 60 inches (1524 mm) or continuous.
   2. Color: Contrasting with roof membrane.

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 roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
      a. Test Frequency: One test probe per each 1000 sq. ft. (93 sq. m), or portion thereof, of roof deck, with not less than three tests probes.
      b. Submit test reports within 24 hours after performing tests.
   5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
   6. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
   1. Submit test result within 24 hours after performing tests.
      a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072726 "Fluid-Applied Membrane Air Barriers."

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:
   1. Install base layer of insulation with joints staggered not less than 24 inches (609.6 mm) in adjacent rows.
      a. Locate end joints over crests of decking.
      b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch (6.35 mm) in width.
e. Fill gaps exceeding 1/4 inch (6.35 mm) with insulation.
f. Cut and fit insulation within 1/4 inch (6.35 mm) of nailers, projections, and penetrations.
g. Loosely lay base layer of insulation units over substrate.
h. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
    1) Fasten insulation according to requirements in approved submittals.
    2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation with joints of each layer offset not less than 12 inches (304.8 mm) from previous layer of insulation.
    a. Staggered end joints within each layer not less than 24 inches (609.6 mm) in adjacent rows.
    b. Install with long joints continuous and with end joints staggered not less than 12 inches (304.8 mm) in adjacent rows.
    c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    d. Make joints between adjacent insulation boards not more than 1/4 inch (6.35 mm) in width.
    e. Fill gaps exceeding 1/4 inch (6.35 mm) with insulation.
    f. Cut and fit insulation within 1/4 inch (6.35 mm) of nailers, projections, and penetrations.
    g. Adhere each layer of insulation to substrate using adhesive according to wind uplift resistance design:
        1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF COVER BOARDS

A. Install cover boards over base with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (152.4 mm) in each direction.
    1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    2. At internal roof drains, conform to slope of drain sump.
        a. Trim cover board so that water flow is unrestricted.
    3. Cut and fit cover board tight to nailers, projections, and penetrations.
    4. Adhere cover board to insulation using adhesive according to wind uplift design.

3.6 INSTALLATION OF ADHERED ROOFING

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer using the splatter method and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply cut edge sealant to seal cut edges of roof membrane and sheet flashings.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring. Replace all existing bolts, nuts, and washers with stainless steel bolts, nuts, and washers. Replace all damaged or cracked clamp rings and drain baskets with new products to match existing drain bowls.

3.7 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to flash off per manufacturer’s specifications. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with new reinforced flashing membrane.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

F. Use liquid flashings only where membrane flashings will not work and are recommended by the manufacturer.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways:
   1. Install flexible walkways at the following locations:
      a. Perimeter of each rooftop unit.
      b. Top and bottom of each roof access ladder.
      c. At other locations indicated on the roof plans.
   2. Provide 6-inch (76-mm) clearance between adjoining pads.
   3. If using continuous walkways, provide a 2” minimum gap every 30 feet (914.4 cm) between runs.
   4. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for

deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 075423.1 - ROOFING INSTALLER'S WARRANTY

ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: (Insert name of Owner).
2. Address: (Insert address).
3. Building Name/Type: (Insert information).
4. Address: (Insert address).
5. Area of Work: (Insert information).
6. Acceptance Date: _____.
7. Warranty Period: 5 years from date of substantial completion.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
   1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
      a. lightning;
      b. peak gust wind speed exceeding [Insert mph (m/sec)];
      c. fire;
      d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      f. vapor condensation on bottom of roofing; and
      g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
   2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
   3. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become

null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

4. During Warranty Period, if original use of 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 or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
5. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
6. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

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

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075423.1

SECTION 077100 - ROOF SPECIALTIES

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 manufactured roof specialties:
   1. Roof edge flashings.
   2. Roof edge drainage systems.
   3. Counterflashings and reglets.
   4. Roof penetration flashings.

B. Related Sections include the following:
   1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 075423 “Thermoplastic-Polyolefin (TPO) Roofing” for installing flashing with roofing membranes.
   3. Section 079200 "Joint Sealants" for field-applied sealants.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
   2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

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.

B. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

E. Samples for Verification:
   1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
   2. Include roof-edge specialties, roof-edge drainage systems, reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATION SUBMITTALS

A. Qualification Data: For manufacturer or fabricator, as applicable.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's or fabricator’s special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.

B. Product Options: This specification has as its Basis-of-Design Products, products that are manufactured in accordance with the basis-of-design products indicated. At the contractor’s option, shop fabricated products using the same materials, sizes, thicknesses, and appearances may be used subject to fabricator’s qualifications indicated below.

C. Fabricator Qualifications: Employs skilled workers who custom fabricate roof specialties similar to that required by this specification and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPR1 ES-1 tested, the fabrication shop is to be listed as able to fabricate required details as tested and approved.

D. Source Limitations: Obtain roof specialties for project from same manufacturer or fabricator.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

C. Where the project consists of multiple buildings, contractor shall assume different colors for each building unless noted otherwise.

1.9 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Specified material thickness/gauges of products are a minimum. Material thickness shall be increased as required to meet dimensions shown on documents and as required to meet Design Pressures.

C. Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:
   1. Design Pressure: In accordance with the Standard Building Code (International Building Code) as adopted by the State of Georgia for the location of the project.

D. Thermal Movements: Provide manufactured roof specialties 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 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.

E. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

2.2 ROOF EDGE FLASHINGS

A. Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (365.76 cm) and a continuous formed- or extruded-aluminum anchor bar with integral drip edge cleat to engage fascia cover. Provide matching mitered and welded corner units.
   1. Basis-of-Design Product: Metal-Era, Inc.; Anchor-Tite or a comparable product by one of the following:
      a. Architectural Products Co.
      b. Hickman Edge Systems
      c. Metal-Era, Inc.
      d. Pac-Clad Petersen
   2. Fascia Cover: Fabricated from the following exposed metal:
      a. Prepainted, Zinc-Coated Steel: minimum 0.028 (24 ga.) inch 0.03 inch (0.7 mm) thick.
   3. Fascia Cover Color: As selected by Architect from custom colors.
   4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
   5. Fascia Accessories: Provide fascia extenders with continuous hold down cleats where indicated on Drawings.

B. Roof Drip Edge Flashing: Manufactured, two-piece, roof drip edge flashing consisting of TPO coated metal drip edge cover in section lengths not exceeding 12 feet (365.76 cm) and a continuous formed galvanized anchor cleat with integral edge to engage drip edge cover. Provide matching mitered and welded corner units.
   1. Basis-of-Design Product: Metal-Era, Inc.; One Drip Edge or a comparable product by one of the following:
      a. Architectural Products Co.
      b. Hickman Edge Systems
      c. Metal-Era, Inc.
      d. Pac-Clad Petersen
   2. Drip Edge Cover: Fabricated from the following exposed metal:
      a. Zinc-Coated Steel: minimum 0.028 (24 ga.) inch 0.03 inch (0.7 mm) thick.
      b. Surface: Smooth

c. Finish: Two-coat fluoropolymer
d. Color: As selected by architect from custom colors.

3. TPO Roofing Membrane: Where drip edge is used with TPO roofing membrane, cover shall be 24 ga. galvanized steel with applicable TPO coating required by TPO manufacturer.

2.3 ROOF EDGE DRAINAGE SYSTEMS

A. Gutters and Downspouts: Manufactured formed gutter in uniform section lengths not exceeding 12 feet (365.76 cm), with mitered and welded or soldered corner units, end caps, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25.4 mm) above front gutter rim. Furnish with flat-stock gutter straps and gutter support brackets. Gutter straps and gutter brackets shall be 3/16" x 1 ½". Furnish expansion joints and expansion-joint covers fabricated from same metal as gutters. Provide a flange that extends minimum 2" back onto roof.
   1. Basis-of-Design Product: Metal-Era, Inc.; Seal-Tite Gutter Systems or a comparable product by one of the following:
      a. Architectural Products Co.
      b. Hickman Edge Systems
      c. Metal-Era, Inc.
      d. Pac-Clad Petersen
   2. Fabricate gutter from the following exposed metal:
      a. Prepainted, Zinc-Coated Steel: As recommended by manufacturer for girth indicated but not less than 0.028 (24 ga.) inch 0.03 inch (0.7 mm) thick.
   3. Gutter Style: Box as indicated on Drawings.
   4. Downspouts: Rectangular closed-face with mitered elbows, manufactured from the following exposed metal. Furnish 1/16" x 1 ½" metal hangers, from same material and finish as downspouts, with anchors.
      a. Prepainted, Zinc-Coated Steel: 0.03 inch (0.7 mm) minimum 0.028 inch (0.71 mm) thick.
   5. Color: As selected by Architect from custom colors.

B. Splash Pans: Fabricate splash pans from the following material:
   1. Stainless Steel: 0.0250 inch (0.64 mm) thick (24 ga.).

2.4 COUNTERFLASHINGS AND REGLETS

A. Basis-of-Design Product: Metal-Era, Inc.; Two-piece counterflashing or a comparable product by one of the following:
   1. Architectural Products Co.
   2. Fry Reglet Corporation.
   3. Hickman Edge Systems
   4. Metal-Era, Inc.
   5. Pac-Clad Petersen

B. Counterflashings: Manufactured units in lengths not exceeding 12 feet (365.76 cm) designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
   1. Prepainted, Zinc-Coated Steel: minimum 0.028 inch (0.71 mm) (24 ga.) thick.

C. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:
   1. Prepainted, Zinc-Coated Steel: minimum 0.028 inch (0.71 mm) (24 ga.) thick.
   2. Type: Surface-mounted with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   3. Type: For masonry application, with offset top flange for embedment in masonry mortar joint.

D. Color: As selected by Architect from custom colors.

E. Equipment Curb Support Flashing: Pre-painted metallic coated steel: 0.0259 inch (0.66 mm).

2.5 EXPOSED MATERIALS

A. Prepainted, Zinc-Coated Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation, structural quality, and prepainted by the coil-coating process to comply with ASTM A755/A755M.
   1. Surface: Smooth, flat finish.
   2. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A755/A755M and coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.0127 mm).

2.6 CONCEALED METALS

A. Aluminum Extrusions: ASTM B221 (((ASTM B221M))) (((ASTM B221M))), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) (Z275) coating designation; structural quality.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

E. 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.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

G. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

H. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

2.8 SPECIAL FABRICATIONS

A. Where any roof specialties are shown to fit a radius, building component, the roof specialty product shall be manufactured to fit the designed radius.

2.9 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. Examine walls and roof edges for suitable conditions for manufactured roof specialties.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
   1. Install manufactured roof specialties with provisions for thermal and structural movement.
   2. Torch cutting of manufactured roof specialties 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 manufacturer.
   1. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.
   2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet (365.76 cm) with no unplanned joints within 18 inches (457.2 mm) of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19.05 mm) for wood screws.

G. Seal joints with butyl sealant as required by manufacturer of roofing specialties.

3.3 ROOF EDGE FLASHING INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.4 ROOF EDGE DRAINAGE SYSTEM INSTALLATION

A. General: Install gutters and downspouts to produce a complete roof drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Gutters: Join and seal gutter lengths. Attach gutters to firmly anchored gutter brackets and straps spaced not more than 30 inches (762 mm) apart. Slope gutters to downspouts.
   1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (1524 cm) apart. Install expansion joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers designed to hold downspouts securely 1 inch (25.4 mm) away from walls. Downspouts shall be manufactured to follow contour of wall. Locate hangers at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
   1. Connect downspouts to underground drainage system indicated. If not indicated, provide elbows at base of downspout to direct water away from building. Provide concrete splash blocks at grade for all downspout locations not connected to underground drainage systems. Concrete splash blocks shall be of [4000] psi ([27579.04] kPa) concrete 12” x 18” long.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement compatible with roofing membrane.

3.5 COUNTERFLASHING AND REGLET INSTALLATION

A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches (101.6 mm) over base flashings. Lap counterflashing joints a minimum of 4 inches (101.6 mm) and bed with butyl sealant.

B. Reglets: Installation of reglets is specified in Division 4 Section "Unit Masonry Assemblies."

3.6 ROOF/PENETRATION FLASHINGS

A. Install roof penetration flashings in accordance with manufacturer’s recommendations for a weather-tight seal.

B. At roof drains, provide 48” square sheet set in mastic over roofing membrane. Prime top surface and strip flash in accordance with roofing manufacturer’s recommendations.

C. At equipment support curbs, install flashing full perimeter of curb as shown on Drawings.

3.7 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 manufactured roof specialties 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 manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

This page intentionally left blank

SECTION 078413 - PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.

B. Related Sections:
   1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency and product being used for the system.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer shall meet one of the following qualification requirements:
   1. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training by the manufacturer for the products specified. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed in accordance with Section 014000 “Quality Requirements” for Special Inspections.
   2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Classification markings on penetration firestopping correspond to designations listed by the following:
         1) UL in its "Fire Resistance Directory."

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Approximately 2 weeks before scheduled commencement of installation of joint systems and through-penetration firestopping, meet at Project site with Installer, installer of each component of associated work, Architect, Owner, joint/through-penetration firestop system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) test agencies, and governing authorities.
   1. Review foreseeable methods and procedures related to fire-resistive joint systems and through-penetration firestop systems work, including but not necessarily limited to the following:
      a. Tour representative areas of building, inspect and discuss condition of substrate, joints, and penetrations.
      b. Review fire-resistive joint and through-penetrations firestop system requirements (Drawings, Specifications, and manufacturer’s written instructions.)
      c. RReview required submittals, both completed and yet to be completed
      d. Review and finalize construction schedule related to work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      e. Review required inspection, testing, certifying, and material usage accounting procedures.
   2. Contractor shall record discussions of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Architect at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by the Architect and building inspector, if required by authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Grace Construction Products.
   2. Hilti, Inc.
   3. Nelson Firestop Products.
   4. Specified Technologies Inc.
   5. 3M Fire Protection Products.
   6. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Acrylic Sealants: Single-component acrylic formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant

additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

K. Intumescent Sealants: Intumescent acrylic or silicone-based sealants.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, 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: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: All fire and/or smoke barriers or walls shall be effectively and permanently identified with signs or stenciling above a decorative ceiling and/or in concealed spaces with letters a minimum of 2 inches (50.8 mm) high on a contrasting background spaced a maximum of 12 feet (365.76 cm) on center with a minimum of one per wall or barrier. The hourly rating shall be included on all rated barriers or walls. Wording shall be similar to the following: '() Hour Fire and Smoke Barrier-Protect All Openings. Where signs are utilized, they shall be designed and installed to resist peeling of detaching from the barrier.
   1. Existing stenciling, acceptable to the authority having jurisdiction, shall be permitted to remain in use. Existing signs that are not peeling or detaching from the barrier shall be permitted to remain in use, subject to the approval of the authority having jurisdiction.

3.5 FIELD QUALITY CONTROL

A. Where deficiencies are found or penetration firestopping is damaged or removed, repair or replace penetration firestopping to comply with requirements.

B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestopping with No Penetrating Items FS-1:
   1. UL-Classified Systems: C-AJ- 0001-0999.

C. Firestopping for Metallic Pipes, Conduit, or Tubing FS-2:
   1. UL-Classified Systems: C-AJ- 1001-1999.

D. Firestopping for Metallic Pipes, Conduit, or Tubing FS-3:
   1. UL-Classified Systems: C-BK- 1001-1999.

E. Firestopping for Metallic Pipes, Conduit, or Tubing FS-4:
   1. UL-Classified Systems: W-L- 1001-1999.

F. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-5:
   1. UL-Classified Systems: C-AJ- 2001-2999.

G. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-6:
   1. UL-Classified Systems: C-BK- 2001-2999.

H. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-7:

1. UL-Classified Systems: W-L- 2001-2999.

I. Firestopping for Electrical Cables FS-8:
   1. UL-Classified Systems: C-AJ- 3001-3999.

J. Firestopping for Electrical Cables FS-9:
   1. UL-Classified Systems: C-BK- 3001-3999.

K. Firestopping for Electrical Cables FS-10:
   1. UL-Classified Systems: W-L- 3001-3999.

L. Firestopping for Cable Trays with Electric Cables FS-11:
   1. UL-Classified Systems: W-J- 4000 Series System using intumescent pillows.

M. Firestopping for Cable Trays with Electric Cables FS-12:
   1. UL-Classified Systems: W-K- 4000 Series System using intumescent pillows.

N. Firestopping for Cable Trays with Electric Cables FS-13:
   1. UL-Classified Systems: W-L- 4000 Series System using intumescent pillows.

O. Firestopping for Insulated Pipes FS-14:
   1. UL-Classified Systems: C-AJ- 5001-5999.

P. Firestopping for Insulated Pipes FS-15:
   1. UL-Classified Systems: C-BK- 5001-5999.

Q. Firestopping for Insulated Pipes FS-16:
   1. UL-Classified Systems: W-L- 5001-5999.

R. Firestopping for Miscellaneous Electrical Penetrants FS-17:
   1. UL-Classified Systems: C-AJ- 6001-6999.

S. Firestopping for Miscellaneous Electrical Penetrants FS-18:
   1. UL-Classified Systems: C-BJ- 6001-6999.

T. Firestopping for Miscellaneous Electrical Penetrants FS-19:
   1. UL-Classified Systems: W-L- 6001-6999.

U. Firestopping for Miscellaneous Electrical Penetrants FS-20:
   1. UL-Classified Systems: C-AJ- 7001-7999.

V. Firestopping for Miscellaneous Mechanical Penetrants FS-21:
   1. UL-Classified Systems: C-BJ- 7001-7999.

W. Firestopping for Miscellaneous Mechanical Penetrants FS-22:
   1. UL-Classified Systems: W-L- 7001-7999.

X. Firestopping for Groupings of Penetrants FS-23:
   1. UL-Classified Systems: C-AJ- 8001-8999.

Y. Firestopping for Groupings of Penetrants FS-24:
   1. UL-Classified Systems: C-BJ- 8001-8999.

Z. Firestopping for Groupings of Penetrants FS-25:
   1. UL-Classified Systems: W-L- 8001-8999.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

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. Joints in or between fire-resistance-rated constructions.

B. Related Sections:
   1. Section 078413 "Penetration Firestop Systems" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
   1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
   1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
      a. Fire-resistive joint system products bear classification marking of qualified testing agency.
      b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
         1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Approximately 2 weeks before scheduled commencement of installation of joint systems and through-penetration firestopping, meet at Project site with Installer, installer of each component of associated work, Architect, Owner, joint/through-

penetration firestop system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) test agencies, and governing authorities.

1. Review foreseeable methods and procedures related to fire-resistive joint systems and through-penetration firestop systems work, including but not necessarily limited to the following:
    a. Tour representative areas of building, inspect and discuss condition of substrate, joints, and penetrations.
    b. Review fire-resistive joint and through-penetrations firestop system requirements (Drawings, Specifications, and manufacturer's written instructions.)
    c. Review required submittals, both completed and yet to be completed
    d. Review and finalize construction schedule related to work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    e. Review required inspection, testing, certifying, and material usage accounting procedures.
2. Contractor shall record discussions of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Architect at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Architect and building inspector of authorities having jurisdiction have examined each installation.

PART 2 PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E1966 or UL 2079:
    1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
    2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grace Construction Products.
   b. Hilti, Inc.
   c. Nelson Firestop Products.
   d. Pecora Corp.
   e. Specified Technologies Inc.
   f. 3M Fire Protection Products.
   g. Tremco, Inc.; Tremco Fire Protection Systems Group.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, 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: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
   1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
   2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: All fire and/or smoke barriers or walls shall be effectively and permanently identified with signs or stenciling above a decorative ceiling and/or in concealed spaces with letters a minimum of [3 inches]([50.8] mm) high on a contrasting background spaced a maximum of [12] feet([365.76] cm) on center with a minimum of one per wall or barrier. The hourly rating shall be included on all rated barriers or walls. Wording shall be similar to the following: '() Hour Fire and Smoke Barrier-Protect All Openings. Where signs are utilized, they shall be designed and installed to resist peeling or detaching from the barrier.
   1. Existing stenciling, acceptable to the authority having jurisdiction, shall be permitted to remain in use. Existing signs that are not peeling or detaching from the barrier shall be permitted to remain in use, subject to the approval of the authority having jurisdiction.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Testing agency to perform tests and inspections in accordance with Section 014000 “Quality Requirements” for Special Inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Wall-to-Wall, Fire-Resistive Joint Systems:
   1. UL-Classified Systems: WW-D- 0000-0999.
   2. Assembly Rating: As indicated for the assembly.
   3. Nominal Joint Width: As indicated.
   4. Movement Capabilities: Class I.

C. Head-of-Wall, Fire-Resistive Joint Systems:
   1. UL-Classified Systems: HW-D- 0000-0999.
   2. Assembly Rating: As indicated for the assembly.
   3. Nominal Joint Width: As indicated.
   4. Movement Capabilities: Class I.

D. Perimeter Fire-Resistive Joint Systems:
   1. UL-Classified Perimeter Fire-Containment Systems: CW-D- 0000-0999.
   2. Integrity Rating: As indicated for assembly.

3. Linear Opening Width: As indicated, maximum.
4. Movement Capabilities: Class I.

END OF SECTION 078443

This page intentionally left blank

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. Nonstaining silicone joint sealants.
   2. Urethane joint sealants.
   3. Immersible joint sealants.
   4. Mildew-resistant 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. Field-Adhesion-Test Reports: For each sealant application tested.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. 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 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.
   5. Test Method: Test joint sealants according to the following hand pull method:

a. Install joint sealants in 5-feet joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed work. Allow sealants to cure fully before testing.
b. Make knife cuts as follows: A horizontal cut from one side of joint to the other followed by 2 vertical cuts approximately 2 inches (50.8 mm) long at side of joint and meeting horizontal cut at top of 2 inch (50.8 mm) cuts. Place a mark 1 inch (25.4 mm) from top of 2 inch piece.
c. Use fingers to grasp 2 inch (50.8 mm) piece of sealant just above 1 inch (25.4 mm) mark; pull firmly down at a 90 degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
d. 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.

6. 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.
7. 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.
5. Unless specifically indicated on the Drawings, no joints shall exceed ½” and will be rejected by the Architect.

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 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.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 795.
      b. Pecora Corporation; Contractor Silicone.
      c. Sika Corp; Sikasil WS-290.
      d. Tremco Incorporated; Spectrem 3.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Master Builders: MasterSeal NP-1.
      b. Pecora Corporation; Dynatrol I-XL.
      c. Sika Corp.: SikaFlex 201US.
      d. Tremco Incorporated; Dymonic 100.

B. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Master Builders: MasterSeal SL2.
      b. Pecora Corporation; Urexpan NR 200.
      c. Sika Corp.: SikaFlex – 2CSL
      d. Tremco Incorporated; Vulkem 445SSL.

2.4 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C1247, Class 1 or Class 2; tested in deionized water unless otherwise indicated

B. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T, NT, and I.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Master Builders: MasterSeal SL-1.
      b. Sika Corporation U.S.; SikaFlex 1c SL.
      c. Tremco Incorporated; Vulkem 45SSL.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786-M White.
b. Pecora Corp.: 898ST
c. Sika Corp.: SikaSil N Plus US.
d. Tremco Incorporated; Tremsil 200.

2.6 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 C1330, Type C (closed-cell material with a surface skin) or 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.

2.7 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. Porcelain enamel.
c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction 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 C1193 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 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.

E. 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 C1193 unless otherwise indicated.

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

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-#1.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between different materials listed above.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-#2.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Joints between plant-precast architectural concrete units.
      c. Control and expansion joints in unit masonry.
      d. Joints in glass unit masonry assemblies.
      e. Joints in exterior insulation and finish systems.
      f. Joints between metal panels.
      g. Joints between different materials listed above.
      h. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
      i. Control and expansion joints in ceilings and other overhead surfaces.
   2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
      a. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-#3.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in exposed cast-in-place concrete slabs.
      c. Control and expansion joints in tile flooring.
      d. Control and expansion joints in resinous flooring.
   2. Joint Sealant: Urethane, M, P, 25, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#4, unless noted otherwise.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. The vertical joints in tile control and expansion joints.
      c. Vertical joints on exposed surfaces of unit masonry, concrete, walls, and partitions.
      d. Joints on underside of plant-precast structural concrete beams.
      e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      f. Corners of CMU construction.
      g. Countertops and walls.
      h. Note: Use JS-5 on vertical control joints and CMU corners up to 10’0” AFF.
   2. Joint Sealant: Urethane, S, NS, 25, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#6.
   1. Joint Locations:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   2. Joint Sealant: Silicone, mildew resistant, S, NS, 25, NT.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors. Use clear at kitchen equipment.

END OF SECTION 079200

This page intentionally left blank

SECTION 081213 - HOLLOW METAL FRAMES

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 hollow-metal frames.

B. Related Requirements:
   1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.
   2. Section 081613 Fiberglass Reinforced Polyester Doors” for FRP doors installed in hollow metal frames.
   3. Section 087100 “Door Hardware” for door hardware installed in metal 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 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:
   1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   2. Locations of reinforcement and preparations for hardware.
   3. Details of each different wall opening condition.
   4. Details of anchorages, joints, field splices, and connections.
   5. Details of moldings, removable stops, and glazing.
   6. 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.

1.6 INFORMATIONAL SUBMITTALS

A. Special Certification: The manufacturers of the steel frames shall legally certify in writing that all exterior steel frames and frames in kitchen area for this Project are, in fact, metallic-coated steel sheet as specified and that all frames are the specified gauge. The certification shall contain the name and job number of the Project and the date of certification. The certification shall be signed by a duly authorized officer of the company and contain his title. The certification shall be notarized by a legal, qualified notary public. Submit three original copies to the Architect.

B. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.

C. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

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 unit to permit air circulation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ceco Door Products; an Assa Abloy Group company.
   2. Curries Company; an Assa Abloy Group company.
   3. Republic; Allegion
   4. Steelcraft; Allegion.

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 FRAMES

A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Materials: Uncoated and Metallic-coated (as noted) steel sheet, minimum thickness of 0.053 inch (1.35 mm).
   3. Construction: Face welded.
      a. Knocked down frames may be used in existing construction where indicated on the Drawings.
   4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL FRAMES

A. Construct exterior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Frames: SDI A250.8, Level 2. At locations indicated in the Door and Frame Schedule.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.35 mm), with minimum A40 (ZF120) coating.

3. Construction: Face welded.
4. Exposed Finish: Prime.

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 (1.07 mm) thick, with corrugated or perforated straps not less than 2 inches (50.8 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 (1.07 mm) thick.
3. 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 (1.07 mm), and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

C. Frame Anchors: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. 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.

F. Grout: ASTM C476, except with a maximum slump of 4 inches (101.6 mm), as measured according to ASTM C143/C143M.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 088000 "Glazing."

I. 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 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 Bar 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: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 16 inches (406.4 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 mm) o.c., to match coursing, and as follows:
        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (609.6 mm) or fraction thereof above 120 inches (3048 mm) high.
    b. Stud-Wall Type: Locate anchors not more than 18 inches (457.2 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 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 (609.6 mm) or fraction thereof above 96 inches (2438.4 mm) high.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152.4 mm) from top and bottom of frame. Space anchors not more than 26 inches (660.4 mm) o.c.
6. Head Anchors: Two anchors per head for frames more than 42 inches (1066.8 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.

C. 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 frames to receive nontemplated, mortised, and surface-mounted hardware.
    2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

D. Electric Junction Boxes: Where electronic hinges, strikes, or other hardware devices are required to be installed in the frames, provide 20 ga. junction box welded to frame and conduit as required for access to facilitate wiring and connector installation. Coordinate exact location with hardware provided.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
    1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
    2. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.

3. 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. Mullions and Transom Bars: Join to adjacent members by welding.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.41 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 frames to receive nontemplated, mortised, and surface-mounted 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. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. 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. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. 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 (1.59 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.59 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.59 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 (1.59 mm), measured at jambs at floor.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (228.6 mm) o.c. and not more than 2 inches (50.8 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: 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 081213

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 081213 “Hollow Metal Frames” for frames receiving wood doors.
   2. Section 087100 “Door Hardware” for hardware installed in wood doors.
   3. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 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: Use same reference numbers as used on Contract Documents. 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 plastic-laminate door faces and 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.
   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 color, texture, and pattern of plastic laminate required.
      b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
   3. Frames for light openings, 6 inches (152.4 mm) long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 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 temperature between 60 and 90 degrees Fahrenheit (32.22 degrees Celsius) and relative humidity between 25 and 55 percent during remainder of construction period.

1.7 WARRANTY

A. 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 (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch (0.25 mm) in a 3-inch (0.01 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, provide products by one of the following:
   1. Masonite Architectural.
   2. Oshkosh Door Company.
   3. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Flush wood doors shall be 1 ¾” thick unless noted otherwise.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S. 1A, "Architectural Wood Flush Doors."

C. WDMA I.S. 1A Performance Grade: Extra Heavy Duty.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   4. Pairs: Provide formed-steel edges and astragals with intumescent seals.
      a. Finish steel edges and astragals with baked enamel same color as doors.

E. Particleboard-Core Doors:
   1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2.
   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.

F. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
a. 5-inch (125-mm) top-rail blocking.
b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
d. 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).

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: Book 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: Match door faces within each separate room or area of building.
8. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
9. Core: Particleboard.
10. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
11. WDMA I.S. 1A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

A. Metal Frames for Light Openings: Design Base: Anemostat Door Products; LoPro. four sided, beveled profile, mitered and welded assembly with hemmed edge. Note edges must be hemmed. Provide security screw fasteners on secure side of doors. Frames by other manufacturers that comply with specifications are acceptable.
1. Material: 20 ga. cold-rolled steel. Primed for field painting.
2. Frames for rated doors shall be tested and approved for ratings indicated.

2.5 ELECTRIC POWER TRANSFER RACEWAY

A. Electric Power Transfer Raceway: Where doors are indicated to be provided with electrified door hardware, provide EPT raceways factory installed in doors to facilitate installation of specified electrified door hardware.

2.6 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.

2.7 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 bottom edges, edges of cutouts, and mortises. (In Cherokee, remove reference to bottom edges.)

B. Factory finish doors that are indicated to receive transparent finish with the exception of hollow core doors on teachers' cabinets.
1. Doors on teachers' cabinets shall be finished by the millwork provider to match the millwork.

C. Transparent Finish:
1. Grade: Premium.
2. Finish: Provide one of the following:
a. ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
b. ANSI/WDMA I.S. 1A TR-8 UV Cured Acrylated Polyester/Urethane
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Open-grain finish.
5. 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. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. 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 081613 - FIBERGLASS REINFORCED POLYESTER 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: Fiberglass polyester doors (FRP) for the following:
   1. Exterior doors.

B. Related Requirements:
   1. Section 081213 “Hollow Metal Frames” for frames receiving FRP doors.
   2. Section 087100 “Door Hardware” for hardware installed in FRP doors.
   3. Section 088000 "Glazing" for glass view panels in FRP doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Use same reference numbers as used on Contract Documents. 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.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for door faces.

D. Samples for Verification:
   1. 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 color, texture, and pattern.
   2. Frames for light openings, 6 inches (152.4 mm) long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of manufacturer's written instructions.

B. Package doors individually in corrugated cartons.

C. Mark each door on top with opening number used on Shop Drawings.

1.6 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Warranty shall also include installation that may be required due to repair or replacement of defective doors.
   2. Warranty Period: Ten years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following products:

1. FRP Architectural Doors, Inc.; FD-25
2. Special Lite; SL17

B. Source Limitations: Obtain doors from single manufacturer.

2.2 FIBERGLASS POLYESTER DOORS, GENERAL

A. FRP Doors: Provide flush type, fiberglass reinforced polyester doors, 1 3/4" thick.

B. All doors shall be machined with templates from the manufacturer of submitted and approved hardware. Doors shall be internally reinforced for specified surface hardware. All doors to be properly reinforced for hardware before core is foamed in door.

C. Doors are to be shipped with hardware installed by the FRP Door Manufacturer except for door closers and holders that may be field installed. Reinforcement must be provided by the door manufacturer for the through bolting of door closures and holders and exit devices. Hardware shall be installed in accordance with Section 087100 “Door Hardware” and hardware manufacturer’s specifications.

D. Fire-Rated FRP Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for ratings of 20 minute doors, based on testing according to NFPA 252.
1. Test Pressure: Test at atmosphere pressure.

E. Comply with fire-resistance and flammability regulations as interpreted by governing authorities as follows:
1. Face sheet tested in accordance with ASTM E84 shall have the following ratings:
2. Smoke Developed: not greater than 450.
3. Flame Spread: not greater than (Class C) Exterior (Class A) interior.

F. Provide door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing and manufacturer's corresponding stock systems according to test methods designated.
1. Thermal Transmittance: U-Value of not more than 0.09 (0.09)/0.70.

G. Provide face sheets that meet the following test requirements:
1. Impact Strength of Face Sheets: ASTM D256 Izod Impact Strength, 14 pounds per inch of notch.
2. Abrasion Resistance of Face Sheets: NEMA Standard L.D1-2.01 and ASTM D 1242, 2000 cycles of Model 503 Taber Abraser with a 1000 gram load, not to exceed 0.23% weight loss, providing 50% less weight loss after 25 abrader cycles.
3. Hardness of Face Sheets: ASTM D 2583, Barcol Meter Hardness Test, not more than 55.
4. Humidity Resistance of Face Sheets: ASTM D570, water absorption not greater than 0.40% after 24-hour immersion.

2.3 MATERIALS

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance and application of required finish: ASTM B221 for extrusions, ASTM B209 for sheet/plate, minimum wall thickness of .125 inch (3.18 mm).

B. Aluminum perimeter extrusions finish shall be:
1. At interior doors, provide AAM10C22A41 Series Finish (Class I anodized, clear finish 204 R1), 0.7 mils (0.01778 mm) or greater thickness.

C. Fasteners: Aluminum, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components.

D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, provide non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A386.

1. Provide manufacturer's standard reinforcement for each type of hardware required, not less than .125" thick.
2. Provide manufacturer's recommended fasteners reinforcement.

E. Core Material: Foamed-in-place urethane foam of minimum 5 pounds per cubic foot density, containing no CFC's.

F. Face Material: Fiberglass reinforced polyester, .120" minimum thickness, with pebble-like embossed finish. Color to be selected by the Architect from a minimum of 8 colors

2.4 LIGHT FRAMES

A. Metal Frames for Light Openings: Manufacturer’s standard four sided, beveled profile, mitered assembly with hemmed edge. Provide security screw fasteners on secure side of doors.
1. Material: Anodized aluminum to match door edges.
2. Frames for rated doors shall be tested and approved for ratings indicated.
3. Frames shall be manufactured to accept glazing system indicated on Drawings and specified for the locations indicated.

2.5 ELECTRIC POWER TRANSFER RACEWAY

A. Electric Power Transfer Raceway: Where doors are indicated to be provided with electrified door hardware, provide EPT raceways factory installed in doors to facilitate installation of specified electrified door hardware.

2.6 FABRICATION

A. Railings and stiles to be extruded 6063 T5 aluminum alloy. All exposed surfaces to be a minimum .125 wall thickness.

B. Stiles shall be tubular to accept hardware as specified.

C. Top and bottom rails to be extruded with legs for interlocking rigidity weather bar where applicable. On toilet stall doors, top and bottom rail shall be fully closed with seamless top and bottom edges, using identical rail section as used for vertical jambs.

D. Face sheets to be locked in by extruded interlocking edges which are to be an integral part of rails and stiles.

E. Joinery to be 3/8" galvanized steel tie rod, top and bottom and 3/16" riveted reinforcing angles and secured with aircraft type nuts.

F. Core to be foamed-in-place.

G. Under Cutting: Where doors are indicated to be undercut, the dimension indicated shall be clear opening from floor finish.

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 as indicated.

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.

END OF SECTION 081613

SECTION 083113 - ACCESS DOORS AND FRAMES

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. Access doors and frames for walls and ceilings.

B. Related Sections include the following:
   1. Section 042000 "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.
   2. Section 092900 “Gypsum Board” for anchoring and finishing of gypsum insert and frame.
   3. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.
   4. Divisions 23 and 26 Sections for systems requiring access doors for installation and maintenance.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

D. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 for vertical access doors and frames.
   2. ASTM E119 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article. Provide access doors for all locations requiring access for installation and maintenance of any and all systems.

PART 2 PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
   1. ASTM A123/A123M, for galvanizing steel and iron products.

2. ASTM A153/A153M, for galvanizing steel and iron hardware.

B. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
   1. ASTM A123/A123M, for galvanizing steel and iron products.
   2. ASTM A153/A153M, for galvanizing steel and iron hardware.

C. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No.1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

E. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acudor Products, Inc.
   2. Best Access Doors.
   3. Karp Associates, Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Masonry wall surfaces.
   2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
   3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
   4. Hinges: Continuous piano.
   5. Latch: Cam latch operated by screwdrivers with interior release.
   6. Size: 16” x 16” in walls unless noted otherwise.

C. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet.
   1. Locations: Gypsum board wall and ceiling surfaces.
   2. Door: Minimum 0.060-inch- thick sheet metal in the form of a pan recessed 5/8 inch (15.88 mm) for gypsum board infill.
   3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead for gypsum board surfaces.
   4. Hinges: Concealed pivoting rod hinge.
   5. Latch: Cam latch operated by screwdriver with interior release.
   6. Size: 24” x 24” in ceilings and 16” x 16” in walls unless noted otherwise.

D. Fire-Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Rated masonry wall surfaces.
   2. Fire-Resistance Rating: Not less than that of adjacent construction.
   3. Door: Minimum 0.060-inch- thick sheet metal, flush concentration.
   4. Frame: Minimum 0.060-inch- thick sheet metal with 1 inch (25.4 mm) wide, surface-mounted trim.
   5. Hinges: Continuous piano.
   6. Automatic Closer: Spring type.
   7. Latch: Self-latching device operated by flush key with interior release.
   8. Size: 16” x 16” unless noted otherwise.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. Exposed Flanges: As indicated.
   2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   3. Provide mounting holes in frames for attachment of units to metal or wood framing.
   4. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install access doors at all locations requiring access for installation and maintenance of any and all systems. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

This page intentionally left blank

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 079200 “Joint Sealants” for sealants used at perimeter of frames.
   2. Section 087100 “Door hardware” for hardware to extent not specified in this section.
   3. Section 088000 "Glazing" for glazing installed in aluminum framed entrances and storefronts.

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.

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 air barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Entrance Door Hardware Schedule: Provide schedule as required by Section 087100 “Door Hardware.”

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. 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.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

B. 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. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 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: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.

C. 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 (396.24 cm) 6 inches (152.4 mm) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (152.4 mm) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.05 mm), whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.18 mm), whichever is smaller.

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

D. 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.

E. Air Leakage: 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. at a static-air-pressure differential of 1.57 lbf/sq. ft.
2. Entrance Doors:
a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
b. Single Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

F. Water Penetration under Static Pressure: Test according to ASTM E331 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 15 lbf/sq. ft.

G. 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 0.46 Btu/sq. ft. x h x deg F (3.35 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 0.25 as determined according to NFRC 200.

H. 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.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Company; Series 451T (2”x4 ½” frame size) or comparable product by one of the following:
1. EFCO Corporation.
2. Kawneer North America.
3. Oldcastle BuildingEnvelope.
4. Tubelite.
5. YKK AP America, Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system and aluminum curtain wall systems, including framing 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. Interior frames may utilize a non-thermally broken frame.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center of frame.

4. Finish: Color anodic finish.
5. Fabrication Method: Screw spline or shear block system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. 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 B221 (((ASTM B221M))).
c. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
d. Structural Profiles: ASTM B308/B308M.
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 A36/A36M.
b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 2-inch (50.8-mm) overall thickness, with minimum 0.188-inch- (4.8-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware" with exception of weather stripping.

B. Weather Stripping: Manufacturer's standard replaceable components.
1. Compression Type: Made of ASTM D2000, molded neoprene, or ASTM D2287, molded PVC.

C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.7 ELECTRIC POWER TRANSFER RACEWAY

A. Electric Power Transfer Raceway: Where doors are indicated to be provided with electrified door hardware, provide EPT raceways factory installed in doors to facilitate installation of specified electrified door hardware.

2.8 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.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

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 A123/A123M or ASTM A153/A153M requirements.

C. Exposed Metal Trim: Where indicated on drawings, provide 0.125” aluminum trim matching storefront finish.

D. Exposed Flashing: Where indicated on drawings, provide exposed trim of 0.040 aluminum sheet with color to match aluminum framed entrances and storefronts, unless otherwise noted.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. 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.

2.9 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 exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   7. Components curved to indicated radii.

D. Storefront Framing: Fabricate components for assembly using shear-block system or screw-spline system.

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 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.

2.10 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0 inch (0.02 mm) or thicker.
   1. Color: Dark bronze .

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 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.

F. 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 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.5 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch (3.18 mm) in 10 feet (304.8 cm); 1/4 inch (6.35 mm) in 40 feet (1219.2 cm).
   2. Level: 1/8 inch (3.18 mm) in 20 feet (609.6 cm); 1/4 inch (6.35 mm) in 40 feet (1219.2 cm).
   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 (1.59 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 (3.18 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 (6.35 mm).

4. Location: Limit variation from plane to 1/8 inch (3.18 mm) in 12 feet (365.76 cm); 1/2 inch (12.7 mm) over total length.

END OF SECTION 084113

This page intentionally left blank

SECTION 085659 - SERVICE AND TELLER WINDOW 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:
   1. Transaction and observation windows.
   2. Glazing.
   3. Intercom and talk through.

1.3 COORDINATION

A. Coordinate installation of anchorages for windows. 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 masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transaction windows.

B. Shop Drawings: Include plans, elevations, sections, details, attachments to other Work, and the following:
   1. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
   2. Glazing details.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of window manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain windows through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of transaction windows and are based on the specific system indicated.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Pack window units and accessories in manufacturer's standard shipping containers and protective packaging. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Label window packaging with Drawing designation.

C. Store window units and accessories on raised blocks to prevent moisture damage protected from exposure to weather and vandalism.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating security windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including deflections exceeding 1/4 inch (6.35 mm).
   2. Failure of welds.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

B. Warranty Period: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Basis-of-Design Product: The design for each security window is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B221/B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.125 inch (3.2 mm) thick at any location for main frame and sash members.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, Plate, and Flat Bars:
   1. ASTM A666, austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
   2. ASME SA-240/SA-240M, chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications.

D. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

E. Embedded Plate Anchors: Fabricated from steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

F. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

G. Fasteners: Manufacturer’s standard non-exposed fasteners of material compatible with window frame and wall construction.

H. Sealants: For sealants required within fabricated security windows, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

I. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, nonshrinking, and nonmigrating.

2.3 WINDOW COMPONENTS

A. Glazing: 5/8" clear tempered insulated glazing.

B. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers, and with a proven record of compatibility with surfaces contacted in installation:
   1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
   2. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

3. Spacers: Elastomeric blocks or continuous extrusions with a Type A Shore durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

C. Welding Materials.

D. Anchors, Clips, and Window Accessories: Stainless steel, hot-dip zinc-coated steel or iron complying with ASTM B633.

2.4 TRANSACTION WINDOWS

A. Basis-of-Design Product: Covenant Security Equipment, Quikserv T2 Ticket Teller Window With Amplified Speak Thru and Slide Up Pass Thru (Item #CSE-QS-TW2-Custom Size-CX) or a comparable product of one of the following:

B. Manufacturers:
1. Covenant Security Equipment
2. Creative Industries, Inc.
3. Laurence, C. R. Company of North America.
4. Quikserv Corporation
5. Wausau

C. Configuration: Provide as shown on Drawings.

D. Framing: Fabricate perimeter framing from metal sheet as follows:
1. Material: Extruded aluminum with Class I, clear anodized finish.
2. Profile: Narrow with face dimension indicated.
3. Minimum Face Dimension: 5/8”.
4. Framing Depth:
   a. Manufacturer's standard. (1 3/8” design base)

E. Head and Jamb Framing: Designed for gasket glazing.

F. Sill: No sill.
1. Sliding Window Hardware: Nylon runners over coiled compression springs. Window shall hold in open position. Provide manufacturer’s standard pull and lock for each vertical sliding glazed panel.

2.5 FABRICATION

A. General: Fabricate transaction windows to comply with indicated standards. Include a complete system for assembly of components and anchorage of windows.

B. Framing: Miter or cope corners the full depth of framing; weld, and dress smooth.

C. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

E. Preglazed Fabrication: Preglaze windows at the factory where possible and practical for applications indicated.

2.6 FINISHES, GENERAL

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. 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.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. 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 inch (0.01 mm) or thicker) complying with AAMA 611.

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 security windows.
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing windows to in-place construction. Include threaded fasteners for masonry and other connectors.

B. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for installing sealants, fillers, and gaskets.
   1. Seal frame perimeter with sealant, unless otherwise indicated.

C. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.3 ADJUSTING

A. Adjust windows to provide a tight fit at contact points, for smooth operation and a secure enclosure.

B. Remove and replace defective work, including windows that are warped, bowed, or otherwise unacceptable.

3.4 CLEANING

A. Clean surfaces promptly after installation of windows. Exercise care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
   1. Lubricate sliding window hardware.

B. Clean glass of preglazed windows promptly after installation.

END OF SECTION 085659

SECTION 087100 - 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. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 01 Section "General Conditions”.
2. Division 06 Section “Rough Carpentry”.
3. Division 06 Section “Interior Finish Carpentry”.
4. Division 08 Section “Hollow Metal Frames”.
5. Division 08 Section “Flush Wood Doors”.
6. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
7. Division 26 Section "Electrical”

D. Codes and References: Comply with the version 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 as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

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. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

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. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. 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.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Door Opening Field Inspection (Punch Report): Provide Door Opening Field Inspection Report as required by Division 01 upon completion of opening inspection, organized by door identifier (mark), and including; individually identified deficiencies associated with assembly components, related opening images and video recordings, and opening remarks.

C. Fire Door Assembly Inspection: Provide Fire Door Assembly Inspection Report upon completion of fire door inspection as required by Division 01 and NFPA 80, section 5.2.2.4.

D. Protective Door Assembly Inspection: Provide Protective Door Assembly Inspection Report upon final completion of non-rated and fire rated egress door inspection as required by Division 01 and NFPA 80, section 5.2.2.4.

1.5 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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. 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.

D. 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.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. 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. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal 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

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 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".

1.7 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.

1.8 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    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:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

    a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

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. Manufacturers:

    a. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Rockwood (RO).

D. Single Motion Flat Latching Devices: Single motion flat latching devices with integrated locking pull, designed for outswing door applications.

1. Provide latching devices with functions and features as follows:

    a. ADA-compliant available, meeting California Building Code (2019) Section 11B-309.4.
    b. Outswing applications only with single motion egress.
    c. Engraved “PUSH” area on egress side.
    d. Optional dogging to allow latch to remain retracted for free operation.

2. Manufacturers:

   a. Rockwood (RO) - SMU9000 Series.
   b. No Substitution.

2.6 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. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. 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.
6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "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: Field verify and key cylinders to match 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).

E. 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.

2.7 KEY CONTROL

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

    a. Medeco (MC).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

    a. Sargent Manufacturing (SA) - 8200 Series.
    b. No Substitution.

2.9 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.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. 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.
3. 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.

4. 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.
5. 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.
6. 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.

7. 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.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. 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 Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. No catch points: addition of applied deflectors or other added components are not allowed.
    d. No visible plastic.
    e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
    f. Constructed of all stainless steel.
    g. Stainless steel pullman type latch with deadlock feature.
    h. Narrow or wide style exterior trim as specified in the hardware sets.
    i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
    j. Ten-year limited warranty for mechanical features.

2. Manufacturers:

a. Sargent Manufacturing (SA) - PE80 Series.
b. No Substitution.

2.11 SURFACE 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.
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. 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 Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. 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 Certified Products Directory (CPD) listed 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. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Sargent Manufacturing (SA) - 281 Series.
b. No Substitution.

C. Door Closers, Surface Mounted (Utility Grade, Chiming): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, utility grade door closers with built in chime that is activated by the rotation of the closer pinion. Closers to be rack and pinion type, cast aluminum case construction, with adjustable backcheck, closing sweep, and latch speed control valves and complete spring power adjustment, sizes 1 thru 6. Provide closer standard packed for regular, top-jamb, and parallel arm type mounting applications.

1. Manufacturers:

a. Norton Rixson (NO) - Norbell Series.
b. No Substitution.

2.12 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1” less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide protective trim with functions and features as follows:

a. Meets ADA requirements for smooth bottom door surfaces.
b. UL Classified options for use on fire-rated doors up to 3 hours.
c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
f. Fasteners included; adhesive-backed options available for select models.
g. Ten-year limited warranty.

2. Manufacturers:

a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 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. Manufacturers:

a. Rockwood (RO).

B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed 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. Manufacturers:

a. Norton Rixson (NO).
b. Rockwood (RO).

c. Sargent Manufacturing (SA).

2.14 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 NFPA 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. Manufacturers:

1. Pemko (PE).

2.15 ELECTRONIC ACCESSORIES

A. Networked Proximity Card Readers: Card readers to support HID 125 kHz proximity technology and interface with the access control reader modules and door control hardware devices as specified. Card readers to meet the following, minimum, design and performance specifications.

1. Reader to operate on 12VDC or 5VDC power from the reader I/O modules at a maximum current rating of 150 mA per reader.
2. Reader to be weatherproof type when installed in exterior or other wet environments.
3. Reader to communicate with the reader I/O modules using industry standard Wiegand protocol interface.
4. Reader to have multi-color LED display and audible status indications.
5. Reader type and model to meet the design and mounting applications needs of each entry point as indicated on the drawings.

6. Manufacturers (125 kHz Proximity):

    a. Corbin Russwin Hardware (RU) - 752F909/751F929 Series.
    b. Sargent Manufacturing (SA) - 4302/4304 Series.

B. Networked Contactless Smart Card Readers: Contactless smart cards reader to securely read access control data from 13.56 MHz contactless smart cards. The contactless smart card reader is designed for use in access control applications by providing:

1. Secure access control data exchange between the smart card and the reader utilizing key diversification and mutual authentication routines.
2. Contactless smart card reader to be designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Operating voltage: 5-16 VDC. Current requirements: 55 mA Avg, 116 mA Peak at 12 VDC.
3. Universal compatibility with most access control systems and backwards compatibility with legacy 125 KHz proximity access control formats.
4. Product construction suitable for both indoor and outdoor applications.
5. Customizable behavior for indicator lights and audible tones.
6. Manufacturers (13.56 MHz iClass):

    a. Corbin Russwin Hardware (RU) - 744F709/744F719 Series.
    b. Sargent Manufacturing (SA) - 6100/6120 Series.

C. Wireless Card Readers: Card readers to support HID 125 kHz proximity technology or 13.56 MHz contactless smart cards as specified in the hardware sets. Card readers to meet the following minimum design and performance specifications.

1. Reader to wirelessly operate on one 3V CR2 lithium battery.
2. Reader to be suitable for outdoor use.
3. Contactless smart card versions to be compatible with the following technologies: iCLASS, iCLASS Seos, iCLASS SE, ISO1443B UID, Mifare, Mifare Plus, Desfire SE, Desfire EV1, NFC
4. Reader to come pre-paired with an Aperio hub and communicate with the hub via IEEE802.14.4 (2.4 GHz) wireless technology.
5. Aperio hub to communicate with the access control panel using industry standard Wiegand protocol interface.
6. Reader to have green LED status indicator.
7. Reader type and model to meet the design and mounting applications needs of each entry point as indicated on the drawings.
8. Manufacturers:

    a. Securitron (SU) - R100 Series.

D. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete

with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

    a. Alarm Controls (AK) - CP1-1026 Series.
    b. Securitron (SU) - DPS Series.

E. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

    a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
    b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
    c. Enhanced surge immunity for input/output protection
    d. Separate, dedicated battery charging circuit to keep locks cooler.
    e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
    f. Instant auto-switch to battery on AC loss.
    g. Expandable up to 16 outputs in the standard enclosure
    h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
    i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
    j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

    a. Securitron (SU) - AQL Series.

2.16 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.

2.17 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. Paint prime coated mullions to match frames.

C. 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
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.

D. 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.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. 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 (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. MR - Markar
4. SU - Securitron
5. RO - Rockwood
6. SA - SARGENT
7. NO - Norton Rixson
8. OT - Other

Hardware Sets

Set: 1.0
Doors: 101, 114
Description: Exterior Aluminum Nightlatch Exit Pair w/ Closer, Card Reader, Remote Release

2	Continuous Hinge	CFM__SLF-HD1 PT - DOOR HEIGHT		PE	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Removable Mullion	L980A - DOOR HEIGHT	US28	SA	087100	
1	Rim Exit Device, Dummy	16 55 PE8810 PTB	US32D	SA	087100	⚡
1	Rim Exit Device, Storeroom	16 55 56 PE8804 PSB	US32D	SA	087100	⚡
1	Cylinder	22 980C1	US26D	SA	087100	
2	Surface Closer	281 CPS	EN	SA	087100	
2	Astragal	18061CNB		PE	087100	
1	Rain Guard	346C		PE	087100	
1	Gasketing	303AV TKSP		PE	087100	
1	Gasketing (Mullion)	5110BL		PE	087100	
2	Sweep (w/ drip edge)	3452CNB		PE	087100	
1	Threshold	252x3AFG MSES25SS		PE	087100	
2	Frame Harness	QC-C1500P		MK	087100	⚡
2	Door Harness	QC-CXXX- LENGTH TO SUIT		MK	087100	⚡
1	Card Reader	BY SECURITY SUPPLIER		OT	281500	⚡
2	Door Position Switch	DPS-M/W-BK (TO SUIT)		SU	087100	⚡
1	Power Supply	AQL4-R8E1		SU	087100	⚡
1	Wiring Diagram	Elevation and Point to Point as Specified		SA	087100	⚡

Notes: Doors normally closed and locked
Entry by card reader, key or when in a timed unlock by access control system programming, or remote release
Free egress at all times

Set: 2.0
Doors: 112, 115.2
Description: Exterior Aluminum Nightlatch Exit w/ Closer, Card Reader, Remote Release

1	Continuous Hinge	CFM__SLF-HD1 PT - DOOR HEIGHT		PE	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1	Rim Exit Device, Storeroom	16 55 56 PE8804 PSB	US32D	SA	087100	⚡
1	Surface Closer	281 CPS	EN	SA	087100	
1	Rain Guard	346C		PE	087100	
1	Gasketing	303AV TKSP		PE	087100	
1	Sweep (w/ drip edge)	3452CNB		PE	087100	
1	Threshold	252x3AFG MSES25SS		PE	087100	
1	Frame Harness	QC-C1500P		MK	087100	⚡
1	Door Harness	QC-CXXX- LENGTH TO SUIT		MK	087100	⚡
1	Card Reader	BY SECURITY SUPPLIER		OT	281500	⚡
1	Door Position Switch	DPS-M/W-BK (TO SUIT)		SU	087100	⚡
1	Power Supply	AQL4-R8E1		SU	087100	⚡
1	Wiring Diagram	Elevation and Point to Point as Specified		SA	087100	⚡

Notes: Door normally closed and locked
Entry by card reader or key
Free egress at all times

Set: 3.0
Doors: 109
Description: Storeroom Pair

2	Continuous Hinge	CFM__SLF-HD1 - DOOR HEIGHT		PE	087100
1	Flush Bolt	2845	US32D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Closet/Storeroom Lock	22 8227 LNL	US26D	SA	087100
1	Coordinator	1700	US28	RO	087100
2	Surface Closer	281 CPSH	EN	SA	087100
2	Astragal	18061CNB		PE	087100
1	Gasketing	303AV TKSP		PE	087100

Set: 4.0
Doors: 111
Description: Exterior Storage

1	Continuous Hinge	CFM__SLF-HD1 - DOOR HEIGHT		PE	087100
1	Closet/Storeroom Lock	22 8227 LNL	US26D	SA	087100
1	Surface Closer	281 CPSH	EN	SA	087100
1	Rain Guard	346C		PE	087100
1	Gasketing	303AV TKSP		PE	087100
1	Sweep (w/ drip edge)	3452CNB		PE	087100
1	Threshold	252x3AFG MSES25SS		PE	087100

Set: 5.0
Doors: 127
Description: Vault

3	Hinge (heavy weight)	T4A3786	US26D	MK 087100	
1	Electric Power Transfer	EL-CEPT	630	SU 087100	⚡
1	Electrified Mortise Lock	22 IDP NAC-82271-24v LNL	US26D	SA 087100	⚡
1	Surface Closer	281 P10	EN	SA 087100	
1	Kick Plate	K1050 10" CSK	US32D	RO 087100	
1	Wall Stop	409	US32D	RO 087100	
1	Gasketing (Head/Jambs)	S88BL		PE 087100	
1	Frame Harness	QC-C1500P		MK 087100	⚡
1	Door Harness	QC-CXXX- LENGTH TO SUIT		MK 087100	⚡
1	Card Reader	BY SECURITY SUPPLIER		OT 281500	⚡
1	Power Supply	AQL4-R8E1		SU 087100	⚡
1	Wiring Diagram	Elevation and Point to Point as Specified		SA 087100	⚡

Notes: Door normally closed and locked
Entry by card reader or key
Free egress at all times

Lockset has integrated request to exit and door position switches

Set: 6.0
Doors: 123, 124
Description: Records, Evidence

3	Hinge (heavy weight)	T4A3786	US26D	MK 087100	
1	Electric Power Transfer	EL-CEPT	630	SU 087100	⚡
1	Electrified Mortise Lock	22 IDP NAC-82271-24v LNL	US26D	SA 087100	⚡
1	Surface Closer	281 OTB	EN	SA 087100	
1	Kick Plate	K1050 10" CSK	US32D	RO 087100	
1	Wall Stop	409	US32D	RO 087100	
1	Gasketing (Head/Jambs)	S88BL		PE 087100	
1	Frame Harness	QC-C1500P		MK 087100	⚡
1	Door Harness	QC-CXXX- LENGTH TO SUIT		MK 087100	⚡
1	Card Reader	BY SECURITY SUPPLIER		OT 281500	⚡
1	Power Supply	AQL4-R8E1		SU 087100	⚡
1	Wiring Diagram	Elevation and Point to Point as Specified		SA 087100	⚡

Notes: Door normally closed and locked
Entry by card reader or key
Free egress at all times

Lockset has integrated request to exit and door position switches

Set: 7.0
Doors: 102, 104, 105, 125, 126
Description: Privacy

3	Hinge, Full Mortise	TA2714	US26D	MK	087100
1	Privacy Lock	LB V21 8266 LNL	US26D	SA	087100
1	Surface Closer	281 OTB	EN	SA	087100
1	Kick Plate	K1050 10" CSK	US32D	RO	087100
1	Mop Plate	K1050 4" CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
1	Coat Hook	RM802	US32D	RO	087100

Set: 8.0
Doors: 103
Description: Vestibule

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100
1	Electric Power Transfer	EL-CEPT	630	SU	087100
1	Electrified Mortise Lock	22 IDP NAC-82271-24v LNL	US32D	SA	087100
1	Surface Closer	281 P10	EN	SA	087100
1	Wall Stop	409	US32D	RO	087100
1	Frame Harness	QC-C1500P		MK	087100
1	Door Harness	QC-CXXX- LENGTH TO SUIT		MK	087100
1	Card Reader	BY SECURITY SUPPLIER		OT	281500
1	Door Position Switch	DPS-M/W-BK (TO SUIT)		SU	087100
1	Power Supply	AQL4-R8E1		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		SA	087100

Notes: Door normally closed and locked
Entry by card reader or key
Free egress at all times

Set: 9.0
Doors: 112.1
Description: Training Room

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100
1	Storeroom/Closet Lock	22 8204 LNL	US32D	SA	087100
1	Surface Closer	281 P10	EN	SA	087100
1	Kick Plate	K1050 10" CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100

Set: 10.0
Doors: 108
Description: Training Room

3	Hinge (heavy weight)	T4A3786	US26D	MK 087100
1	Storeroom/Closet Lock	22 8204 LNL	US32D	SA 087100
1	Surface Closer	281 P10	EN	SA 087100
1	Wall Stop	409	US32D	RO 087100

Set: 11.0
Doors: 106, 107, 110, 113
Description: Storeroom w/ Closer

3	Hinge, Full Mortise	TA2714	US26D	MK 087100
1	Storeroom/Closet Lock	22 8204 LNL	US26D	SA 087100
1	Surface Closer	281 OTB	EN	SA 087100
1	Wall Stop	409	US32D	RO 087100
3	Silencer	608-RKW		RO 087100

Set: 11.1
Doors: 130.1
Description: Storeroom w/ Closer

3	Hinge, Full Mortise	TA2714	US26D	MK 087100
1	Storeroom/Closet Lock	22 8204 LNL	US26D	SA 087100
1	Surface Closer	281 CPS	EN	SA 087100
1	Wall Stop	409	US32D	RO 087100
3	Silencer	608-RKW		RO 087100

Set: 12.0
Doors: 117, 118, 119, 121, 122, 128, 129, 130
Description: Office

3	Hinge, Full Mortise	TA2714	US26D	MK 087100
1	Office/Entry Lock	22 8205 LNL	US26D	SA 087100
1	Wall Stop	409	US32D	RO 087100
3	Silencer	608-RKW		RO 087100
1	Coat Hook	RM802	US32D	RO 087100

Set: 13.0
Doors: 120
Description: Conference

3	Hinge, Full Mortise	TA2714	US26D	MK 087100
1	Passage Latch	8215 LNL	US26D	SA 087100
1	Wall Stop	409	US32D	RO 087100
3	Silencer	608-RKW		RO 087100

Set: 14.0
Doors: 114.1, 115
Description: Classroom (passage or storeroom) w/ Closer

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100
1	Classroom Lock	22 8237 LNL	US26D	SA	087100
1	Surface Closer	281 P10	EN	SA	087100
1	Wall Stop	409	US32D	RO	087100

Notes:

Set: 15.0
Doors: 116
Description: Classroom w/ Closer

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100
1	Classroom Lock	22 8237 LNL	US26D	SA	087100
1	Surface Closer	281 OTB	EN	SA	087100
1	Wall Stop	409	US32D	RO	087100

Notes:

Set: 16.0
Doors: 115.1
Description: Lockset w/ Closer, Card Reader, Remote Release

3	Hinge (heavy weight)	T4A3786	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	ϟ
1	Electrified Mortise Lock	22 IDP NAC-82271-24v LNL	US26D	SA	087100	ϟ
1	Surface Closer	281 CPS	EN	SA	087100	
1	Frame Harness	QC-C1500P		MK	087100	ϟ
1	Door Harness	QC-CXXX- LENGTH TO SUIT		MK	087100	ϟ
1	Card Reader	BY SECURITY SUPPLIER		OT	281500	ϟ
1	Power Supply	AQL4-R8E1		SU	087100	ϟ
1	Wiring Diagram	Elevation and Point to Point as Specified		SA	087100	ϟ

Notes: Door normally closed and locked
Entry by card reader, key or remote release
Free egress at all times

Lockset has integrated request to exit and door position switches

END OF SECTION 087100

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 088000 - GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass products.
   2. Insulating glass.
   3. Glazing sealants.
   4. Glazing tapes.
   5. Miscellaneous glazing materials.

1.2 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 in accordance with ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products; 12 inches (304.8 mm) square.
   1. Tinted glass.
   2. Coated glass.
   3. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass.

B. Sample Warranties: For special warranties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with 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.

1.7 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.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 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. AGC Glass Company North America, Inc.
   2. Cardinal Glass Industries.
   3. Guardian Glass.
   4. Pilkington North America Inc.
   5. Vitro Architectural Glass.

B. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

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 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. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
   1. Design Wind Pressures: Determine design wind pressures applicable to Project in accordance with ASCE/SEI 7, based on heights above grade indicated on Drawings.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 0.24 inch (6 mm) thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
   4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
   5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
   2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
   3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum.
   1. Minimum Glass Thickness for Exterior Lites: 0.24 inch (6 mm).
   2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide, 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 C1048, 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.

B. Low-E-Coated Vision Glass: ASTM C1376.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
   1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
   2. Perimeter Spacer: Aluminum with black, color anodic finish.
   3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 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 of industry colors.

B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow; Dowsil 790.
      b. GE Construction Sealants; SilPruf LM SCS2700.
      c. Pecora Corporation; 890NST.
      d. Sika Corporation U.S.; Sikasil WS-290.
      e. Tremco Incorporated; Spectrem 1.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by 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:
   1. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:
   1. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:
   1. Type recommended in writing by sealant or glass manufacturer.

2.9 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 , ambient; 180 deg F , material surfaces.

B. Grind smooth and polish exposed glass edges and corners.

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- 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 in accordance with 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 in writing 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 in writing 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 in writing 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 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 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type MG-1: Fully tempered float glass.
   1. Minimum Thickness: 0.24 inch (6 mm).
   2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Low-E-Coated, Tinted Insulating Glass Type IG-1:
   1. Basis-of-Design Product: Vitro; SolarBan 60 on Solar Gray + ½" air + clear.
   2. Overall Unit Thickness: 1 inch (25.4 mm).
   3. Minimum Thickness of Each Glass Lite: 0.24 inch (6 mm).
   4. Outdoor Lite: Tinted fully tempered float glass.
   5. Tint Color: Gray .
   6. Interspace Content: Air.
   7. Indoor Lite: Clear fully tempered float glass.
   8. Low-E Coating: Sputtered on second.
   9. Winter Nighttime U-Factor: 0.29 maximum.
   10. Visible Light Transmittance: 35 percent minimum.
   11. SHGC: 0.25 maximum.
   12. Safety glazing required.

END OF SECTION 088000

This page intentionally left blank

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 partitions.
   2. Suspension systems for interior ceilings and soffits.
   3. Grid suspension systems for gypsum board ceilings.

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.

1.4 QUALITY ASSURANCE

A. 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, or the Steel Stud Manufacturers Association.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A653/A653M, G40 (Z120) for interior use and ASTM A653/A653M, G60 (Z180) for exterior use, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C645. Use either steel studs and tracks or embossed steel studs and tracks.
   1. Steel Studs and Tracks:
      a. Minimum Base-Metal Thickness: [0.0179] inch ([0.45] mm).
      b. Depth: [3-5/8] inches ([92] mm) unless noted otherwise.
   2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C645 steel studs and tracks.
      a. Minimum Base-Metal Thickness: [0.0147] inch ([0.37] mm).
      b. Depth: [3-5/8] inches ([92] mm) unless noted otherwise.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Track System: ASTM C645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (304.8 mm) of the top of studs to provide lateral bracing.
2. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
3. Deflection Track: Steel sheet top track 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.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm) unless noted otherwise.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
2. Depth: 7/8 inch (22.22 mm) unless noted otherwise.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19.05 mm) unless noted otherwise.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.84 mm).
3. Tie Wire: ASTM A641/A641M, 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.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22.22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, 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. Hanger Attachments to Concrete:
1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (4.06 mm) in diameter.

D. Flat Hangers: Steel sheet, not less than 1 by 3/16 inch (25 by 5 mm) by length indicated.

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of [0.0538] inch ([1.37] mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 2 inches (50.8 mm) unless noted otherwise.

F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19.05 mm) deep.
2. Steel Studs and Tracks: ASTM C645.
a. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
b. Depth: 3-5/8 inches (92 mm) unless noted otherwise.
3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22.22 mm) deep.
a. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
a. Configuration: Asymmetrical or hat shaped.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation by Rockfon; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel 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 the following:
1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.

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 C754.
1. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
2. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. 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 (406.4 mm) o.c. unless otherwise indicated.
   2. Multilayer Application: 16 inches (406.4 mm) o.c. unless otherwise indicated.
   3. Tile Backing Panels: 16 inches (406.4 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 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 that penetrate 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 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. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

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 (609.6 mm) o.c.

F. Z-Shaped Furring Members:
   1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (609.6 mm) o.c.
   2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (609.6 mm) o.c.
   3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (304.8 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3.18 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spac[ings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches (1219.2 mm) o.c.
   2. Carrying Channels (Main Runners): 48 inches (1219.2 mm) o.c.
   3. Furring Channels (Furring Members): 16 inches (406.4 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. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. 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.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch (3.18 mm) in 12 feet (365.76 cm) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

This page intentionally left blank

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.

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.

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 C840 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.

D. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of ceilings until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive ceilings:
      a. Installation of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.

E. Coordinate with fire marshal prior to installing ceilings. Most jurisdictions require above-ceiling inspections prior to installing ceilings.

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 E119 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum.
   2. CertainTeed Corp.
   3. Georgia-Pacific Gypsum LLC.
   4. National Gypsum Company.
   5. USG Corporation.

B. Gypsum Board, Type X: ASTM C1396/C1396M.
   1. Thickness: 5/8 inch (15.88 mm).
   2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.

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 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.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
   1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound Attenuation Blankets: ASTM C665, 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.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
      b. Grabber Construction Products; Acoustical Sealant GSC.
      c. Pecora Corporation; AC-20 FTR.
      d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      e. USG Corporation; SHEETROCK Acoustical Sealant.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072100 "Thermal 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 C840.

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 (1.59 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. Where Drawings indicate gypsum board on one side only, brace studs as necessary.
   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. 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. Type X: Horizontal and vertical surfaces unless otherwise indicated.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
   2. 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.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (406.4 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 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. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. Bullnose Bead: Use at outside corners where indicated.
   3. LC-Bead: Use at exposed panel edges.
   4. L-Bead: Use where indicated.
   5. U-Bead: Use at exposed panel edges where indicated.

3.5 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 C840:
   1. Level 2: Ceiling plenum areas, concealed areas, and where indicated..
   2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 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

This page intentionally left blank

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. Ceramic mosaic tile.
   2. Stone thresholds.
   3. Tile backing panels.

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. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (304.8 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
   3. Full-size units of each type of trim and accessory for each color and finish required.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of each type of floor tile installation.
   2. Build mockup of each type of wall tile installation.
   3. Mock-ups shall be 6’ x 6’ area in locations agreed to by Architect.
   4. 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. 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.

1.7 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 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile 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. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component 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.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Stone thresholds.
   2. Cementitious backer units.

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 on exteriors or 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. Ceramic Tile Type CT: Factory-mounted unglazed ceramic mosaic tile.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal-Tile Corporation; Price Group 2 or comparable product by one of the following:
      a. American Olean Corporation.
      b. Dal-Tile Corporation.

c. Florida Tile
d. Mannington Ceramic Tile
e. Metropolitan Ceramics.

2. Composition: Porcelain.
3. Module Size: 2 by 2 inches (50.8 by 50.8 mm).
4. Thickness: 1/4 inch (6.35 mm).
5. Face: Plain with cushion edges.
6. Surface: Smooth, without abrasive admixture.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
9. Grout Color: As selected by Architect from manufacturer's full range.
10. 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 Cove: Cove, module size 2 by 1 inch (50.8 by 25.4 mm), unless noted otherwise.
    b. Base: At CMU Walls and Other Walls Not Having a Wainscot: Provide factory mounted, three-member built-up cover base with bullnose cap; module size 2” x 2”.
    c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 2 by 2 inches (50.8 by 50.8 mm).
    d. External Corners: Surface bullnose, module size 2 by 2 inches (50.8 by 50.8 mm).
    e. Internal Corners: Cove, module size 2 by 1 inch (50.8 by 25.4 mm).

B. Ceramic Tile Type CT-2: Glazed ceramic tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal-Tile Corporation; Mythology or comparable product by one of the following:
    a. American Olean Corporation.
    b. Dal-Tile Corporation.
    c. Florida Tile
    d. Mannington Ceramic Tile
    e. Metropolitan Ceramics.
2. Composition: Porcelain.
3. Module Size: 4 by 12 inches.
4. Thickness: 5/16 inch.
5. Face: Undulated.
6. Surface: Smooth.
7. Tile Color and Pattern: As selected by Architect from manufacturer's full range, pattern 1/3 running bond.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.59 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Custom Building Products; Wonderboard.
      b. FinPan, Inc.; ProTEC Concrete Backer Board.
      c. USG Corporation; DUROCK Cement Board.
   2. Thickness: 5/8 inch (15.88 mm).

2.6 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

B. Dry-Set Portland Cement Mortar (Thinset): ANSI A118.1.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. TEC, H. B. Fuller Construction Products

C. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. Southern Grouts & Mortars, Inc.
      f. TEC, H. B. Fuller Construction Products
   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. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Standard Cement Grout: ANSI A118.6.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. Southern Grouts & Mortars, Inc.
      f. TEC, H. B. Fuller Construction Products

B. High-Performance Tile Grout: ANSI A118.7.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bostik, Inc.
      b. Custom Building Products.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. Southern Grouts & Mortars, Inc.
      f. TEC, H. B. Fuller Construction Products

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.8 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. 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.

C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.9 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 bonded mortar bed or 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 waterproofing by applying a mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch (6.35 mm) 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. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.

B. 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.

C. 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.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. 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 the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. 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.
   2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   3. 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.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Ceramic Mosaic Tile: 1/8 inch (3.18 mm).

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thinset).
   2. Do not extend waterproofing under thresholds set in dry-set portland cement or latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.

K. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
   1. Do not use sealer on epoxy grouts.

3.4 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.

3.5 TESTING ADJUSTING AND CLEANING

A. Water Flow/Drainage Test: Perform water flow drainages test as required for “Slope Floors” in Section 017300 “Execution” after floors have cured.” Floors not draining completely shall be corrected.

B. 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.

C. 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.

3.6 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.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
   1. Ceramic Tile Installation for Toilets and Restrooms Unless Noted Otherwise: TCNA F112 and ANSI A108.1B; cement mortar bed (thickset) bonded to concrete.
      a. Ceramic Tile Type: Unglazed ceramic mosaic as indicated on the Drawings.
      b. Bond Coat for Cured-Bed Method: Dry-set portland cement mortar.
      c. Grout: Use standard unsanded cement at ceramic tile grout.

B. Interior Wall Installations, Metal Studs or Furring:
   1. Ceramic Tile Installation at Toilets where indicated: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
      a. Ceramic Tile Type: Ceramic tile.
      b. Thinset Mortar: Latex- portland cement mortar.
      c. Grout: High-performance unsanded grout.

END OF SECTION 093013

This page intentionally left blank

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 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. Acoustical Ceiling Panels: Furnish 100 full-size panels of APC #1.
   2. Suspension-System Components: Furnish 100 lineal feet of each exposed component for suspension system for APC #1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, 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.

1.7 FIELD 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.

B. Above-Ceiling Observation: Before Contractor installs acoustical panel ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of ceilings until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive ceilings:
      a. Installation of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.

C. Coordinate with fire marshal prior to installing ceilings. Most jurisdictions require above-ceiling inspections prior to installing ceilings.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E1264 for Class A materials.
   2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations: Obtain acoustical ceiling panels and supporting suspension system from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANELS APC #1:

A. Manufacturers/Products: Subject to compliance with requirements, provide one of the following:
   1. Armstrong World Industries, Inc.; Cortega
   2. CertainTeed Corp.; Baroque
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.; Radar

B. Classification: Provide panels complying with ASTM E1264 for type, form, and pattern as follows:
   1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
   2. Pattern: CD (perforated, small holes and fissured).

C. Color: White.

D. LR: Not less than 0.80.

E. NRC: Not less than 0.55.

F. CAC: Not less than 30.

G. Edge/Joint Detail: Square.

H. Thickness: 5/8 inch (15.88 mm).

I. Modular Size: 24 by 24 inches (610 by 610 mm).

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635/C635M.
   1. High-Humidity Finish: Comply with ASTM C635/C635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at three times hanger design load (((ASTM C635/C635M)), Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR APC #1 CEILINGS

A. Manufacturers/Products: Subject to compliance with requirements, provide one of the following:
   1. Armstrong World Industries, Inc.; Prelude XL
   2. CertainTeed Corp.; EZ Stab Classic System
   3. USG Interiors, Inc.; Subsidiary of USG Corporation; Don DX (“only” in Walton County)

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A653/A653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. End Condition of Cross Runners: Override (stepped) type.
   3. Face Design: Flat, flush.
   4. Cap Material: Steel cold-rolled sheet.
   5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corp.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
   2. For lay-in panels in corridors, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
   3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant for Concealed Joints:
      a. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
      b. Pecora Corporation; AIS-919.
      c. Tremco, Inc.; Tremco Acoustical Sealant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including 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 with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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. Where ceiling plans indicate more than a full 2’-0” panel width, contractor shall use 2’ x 4’ panels and cut as necessary.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

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 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.
   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 and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches (1219.2 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (203.2 mm) from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   12. Install hangers from suspension system at each corner of light fixture.

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. (Not in Cherokee)
   2. Screw attach moldings to substrate at intervals not more than 16 inches (406.4 mm) o.c. and not more than 3 inches (76.2 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch (3.18 mm) in 12 feet (365.76 cm). 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 fit 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 in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

This page intentionally left blank

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Transition strips.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

1.4 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. Furnish not less than 50 linear feet of each type, color, pattern, and size of resilient base installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

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. 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 GENERAL

A. Where the project contains multiple facilities/buildings, contractor shall assume separate colors will be selected for each facility building.

2.2 RESILIENT BASE

A. Resilient Base:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allstate Rubber Corp.; Stoler Industries.

b. Armstrong World Industries, Inc.
c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
d. Flexco, Inc.
e. Mannington Commercial
f. Mohawk
g. Roppe Corporation, USA.
h. Tarkett

B. Resilient Base Standard: ASTM F1861.
1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch (3.18 mm).

D. Height: 4 inches (101.6 mm).

E. Lengths: Coils in manufacturer's standard length. Install with maximum lengths possible with no lengths less than 2’-0”.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Finish: Matte.

I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RESILIENT MOLDING ACCESSORY

A. Transition Strips: Provide transition strips at all locations where dissimilar floor finishes meet unless otherwise noted in floor finish sections. Transition strips shall be two (2) piece accessories of an aluminum receiver with a PVC insert. Aluminum receiver shall be minimum .135 extruded aluminum prepunched for securing to floor at 8” o.c. PVC insets shall be minimum .148 gauge PVC and manufactured to provide smooth transitions between specified floor finishes.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Gradus Limited; Clip-Top-Transition Strips or a comparable product by another manufacturer.

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 manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products 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.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 practicable 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. Form without producing discoloration (whitening) at bends. Base shall run a minimum of 2’-0” on each side of corner.
   2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece.
   1. Install transition strips at all differing floor finish materials. Install strips under doors of adjacent spaces of differing floor finish materials.
   2. Set transition strips in a continuous bed of adhesive and anchor to floor using masonry screws.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

This page intentionally left blank

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Luxury vinyl floor tile (LVT).

B. Related Sections:
   1. Section 096513 "Resilient Base and Accessories" for resilient base, transition strips, and other accessories installed with resilient floor coverings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of floor tile indicated.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 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. Floor Tile: Furnish 100 sq. ft. of each type, color, and pattern of floor tile installed.

1.6 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 indicated.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.7 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.

1.8 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. 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 GENERAL

A. Where the project contains multiple facilities/buildings, contractor shall assume separate colors will be selected for each facility/building.

2.2 LUXURY VINYL FLOOR TILE (LVT)

A. Products: Subject to requirements, provide one of the following:
   1. Shaw Contract – Unite Creating Space, Terrain II and Compound and Cast Collections
   2. Karden: Loose Lay and Loose Lay Longboard
   3. Mohawk: Hot and Heavy Collection and Mass Appeal
   4. Tarkett: Adapptt and Even Plane

B. Tile Standard: ASTM F1700.
   1. Class: III, printed film vinyl tile
   2. Type: A & B

C. Thickness: Minimum 0.18 inch (4.5 mm).

D. Wear Layer: Minimum 20 mil (0.508 mm).

E. Colors and Patterns: Multiple colors to be selected.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Provide adhesive for installations up to 95% RH as recommended by the manufacturer for new slabs. For renovations and installation of finishes on existing slabs, provide adhesive for installations up to 99% RH as recommended by Manufacturer.

C. Commercial Epoxy Adhesive: Where indicated, provide two-part epoxy adhesive as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile or transfer through tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.
   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 substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum relative humidity level measurement in accordance with manufacturer’s written guidelines.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound as recommended by flooring manufacturer and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 square with room axis 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 with grain direction in accordance with manufacturer’s recommendation 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. No cut tiles shall be less than 4” wide.

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, nonstaining 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. Unless indicated otherwise, 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.

I. For LVT, adhere floor tiles to flooring substrates using minimal adhesive applied to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

J. Adhere floor tiles to flooring substrates in front of all toilet batteries, water coolers, and exterior entrance doors using a two-part commercial epoxy adhesive. Extend epoxy back a minimum of 6’-0” by width of corridor at exterior doors. Adhesive at toilet batteries and water coolers shall extend 6’-0” in front of and to each side of openings/coolers.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of 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 products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096519

SECTION 096810 - COMPOSITE MODULAR TEXTILES

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 composite modular textiles (CMT).

B. Related Sections include the following:
   1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with CMT.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in CMT.
   2. CMT type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Type, color, and location of insets and borders.
   8. Type, color, and location of edge, transition, and other accessory strips.
   9. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. CMT: Full-size Sample.
   2. Composite Base Material: Two-foot long sample.

D. Product Schedule: For CMT. Use same designations indicated on Drawings.

E. Qualification Data: For Installer.

F. Maintenance Data: For CMT to include in maintenance manuals. Include the following:
   1. Methods for maintaining CMT, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to CMT.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer with not less than 2 years of CMT installation experience similar to work required by this Project and as approved by manufacturer.

B. Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label for textile composite modular flooring and adhesives or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Composite Modular Textile, composite modular flooring, and adhesives bearing the label indicate that the CMT has been tested and meets the Regulatory Requirements and criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area, protected from damage, soiling, and moisture. Do not store CMT near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

B. Store materials in area of installation for a minimum period of 48 hours prior to installation

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install CMTs until 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.

C. Do not install CMTs over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by CMT manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of CMTs, install CMTs before installing these items.

1.7 WARRANTY

A. Special Warranty for CMT: Manufacturer's standard form in which manufacturer agrees to repair or replace components of CMT installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of CMT due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of bind strength, dimensional stability, excess static discharge, resiliency loss of backing of more than 10% and delamination.
   3. Warranty Period: 25 years from date of Substantial Completion.
   4. Installer Warranty: Provide a written installation warranty that guarantees the completed installation to be free of defects in material and workmanship for a period of one year from the date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. CMT: Full-size units equal to 2 percent of amount installed for each type indicated, but not less than 100 sq. ft..

PART 2 PRODUCTS

2.1 COMPOSITE MODULAR TEXTILES (CMT)

A. Basis-of-Design Product: Subject to compliance with requirements, provide J & J Flooring; Kinetex composite modular tile:
   1. Furnish first quality composite modular textiles; free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide CMT materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade CMT which gives adequate durability and performance.

B. Color: As selected by Architect from manufacturer's full range.

C. Fiber Type: Polyester.

D. Pile Type: Level

E. Dye Method: Solution dyed.

F. Pile Thickness: Minimum 0.205 inch (5.21 mm) per ASTM D5848.

G. Pile Weight: 4.5 – 5.2 oz./sq. ft., not including weight of backing.

H. Backing Materials: Polyester felt cushion:

I. Size: 24 by 24 inches (609.6 mm) modular tile.

J. Applied Soil-Resistance Treatment: Manufacturer's standard material.

K. Performance Characteristics: As follows:
   1. Flammability and Critical Radiant Flux Requirements: Comply with 16 CFR 1630. Provide material with a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E648.
   2. Colorfastness to Crocking: Comply dry and wet crocking with AATCC 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.
   3. Colorfastness to Light: Comply colorfastness to light with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.
   4. Colorfastness to Water: Comply colorfastness to water with AATCC 107 and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.
   5. Delamination Strength: Provide delamination strength for tufted CMT with a secondary back of minimum 2.5 lbs/inch.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by CMT manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed CMT and is recommended by CMT manufacturer for releasable installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting CMT performance. Examine CMT for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by CMT manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving CMT.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with CMT manufacturer's written installation instructions for preparing substrates indicated to receive CMT installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3.18 mm) wide or wider, and protrusions more than 1/32 inch

(0.79 mm), unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by CMT manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing CMT.

3.3 INSTALLATION

A. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI CIS. Protect edges of CMT meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in CMT area for 24 hours after installation. Complete other work which would damage the CMT prior to installation of CMT.

B. Installation Method: As recommended in writing by CMT manufacturer for glue down.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit CMT to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend CMT into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing CMT:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by CMT manufacturer.
   2. Remove yarns that protrude from CMT surface.
   3. Vacuum CMT using commercial machine with face-beater element.

B. Protect installed CMT to comply with manufacturer’s recommendations.

C. Protect CMT against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by CMT manufacturer.

END OF SECTION 096810

SECTION 099113 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Galvanized metal.

B. Related requirements include the following:
   1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

A. Gloss Level 1 (Flat): Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

D. Gloss Level 5 (Semigloss): 35 to 70 units at 60 degrees, according to ASTM D523.

E. Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D523.

F. Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Paint Schedule: Provide a paint schedule indicating surface and actual paint product to be used on that surface for each surface and product.

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches (203.2 mm) square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

1.5 INFORMATION SUBMITTALS

A. Qualification Data: For application.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

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 paints only when temperature of surfaces to be painted and ambient air temperatures are between 65 and 80 deg F.

B. Do not apply paints in snow, rain, fog, or mist; 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. This Project contains existing surfaces requiring additional preparation from new/unpainted surfaces. Prepare existing surfaces in accordance with “Preparation of Existing Surfaces” specified elsewhere in this Specification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Benjamin E. Moore (More)
   2. Pittsburgh Paints (PITT) – formerly PPG Paints
   3. Sherwin Williams (S/W)

2.2 PAINT, GENERAL

A. Material Compatibility: Provide primers and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Colors: As selected by Architect from manufacturer's full range.

D. Accent Painting: Accent painting is defined as painting of indicated surfaces with a different color than adjacent surfaces. Contractor shall assume the following surfaces will receive accent painting:
   1. All metal door and view window frames.

E. For projects containing more than one facility/building, contractor shall assume different colors will be selected for each facility/building including accent colors.

2.3 EXTERIOR PRIMERS

A. Exterior Ferrous-Metal Primer: Factory-formulated epoxy metal primer for exterior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP1550 Concrete and Metal Epoxy
   2. PITT PPG Amerlock 2 High Solids Epoxy
   3. S/W B67-5 Series Recoatable Epoxy Primer

B. Exterior Galvanized Metal Primer: Factory-formulated epoxy metal primer for exterior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP1550 Concrete and Metal Epoxy Prime

2. PITT PPG Amerlock 2 High Solids Epoxy
3. S/W B67-5 Series Recoatable Epoxy Primer

2.4 EXTERIOR FINISH COATS

A. Exterior Full-Gloss Acrylic Aliphatic Urethane for Ferrous and Other Metals: Factory-formulated full-gloss acrylic-aliphatic urethane coating for exterior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm) per coat.
   1. Moore HP5000 Aliphatic Urethane Gloss
   2. PITT 95-812 Pitt-thane Ultra Acrylic Aliphatic Urethane Gloss
   3. S/W B65-300 High Solids Polyurethane

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

B. 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.

C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems 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. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. 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.

3.3 PREPARATION OF EXISTING SURFACES:

A. General: All surfaces must be cleaned and be free of mildew and construction dust and dirt. Remove all gum and tape and subsequent residue. Repair cracks and remove old, deteriorated caulk in masonry walls. Bare wood and metal must be spot primed. All loose paint must be scraped and/or sanded to provide sound substrate. Rusty metal must be wire brushed and scraped to remove any loose paint.

B. Priming on Existing Surfaces: Unless required by manufacturer, specified primers may be omitted on existing surfaces where existing finishes are in good condition and are not otherwise removed. Any areas of peeling paint removal or removal of any existing finishes down to bare substrates and shall be re-primed prior to installing new paint finishes. If existing surfaces require priming, new primers shall be as recommended by paint manufacturer for the existing surfaces/conditions present.

C. All Existing Metal Door and Window Frames: Using a grease cutting detergent, clean all surfaces to be painted. Sand with a fine grit sandpaper, wipe off dust, and apply a metal primer to any bare metal surfaces

3.4 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 items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Finished mechanical and electrical equipment.
      b. Light fixtures.
      c. Prefinished aluminum storefront.
      d. Prefinished metal roofing and flashing.
   2. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
      d. Copper and copper alloys.
      e. Bronze and brass.
   3. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.
      e. Door hardware.
   4. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

E. 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

3.5 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 of paint materials 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.

3.6 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.

3.7 EXTERIOR PAINTING SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal.
   1. Full-Gloss Acrylic Aliphatic Urethane Finish: Two finish coats over a rust-inhibitive primer.
      a. Primer: Exterior ferrous-metal primer.
      b. Finish Coats: Exterior full-gloss acrylic aliphatic urethane coating.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
   1. Full-Gloss Acrylic Aliphatic Urethane Finish: Two finish coats over a galvanized metal primer.
      a. Primer: Exterior galvanized metal primer.
      b. Finish Coats: Exterior full-gloss acrylic aliphatic urethane coating.

END OF SECTION 099113

This page intentionally left blank

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 01 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. Wood.
   6. Gypsum board.

B. Related Sections include the following:
   1. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

A. Gloss Level 1 (Flat): Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Gloss Level 2 (High Side, Flat): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. Gloss Level 5 (Semigloss): 35 to 70 units at 60 degrees, according to ASTM D523.

F. Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D523.

G. Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Paint Schedule: Provide a paint schedule indicating surface and actual paint product to be used on that surface for each surface and product.

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches (203.2 mm) square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

1.5 INFORMATION SUBMITTALS

A. Qualification Data: For applicator.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

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 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.

C. This Project contains existing surfaces requiring additional preparation from new/unpainted surfaces. Prepare existing surfaces in accordance with “Preparation of Existing Surfaces” specified elsewhere in this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Benjamin Moore & Co. (Moore).
   2. Pittsburgh Paints (PITT) – formerly PPG Paint
   3. Sherwin Williams (S/W)

2.2 PAINT, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Colors: As selected by Architect from manufacturer's full range.

D. Accent Painting: Accent painting is defined as painting of indicated surfaces with a different color than adjacent surfaces. Contractor shall assume the following surfaces will receive accent painting:
   1. All metal door and view window frames.
   2. All metal window frames in wood doors.

2.3 BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated acrylic latex block fillers. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 8 mils (0.2032 mm).
   1. Moore 571 Ultra Spec Hi-Build Masonry Block Filler
   2. PITT 6-7 Speedhide Acrylic Latex Masonry Block Filler

3. S/W B25W25 Prep Rite Acrylic Latex Block Filler

2.4 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 1.2 mils (0.03048 mm).
   1. Moore 608 Ultra Spec Masonry Interior/Exterior 100% Acrylic Sealer
   2. PITT 4-603XI Perma Crete Alkali Resistant Primer
   3. S/W LX02W0050 Loxon Concrete and Masonry Latex Primer

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 1.2 mils (0.03048 mm).
   1. Moore N534 Ultra Spec 500 Interior Latex Primer
   2. PITT 6-2 Speedhide Latex Primer Sealer
   3. S/W B28W2600 Pro Mar 200 Zero VOC Latex Primer

C. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 1.5 mils (0.0381 mm).
   1. Moore 032 Fresh Start Undercoater and Primer/Sealer
   2. PITT 17-921X 1 Seal Grip Universal Primer
   3. S/W B49W8820 Multi-Purpose Oil Based Primer

D. Interior Ferrous-Metal Primer (unless noted otherwise): Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP1100 Acrylic Metal Primer
   2. PITT Multiprime 4160 Rust Inhibitive Alkyd Primer
   3. S/W B50*Z6 Kem Kromik Universal Metal Primer

E. Interior Ferrous-Metal Primer for Dryfog/Dryfall Finishes: Factory-formulated quick-drying rust-inhibitive acrylic metal primer. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP1100 Acrylic Metal Primer
   2. PITT 90-1912 Pitt-Tech Plus EP Hi Performance Acrylic Primer & Finish
   3. S/W B66 Pro Industrial Pro-Cryl Universal Prime

F. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP110 Acrylic Metal Primer
   2. PITT 90-1912 Pitt-Tech Hi Plus EP Performance Acrylic Primer
   3. S/W B66-1310 Pro Industrial Pro-Cryl Universal Primer

G. Interior Zinc-Coated Metal Primer for Dryfall/Dryfog Finishes: Factory-formulated rust-inhibitive acrylic metal primer. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils (0.0508 mm).
   1. Moore HP1100 Acrylic Metal Primer
   2. PITT 90-1912 Pitt-Tech Plus EP Hi Performance Acrylic Primer
   3. S/W B66 Pro Industrial Pro-Cryl Universal Primer

2.5 INTERIOR FINISH COATS

A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.8 mils (0.07112 mm), excluding primer coat.
   1. Moore T538 Ultra Spec 500 Interior Eggshell

2. PITT 6-411ZV Series Speedhide Zero VOC Latex Eggshell
3. S/W B20W12651 ProMar 200 Zero VOC Latex Eggshell

B. Interior Semigloss Waterborne Acrylic Dryfall/Dryfog: Factory-formulated semigloss waterborne acrylic dryfall/dryfog for interior application. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 2.0 mils, per coat.
1. Moore 397 Latex Dry Fall Semi-Gloss
2. PITT 6-724XI Speedhide Super-Tech WB Semi-Gloss Dryfog
3. S/W B42W83 Low VOC Waterborne Acrylic Dryfall Semi-Gloss

C. Interior Semigloss Pre-Catalyzed Water-Borne Epoxy: Factory formulated semigloss pre-catalyzed water-borne epoxy. Apply at a spreading rate recommended by the manufacturer but not less than a dry film thickness of 1.5 mils (0.0381 mm) excluding prime coat.
1. Moore HP3410 Pre-Catalyzed Waterborne Epoxy Semi-Gloss
2. PITT 16-510 Series Pitt-Glaze WB-1 Pre-Catalyzed Water-Borne Acrylic Epoxy Semigloss
3. S/W K46-150 Series Pre-Catalyzed Waterbase Epoxy, Semigloss

D. Interior Full-Gloss Alkyd Enamel for Wood and Metal Surfaces: Factory-formulated full-gloss alkyd interior enamel. Apply at a rate recommended by the manufacturer but not less than a total dry film thickness of 2.0 mils (0.0508 mm) per coat.
1. Moore HP2200 Alkyd Urethane Enamel Gloss
2. PITT 4139-10 Glyptex Alkyd Gloss Enamel
3. S/W B54-150 Series Pro Industrial Urethane Alkyd Enamel, Gloss

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. Wood: 15 percent.
3. Gypsum Board: 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.

E. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

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. 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.

I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 PREPARATION OF EXISTING SURFACES:

A. General: All surfaces must be cleaned and be free of mildew and construction dust and dirt. Remove all gum and tape and subsequent residue. Repair cracks and remove old, deteriorated caulk in masonry walls. Bare wood and metal must be spot primed. All loose paint must be scraped and/or sanded to provide sound substrate. Rusty metal must be wire brushed and scraped to remove any loose paint.

B. Priming and Blockfill on Existing Surfaces: Unless required by manufacturer, specified primers and block fillers may be omitted on existing surfaces where existing finishes are in good condition and are not otherwise removed. Any areas of peeling paint removal or removal of any existing finishes down to bare substrates and shall be re-primed or blockfilled prior to installing new paint finishes. If existing surfaces require priming, new primers shall be as recommended by the paint manufacturer for the existing surfaces/conditions present.

C. Existing Concrete Masonry Units to be Painted: All poorly adhered or peeling paint shall be removed before application of new paint as scheduled. All areas where masking tape applied to wall surfaces removes paint or where paint is already peeling shall be wire brushed and lightly sanded to remove all non-adhering paint. Care should be taken not to damage wall surfaces with over aggressive wire brushing so as not to permanently mar faces of block. Do not proceed with application of primer until written approval for surface preparation has been secured from Architect.

D. Existing CMU Walls: Before painting existing block, clean walls of airborne grease and residue, hand oils and any other substance that would prevent adhesion of the finish coat and scuff sand all glossy surfaces. Remove all peeling paint. Repair any damaged areas and sand

areas where paint has chipped to reduce the cratered edges. Since some areas require the addition of new CMU next to existing CMU, a similar system must be followed to obtain the same finished look. New CMU should be block filled so that it resembles the same texture as adjoining blocks.

1. In no case is paint to be applied over existing non-adhering substrate.

E. All Existing Metal Door and Window Frames: Using a grease cutting detergent, clean all surfaces to be painted. Sand with a fine grit sandpaper, wipe off dust, and apply a metal primer to any bare metal surfaces.

3.4 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. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork.
      b. Acoustical wall panels.
      c. Metal lockers.
      d. Finished mechanical and electrical equipment.
      e. Light fixtures.
      f. Prefinished wood doors.
      g. Prefinished acoustical metal deck.
      h. Prefinished aluminum storefront.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Utility tunnels.
      e. Pipe spaces.
      f. Duct shafts.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
      d. Copper and copper alloys.
      e. Bronze and brass.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.

c. Sensing devices.
d. Motor and fan shafts.
e. Door hardware

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

E. 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.

F. 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.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
2. Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.5 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.

3.6 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.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete and Masonry (other than concrete unit masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
   1. Pre-Catalyzed Waterborne Epoxy Semigloss Finish: Two finish coats over a primer.
      a. Primer: Interior concrete and masonry primer
      b. Finish Coats: Interior semigloss pre-catalyzed epoxy

B. Concrete Unit Masonry: Provide the following finish system over interior concrete unit Masonry:
   1. Pre-Catalyzed Waterborne Epoxy Semigloss Finish: Two finish coats over a blockfill/primer.
      a. Block Filler: At new CMU, provide interior concrete unit masonry block filler.
      b. Primer: At existing painted CMU, provide primer recommended by manufacturer based on existing conditions.
      c. Finish Coat: Interior semigloss pre-catalyzed epoxy

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
   1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
      a. Primer: Interior gypsum board primer.
      b. Finish Coats: Interior low-luster acrylic enamel.

D. Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces:
   1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a wood primer.
      a. Primer: Interior wood primer for full-gloss alkyd-enamel finishes.
      b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.

E. Ferrous Metal: Provide the following finish systems over ferrous metal, unless indicated otherwise:
   1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a primer.
      a. Primer: Interior ferrous-metal primer.
      b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.

F. Ferrous Metal: Provide the following finish systems over ferrous metal roof deck and exposed bar joists:
   1. Semi-Gloss Waterborne Acrylic Dryfall (Dryfog) Finish: One finish coat over a primer.
      a. Primer: Interior ferrous-metal primer for dryfog/dryfall finishes.
      b. Finish Coats: Interior semigloss waterborne acrylic dryfall/dryfog.

G. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
   1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a primer.
      a. Primer: Interior zinc-coated metal primer.
      b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.

H. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated (galvanized) roof deck.
   1. Semi-Gloss Waterborne Acrylic Dryfall (Dryfog) Finish: One finish coat over a primer.
      a. Primer: Interior zinc-coated metal primer for dryfall/dryfog finishes.
      b. Finish Coats: Interior semi-gloss waterborne acrylic dryfall (dryfog).

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Visual display board assemblies.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Visual display board assemblies.

B. Product Data Submittals: For each product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

C. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.

D. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
   1. Samples of facings for each visual display panel type, indicating color and texture.
   2. Fabric swatches of fabric facings for tackboards.
   3. Include accessory Samples to verify color selected.

E. Samples for Verification: For each type of visual display unit indicated.
   1. Visual Display Panel: Not less than 8-1/2 by 11 inches (279.4 mm), with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.

F. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and project. At completion of project, store extra materials as directed by owner.
   1. Provide two full-size 8-foot tackboards complete with accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: 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 exhibit crazing, cracking, or flaking.
   2. Warranty Period:
      a. Life of the building.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; 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.

2.2 VISUAL DISPLAY BOARD ASSEMBLIES

A. Visual Display Board Assemblies: Markerboards (MB) and/or Tackboards (TB).
   1. Manufacturers: subject to compliance with requirements, provide products by one of the following:
      a. ADP/Lemco, Inc.
      b. AARCO Products, Inc.
      c. ASI Visual Display Products
      d. Claridge Products & Equipment, Inc.
      e. Nelson Adams
      f. Platinum Visual Solutions

B. Visual Display Board Assembly: Factory fabricated.
   1. Assembly: Markerboard and tackboard.
   2. Corners: Square.
   3. Width: As indicated on Drawings.
   4. Height: 4’-0”
   5. Mounting Method: Direct to wall.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
   1. Color: White.

D. Tackboard Panel: Vinyl-fabric-faced tackboard panel on core indicated.
   1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
   2. Color and Pattern: As selected by Architect from full range of industry colors.

E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; 5/8” wide standard shape.
   1. Aluminum Finish: Clear anodic finish.

F. Joints: 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.

G. Chalktray: Manufacturer's standard; continuous.
   1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

H. Special-Purpose Graphics: Fuse or paint music staff lines graphic onto surface of visual display unit in locations indicated.

2.3 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core

material, and porcelain-enamel face sheet with high-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Face Sheet Thickness: 0.021 inch (0.53 mm) uncoated base metal thickness.
2. Particleboard Core: 3/8 inch (9.52 mm) thick; with 0.005-inch- thick, aluminum foil backing.
3. Fiberboard Core: 3/8 inch (9.52 mm) thick; with 0.001-inch- thick, aluminum foil backing.
4. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.4 TACKBOARD PANELS

A. Tackboard Panels:
   1. Facing:
      a. Vinyl fabric factory laminated to 1/4-inch- thick, cork sheet.
   2. Core:
      a. 3/8-inch- thick fiberboard.

2.5 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish ; with surface-burning characteristics indicated.

C. Vinyl Fabric: Mildew resistant, washable, complying with ASTM F793/F793M, Type II, burlap weave; weighing not less than 13 oz./sq. yd.; with surface-burning characteristics indicated.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. Extruded Aluminum: ASTM B221, Alloy 6063.

G. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500 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. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0 inch (0.01 mm) or thicker.

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prime wall surfaces indicated to receive visual display units direct-applied assemblies and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

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.

B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, 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.
   2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Factory-Fabricated Visual Display Board Assemblies:
   1. Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (406.4 mm) o.c., horizontally and vertically.
   2. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (406.4 mm) o.c. Secure tops and bottoms of boards to walls.

D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101416 - PLAQUES

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 metal plaques Commemorative and Logo as required by the drawings.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plaques.
   1. Include fabrication and installation details and attachments to other work.
   2. Show plaque 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 plaque.

C. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.
   1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
   1. Plaques: Full-size Sample.
   2. Exposed Accessories: Full-size Sample of each accessory type.
   3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

E. Product Schedule: For plaques. Use same designations indicated on Drawings or specified.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For plaques to include in maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of plaques 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.
   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".

2.2 PLAQUES

A. Cast Plaque: Cast-metal plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Gemini Incorp.
      b. Leeds Architectural Letters, Inc.

c. Metal Arts; Div. of L & H Mfg.
d. Metallic Arts, Inc.
e. Southwell Co.

2. Plaque Material: Cast aluminum.
3. Finishes:
   a. Integral Metal Finish: As selected by Architect from full range of industry finishes.
   b. Overcoat: Manufacturer's standard baked-on clear coating.
4. Background Texture: Leatherette.
5. Integrally Cast Border Style: Double-raised line border or as required by graphic.
6. Size and Shape: Provide as shown on Drawings.
7. Mounting: Concealed studs.
8. Text and Typeface: Typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised characters to contrast with background color.

2.3 MATERIALS

A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221 (((ASTM B221M))), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. Plaque Mounting Fasteners:
      a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard plaques according to requirements indicated.
   1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques 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. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
   4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   5. 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 plaque finish.
   6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0 inch (0.02 mm) or thicker.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils 0 inch (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

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.

B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
   1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
   2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
   3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
   4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:
   1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
      a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques 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 plaques are installed.

C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

This page intentionally left blank

SECTION 101423 - 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:
   1. Panel signs.

B. Related Requirements:
   1. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
   2. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
   3. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
   4. Division 26 Section "Interior Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.3 DEFINITIONS

A. Accessible: In accordance with the U.S. Department of Justice “2010 ADA Standards for Accessible Design.”

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel 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 others, 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. Panel Signs: Full-size Sample.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.6 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 U.S. Department of Justice "2010 ADA Standards for Accessible Design."

2.2 SIGNS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Graphics, Inc.
   2. Avalis Wayfinding Solutions
   3. Best Sign Systems, Inc.
   4. Henry Graphics
   5. Mohawk Sign Systems.
   6. Nelson-Harkins Industries.
   7. The Sign Store.

B. Panel 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. Laminated-Sheet Sign: Sandblasted polymer face sheet with raised graphics laminated to acrylic or phenolic backing sheet to produce composite sheet.
      a. Composite-Sheet Thickness: 0.125 inch (3.18 mm).
      b. Changeable Graphics: Slide-in changeable insert.
   2. Graphic Process: Provide raised copy in accordance with one of the following processes:
      a. Provide computer cut raised letters/symbols chemically welded to panel surface.
      b. Provide raised letters/symbols by blasting away panel surfaces leaving raised text and Braille as an integral part of the sign.
      c. All raised letters/symbols shall be minimum 1/32 inch (0.79 mm) thick in contrasting color from panel surfaces/background.
   3. Sign-Panel Perimeter: Finish edges smooth.
      a. Edge Condition: Square cut.
      b. Corner Condition in Elevation: Square.
   4. Mounting: Surface mounted to wall with silicone adhesive.
   5. Surface Finish:
      a. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.
      b. For projects with more than one building/facility, contractor shall assume a different color will be selected for each building facility.
   6. Text and Typeface: Accessible raised characters and Braille. Helvetica Condensed. Finish raised characters to contrast with background color, and finish Braille to match background color.
   7. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.59 mm) measured diagonally from corner to corner.

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.

C. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch (1.2-mm) nominal thickness.

D. Paints and Coatings for Sheet Materials: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.

E. Exterior Panel Signs: Signs that are located on the exterior of the building shall be constructed of weather resistant materials recommended by the manufacturer. Appearance of exterior signs shall match interior.

2.4 ACCESSORIES

A. Adhesives: Silicone adhesive as recommended by sign manufacturer.

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.

B. 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. Furnish two blank inserts for each sign for Owner's use.
   2. Insert slot shall have a clear polycarbonate layer over slot for the insert to fit behind.
   3. Inserts shall be 1/16” thick engraved or digitally printed plastic laminate. Inserts shall exactly match background color of sign.

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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

C. Mounting Methods:
1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.3 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

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Custodial accessories

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

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 products using designations indicated on the toilet accessory schedule on the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 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.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 0.24 inch (6 mm) thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bradley Corporation.

B. Toilet Tissue (Roll) Dispenser TA3:
   1. Basis-of-Design Product: Bradley Corporation; Model #5241-52.
   2. Description: Double-roll dispenser.
   3. Mounting: Surface mounted.
   4. Operation: Noncontrol delivery with theft-resistant spindle.
   5. Capacity: Designed for 5-inch- (127-mm-) diameter tissue rolls.
   6. Material and Finish: Satin-finish aluminum bracket with plastic spindle.

C. Paper Towel (Folded) Dispenser TA4:
   1. Basis-of-Design Product: Bradley Corporation; Model #250-15.
   2. Mounting: Surface mounted.
   3. Minimum Capacity: 400 C-fold or 525 multifold towels.
   4. Material and Finish: Stainless steel, No. 4 finish (satin).
   5. Lockset: Tumbler type.
   6. Refill Indicators: Pierced slots at sides or front.

D. Paper Towel (Folded) Dispenser and Waste Receptacle TA14:
   1. Basis-of-Design Product: Bradley Corporation; Model #237-10.
   2. Description: Combination Unit.
   3. Mounting: Semi-recessed 3 ½" max.
   4. Minimum Capacity: 1100 single-fold, 800 multi-fold or 600 c-fold paper towels and a 12 gallon waste container.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).
   6. Lockset: Tumbler type for both towel dispenser and waste receptacle.

E. Liquid-Soap Dispenser TA1W:
   1. Owner furnished. Contractor installed.

F. Grab Bars TA5:
   1. Basis-of-Design Product: Bradley Corporation; Model # 812 .
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch (1.27 mm) thick.
      a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

G. Mirror Unit TA2 and TA2F:
1. Basis-of-Design Product: Bradley Corporation; Model # 780.
2. Frame: Stainless-steel angle, 0.05 inch (1.27 mm) thick.
a. Corners: Welded and ground smooth.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
4. Size: As indicated on Drawings.

H. Clothing Hook TA11:
1. Basis-of-Design Product: Bradley Corporation; Model #917.
2. Mounting: Surface-mounted
3. Material: Stainless-steel.
4. Finish: Satin

2.3 CUSTODIAL ACCESSORIES

A. Basis-of-design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bradley Corporation

B. Mop and Broom Holder TA8:
1. Basis-of-Design Product: Bradley Corporation; Model #9984.
2. Description: Unit with shelf, hooks, holders.
3. Length: 36 inches (914.4 mm).
4. Hooks: Three
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
a. Shelf: Not less than nominal 0.05-inch-(1.3-mm-) thick stainless steel.

2.4 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 be included in key control cabinet.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories according to 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. All accessories shall be mechanically fastened to surfaces. Tapes or adhesives only are not acceptable.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguisher.

B. Related Requirements:
   1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing semirecessed method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.
   1. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For fire-protection cabinets. Indicate whether semirecessed. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.4 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.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets and accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.3 FIRE-PROTECTION CABINET FE:

A. Cabinet Type: Suitable for fire extinguisher.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. JL Industries, Inc.; a division of the Activar Construction Products Group.
      b. Larsens Manufacturing Company.
      c. Potter Roemer LLC, division of Morris Group International

B. Cabinet Construction: Nonrated and rated where located in rated partitions.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
   1. Rolled-Edge Trim: 3-inch backbend depth.

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide projecting door pull and friction latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. 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: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
      a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER."
         1) Location: Applied to cabinet glazing.
         2) Application Process: Silk-screened or pressure-sensitive vinyl letters.
         3) Lettering Color: Red.
         4) Orientation: Vertical.

K. Materials:
   1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
      a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
      b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      c. Color: White .
   2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 0.12 inch (3 mm) thick, Class 1 (clear).

2.4 MOUNTING BRACKETS

A. Mounting Brackets: Where indicated, provide mounting brackets to mount fire extinguisher to wall.
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
      a. Identify fire extinguisher in security fire-protection cabinet with the words " FIRE EXTINGUISHER."
         1) Location: Applied to wall surface.
         2) Application Process: Decals.
         3) Lettering Color: Red.
         4) Orientation: Horizontal.

B. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
   a. Finish: Baked enamel or powder coat.
   b. Color: White.

2.5 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.

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 (12.7 mm) thick.
   2. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 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 unacceptable. 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 semirecessed 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 height indicated below:
   1. Fire-Protection Cabinet Mounting Height: 48 inches (1219.2 mm) above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

C. Identification:
   1. 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 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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:
   1. Section 104413 "Fire Extinguisher Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. 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 QUALITY ASSURANCE

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.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.8 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.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 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. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      b. Larsen's Manufacturing Company.
      c. Potter Roemer LLC.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.

4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container (Unless Noted Otherwise): UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
b. Larsen's Manufacturing Company.
c. Potter Roemer LLC.

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.
1. Mounting Brackets: 48 inches (1219.2 mm) above finished floor to handle of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105113 - METAL EVIDENCE LOCKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal evidence locker units with hinged doors.

1.2 REFERENCES

A. ASTM International (ASTM) (www.astm.org) A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Manufacturer's descriptive data for each product.
   2. Shop Drawings: Include dimensioned plans and elevations showing locker layout and relationship to adjacent construction.
   3. Samples: 3-1/4 x 1-1/2 inch (38 mm) paint samples showing available colors.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years documented experience in work of this Section.

1.5 WARRANTIES

A. Provide manufacturer’s 5-year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide model No.2406AA, Tiffin Security Law Enforcement Lockers by Steele Solutions. www.steelesolutions.com or a comparable product by another manufacturer.

2.2 METAL LOCKERS DESCRIPTION

A. Configuration: Pass-through.

B. Mounting: Recessed.

C. Contain multiple compartments of varying sizes as indicated on Drawings.

2.3 MATERIALS

A. Steel Sheet:
   1. ASTM A1008/A1008M.

2.4 CONSTRUCTION:

A. Doors, frames, shelves, tops, bottoms, and exposed sides: Minimum 16-gauge steel.

2.5 FRAMES:

A. Formed and welded into integrated units with doors installed.

B. Body parts are flanged and angled to provide rigidity; assembled by welding, bolting, or riveting using corrosion-resistant bolts and aluminum or stainless-steel rivets.

C. Provide mounting holes for attaching lockers back-to-back and side-by-side.

D. The interior of lockers is constructed flush, without offsets and protrusions.

2.6 DOORS OF PASS THRU UNITS:

A. Customer side:
   1. Louverless, self-closing.

2. Door hinges: continuous type, 180 degree opening.
3. Keyless locking lift latch; locks when door is closed, and latch is pushed up. Unlocked from control side. 3 keys per lock and one master key. Key as directed by Owner.

B. Control side:
1. Full-height door with 16 gauge steel three point latch bar with padlock provisions.
2. Control locking mechanisms not accessible from the customer side.

C. Number plates: Manufacturer’s standard, sequentially numbered.

2.7 ACCESSORIES:

A. 2 Inch wide recess trim kit, minimum 20 gauge steel. Field cut to size.

B. 4 Inch high closed base, attached to unit, minimum 14 gauge steel.

2.8 FINISHES

A. Steel:
1. Minimum 3 mil (0.0762 mm) thick factory-applied baked-on textured powder coat finish.
2. Color: color to be selected from manufacturer's full color range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

B. Set plumb, level, and aligned.

C. Attach lockers to supporting construction with anchors best suited to substrate conditions.

D. Bolt adjacent locker units together to provide rigid installation.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION 105113

SECTION 107326 - WALKWAY COVERINGS

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. Extruded aluminum walkway covers.
   2. Extruded aluminum rod supported canopies.

B. Related Sections: The following sections contain requirements that relate to this section:
   1. Section 033000 “Cast-in-Place Concrete” for concrete under and around canopies.
   2. Section 079200 “Joint Sealants” for sealants used in this work.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for walkway covers and rod supported canopies.

B. Shop Drawings: For layout and erection of walkway covers and rod supported canopies. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others. Drawings and details shall be project specific. Where project details differ from manufacturers standard details, project details shall be provided

C. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.

D. Structural Design: Provide structural design calculations for canopy members; include reaction loads at columns for structural design of footings.

E. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

1.4 QUALITY ASSURANCE

A. Structural engineering design documents shall be stamped by a structural engineer registered to practice in the state of this project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
   1. Dittmer Architectural Aluminum.
   2. Mitchell Metals.
   3. Peachtree Protective Covers.
   4. Perfection Architectural Systems, Inc.
   5. Tennessee Valley Metals

2.2 MATERIALS

A. Walkway Covers: All-extruded aluminum structural system, radius-cornered, tubular, columns and open top beams and extruded, flat pan, self-flashing, interlocking deck. All sections shall be extruded aluminum alloy 6063 alloy-T-6 temper with a minimum thickness of 0.060. Closures at deck ends shall be weld plates.

B. The structure shall be designed to meet Building Codes and ordinances applicable to the jurisdiction of this project. Roof deck shall also be capable of withstanding concentrated loads at any point such as walking on top.

C. Rod Supported Canopies: Provide hanger rod type canopy with extruded, flat pan, aluminum deck. Deck members shall be self-flashing with interlocking edges. Closures at deck ends shall be weld plates. Fascia shall be 6" gutter, style 'J' extruded aluminum unless otherwise shown on drawings. Fascia shall be factory mitered and welded with neat, square corners.
   1. Support rods shall be round rod or pipe. No square tubing is acceptable.

D. Foam Block-Outs: Rigid foam blocks sized as required for column embedment depth and shape.

E. Sealants: Sealants use shall be in accordance with Specification Section "Joint Sealants."

F. Fasteners: All fasteners shall be stainless steel or aluminum rivets. Screws shall be provided with neoprene washers

G. Flashing: All flashing shall be .040 aluminum (min.).

2.3 FABRICATION

A. Bent Construction: Beams and columns shall be factory mitered and welded with neat and square corners, into one-piece rigid bents. Beam and column sizes shall be as indicated on drawings unless a larger size is required for structural loading. Where larger sizes are required for structural loading, they shall be brought to the attention of the Architect. A coat of clear acrylic metal lacquer shall insulate column ends from electrolytic reaction with grout. Dimensions and elevations shall be field verified prior to beginning fabrication.

B. Roof Deck: Manufactured extruded modules of interlocking deck in a homogenous structural unit, with joint designed and fabricated into structurally rigid, flat pan shape which is self-flashing. Interlocking joints shall be positively fastened as required to meet engineering design requirements. Fastening may be self-riveted by upsetting the metal or by screws or rivets. Roof deck on simple spans of 15' or more shall be assembled with camber sufficient to neutralize deflection caused by the dead load of material and to provide positive drainage from the center of the deck. The underside of the deck shall be flat with no protruding ribs.

C. Concealed Drainage: Water shall drain internally from deck to beams to columns, spouting out at ground level through designated columns. Outlet holes in columns shall be cut neatly and as close to ground as practical. Deflectors shall be provided at all outlets. Deflectors shall be fastened at both front and back so they are permanently held in place. Deflectors shall be field installed after grouting bottom of columns as indicated under the "execution" section of this specification section.

D. Fascia: Provide manufacturer's standard shape, 6 inches (152.4 mm). Fascia corners shall be factory mitered and neatly joined. Exposed fasteners and/or cover plates at corners are not acceptable.

E. Expansion Joints: Structure shall be designed for temperature changes of 120 deg. F., with expansion joints provided if required and shown on shop drawings. Such joints shall have no metal-to metal contact between deck and beam or clamps. Expansion joints in fascia shall be provided with cover plates to cover any fasteners and or joints in fascia.

2.4 FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and for designations of finishes.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0 inch (0.02 mm) or thicker

C. Colors: Dark Bronze.

PART 3 EXECUTION

3.1 PREPARATION

A. Begin erection only after all concrete, masonry, and roofing work in the vicinity is complete and cleaned

3.2 INSTALLATION

A. Erection shall be performed by the walkway cover manufacturer.

B. Protective covers shall be erected true to line, level and plumb. Columns and beams shall be aligned with care before columns are grouted. Downspout columns shall be filled with grout to the discharge level to prevent standing water and downspout deflectors installed after grouting.

C. Flashing, at adjoining construction to be installed as detailed to provide a water tight joint. Built-in or thru-wall flashing, where indicated or specified, shall be coordinated with protective cover shop drawings and installation.

3.3 CLEANING

A. Clean walkway cover components after completion of installation.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer, that insures walkway cover is left without damage or scratches at the time of Substantial Completion.

END OF SECTION 107326

This page intentionally left blank

SECTION 107516 - GROUND-SET FLAGPOLES

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 ground-set flagpoles made from aluminum.

B. Owner-Furnished Material: Flags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles.
   1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
   2. Include section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
   1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location as shown on Drawings for building but not less than required by building code for location of project.
   2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.76 mm).
   1. American Flagpole and Flag Company.
   2. Baartol Company Inc. (The)
   3. Concord American Flagpole.
   4. Eder Flag Manufacturing Company, Inc.

5. Ewing International.
6. Pole-Tech Company Inc.

B. Exposed Height: 30 feet (914.4 cm).

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
1. 0.063-inch (1.6-mm) spun aluminum with gold anodic finish.

B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- (8-mm-) diameter, braided polypropylene halyard and 9-inch (228-mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
1. Halyards and Cleats: One at each flagpole.
2. Halyard Flag Snaps: Chromium-plated bronze swivel snap hooks with neoprene or vinyl covers. Furnish four per halyard.

2.5 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C33/C33M, fine aggregate.

D. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Section 079200 "Joint Sealants."

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44.
1. Color: Dark bronze.
2. 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 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.

F. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

G. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107516

This page intentionally left blank

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manually operated, single-roller shades.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (254 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.
   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches (254 mm) square. Mark interior face of material if applicable.
   2. Installation Accessories: Full-size unit, not less than 10 inches (254 mm) long.

F. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades 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 roller shades until construction and finish work in spaces, including painting, 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: Where roller shades 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 roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED, SINGLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Draper; Model FlexShade NEXD or a comparable product by one of the following:
   1. Lutron Electronics
   2. Mecho Shade Systems, LLC

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Nickel-plated metal.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer Type: Clip, jamb mount.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of interior face of shade.
   2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:
   1. Shadeband Material: Light-filtering fabric.
   2. PVC Coated Fiberglass
      a. Basketweave
         1) SheerWeave Series SW2410 by Phifer: 500 denier fiberglass, vinyl coated and woven into a 2 x 2 basket weave. Fire rating: California U.S. Title 19 (small scale), NFPA 701 TM#1 (small scale), NFPA 101 (Class A Rating), IBC Section 803.1.1 (Class A Rating), BS 5867 Part 2 Type B Performance, NFPA 701 TM#2 (large scale), CAN/ULC-S 109 (large and small scale), CAN/CGSB2-4.162-M80. Bacteria and fungal resistance: ASTM E 2180, ASTM G 21, ASTM G 22, AATCC30 Part 3, ASTM D 3273, UL GREENGUARD Mold and Bacteria Standard ASTM 6329; includes Microban antimicrobial additives. Environmental certification: Certified to UL GREENGUARD and GREENGUARD Gold standards for low chemical emissions into indoor air during product usage. Safe

use: RoHS/Directive 2002/95/EC, US Consumer Product Safety Commission Section 101 and ANSI/WCMA A 100.1-2007 for lead content and REACH (EC 1907/2006) compliant.

2) Imported basketweave fabrics not woven in the USA are not acceptable.

G. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open.
2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller shade manufacturer.
2. Type: PVC-coated fiberglass.
3. Thickness: 0.025 inches (0.64 mm).
4. Weight: 16.4 oz./sq. yd.
5. Roll Width: Maximum possible for location indicated.
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: 3 percent.
8. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A100.1, including requirements for tension, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6.35 mm) per side or 1/2-inch total, plus or minus 1/8 inch (3.18 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123623.13 - 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 plastic-laminate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, and adhesive for bonding plastic laminate.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in plastic-laminate countertops.

C. Samples for Initial Selection:
   1. Plastic laminates.

D. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches (200 by 250 mm) for each type, color, pattern, and surface finish.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Formica Corporation.
      b. Panolam Industries International, Inc./Nevamor
      c. Wilsonart International; Div. of Premark International, Inc.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from manufacturer's full range in the following categories:
   2. Where project includes more than one building/facility, contractor shall assume a different color will be selected for each building.
      a. Solid colors, gloss and matte finish.
      b. Solid colors with core same color as surface, gloss and matte finish.
      c. Wood grains, gloss and matte finish.
      d. Patterns, gloss and matte finish.
   3. Wood Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: 3-mm PVC edging.

F. Core Material: Medium-density fiberboard.

G. Core Material at Sinks: Exterior-grade plywood.

H. Core Thickness: 3/4 inch (19.05 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.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate where underside is exposed.

J. Paper Backing: Provide paper backing on underside of countertop substrate where tops are installed on base cabinets.

K. No backing is required at plywood cores.

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. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
   2. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD,, molded-plastic grommets and flip-top matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "TG series" by Doug Mockett & Company, Inc., or a comparable product by another manufacturer.

B. Countertop/Workstation Bracket: Metal support bracket as manufactured by A & M Hard-ware, Inc. – 888-647-0200 or a comparable product by another manufacturer.
   1. Color: White

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Contact cement unless noted otherwise.

1. Adhesive for Bonding Edges: Hot-melt adhesive.
2. Adhesive for Countertops at Sinks: Urea formaldehyde.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25.4 mm) over base cabinets. Ease edges to radius indicated for the following:

B. 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.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

PART 3 EXECUTION

3.1 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 backpriming.

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.
   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 (152.4 mm) of front and back edges and at intervals not exceeding 24 inches (609.6 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Install countertops with no more than 1/8 inch (3.18 mm) in 96-inch (0.12 inch (3 mm) in 2400-mm) sag, bow, or other variation from a straight line.
   2. Secure backsplashes to tops and to walls with adhesive.
   3. Seal junctures of tops, splashes, and walls with sealant as specified in accordance with Section 079200 “Joint Sealants.”

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 123623.13

SECTION 220513 - COMMON REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED WORK

A. All Division 22 sections.

1.2 WORK SEQUENCE

A. Install piping, equipment and accessories as construction progresses so cutting and patching of new construction will not be required. See also paragraph "Sequencing and Scheduling" herein.

1.3 SUBMITTALS

A. Provide submittals in accordance with Section 013300 - Submittal Procedures.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 220519 - Meters and Gages for Plumbing Piping
      a. Stem type thermometers.
   2. Section 220523 - General Duty Valves for Plumbing Piping
      a. Ball valves.
      b. Check valves.
   3. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment
      a. Upper attachments
      b. Pipe attachment (hangers and clamps)
      c. Metal Framing Channel
      d. Pipe Positioning Systems
      e. Insulation Shields
      f. Roof Mounted Pipe Supports
   4. Section 220553- Identification for Plumbing Piping and Equipment
      a. Pipe markers.
   5. Section 220716 - Plumbing Piping and Equipment Insulation
      a. Insulation
      b. Jackets and Accessories
      c. Proof of Contractor's three years experience
   6. Section 221116 - Domestic Water Piping
      a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
   7. Section 221119 - Domestic Water Piping Specialties
      a. Dielectric Connections
      b. Solder
      c. Wall hydrants.

d. Water hammer arresters.
e. Trap primers

8. Section 221316 - Sanitary Waste and Vent Piping
   a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
9. Section 221319 - Sanitary Waste Piping Specialties
   a. Floor drains.
   b. Cleanouts.
   c. Flashing
10. Section 221423 - Facility Natural Gas Piping
    a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
    b. Valves.
11. Section 223300 - Electric, Domestic Water Heaters
    a. Electric water heaters
    b. Recirculating pumps
    c. Hot water temperature maintenance system
    d. Mixing valves
12. Section 224000 - Plumbing Fixtures
    a. Plumbing Fixtures

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Submittals shall only include the products relevant to this specific project. Submittals shall not include other products produced by the manufacturer which are not specified on this project. Submittals containing several products on the same sheet shall have an arrow or other marker to identify the specific product submitted. Also, submittals for a single product that have options shall have an arrow or other marker to identify that the specified options are being provided. Submittals that include products not specified for this project, or that include several products on one sheet without being marked, or that do not show options selected shall be rejected. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Piping Submittals: Submittal data required for piping systems shall consist of a single sheet of paper with the type of piping systems on this project, and the corresponding piping the contractor intends to provide. For example: “Domestic Cold Water Piping Above Grade – Type ‘L’ copper”, “Process Drain Piping Below Grade – ASTM A74, service weight hub and spigot Cast Iron.” Contractor shall not submit manufacture’s data sheets on piping.

K. Review, Corrections, or Comments made on the Submittals <u>do not</u> relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addenda (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

L. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the review for each trade.
   1. RNE - Reviewed, No Exceptions Noted
      a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
      b. No corrective action required at this time.
   2. FNC - Furnish with Noted Corrections
      a. Indicates the contractor shall ensure that all necessary or noted corrections are incorporated into equipment furnished to the project.
      b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
   3. RES - Revise and Resubmit
      a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
      b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
   4. PSD - Provide Submittal Data
      a. Indicates submittal data was not provided for this item or section.
      b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

M. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All items shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractors failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.4 REGULATORY REQUIREMENTS

A. All work installed under Division 22 shall conform to the current adopted Edition of Building/Mechanical Codes and their appropriate amendments:
   1. Life Safety Code, NFPA 101
   2. International Building Code with Georgia Amendments
   3. International Plumbing Code with Georgia Amendments
   4. Standard for Health Care Facilities, NFPA 99
   5. International Gas Code with Georgia Amendments
   6. National Fuel Gas Code, NFPA-54
   7. Installation of Sprinkler Systems, NFPA 13
   8. City of McDonough and Henry County Codes
   9. Requirements of the State of Georgia Fire Marshall's Office.
   10. ASME Boiler and Pressure Vessel Code, Section 1, 4, and 9.
   11. GA State Minimum Standard Energy Code.
   12. ASME A17.1, Safety Code for Elevators and Escalators.

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.5 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

1.6 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 22 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g. ceiling plenums, mechanical rooms, etc.) are coordinated and installed to ensure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than six week fabrication schedules. See Division 1 - Summary for additional requirements.

D. Phasing: Contractor shall conform to phasing plans as stated in the Architectural contract documents.

1.7 ACCEPTABLE PRODUCTS

A. Basis of Design: Model numbers indicated herein or shown on the drawings are the Basis of Design and are based on the most recent literature provided to the Engineer from the Manufacturer's Representative. The Contractor may substitute equal and approved equipment from the basis of design manufacturer or manufacturers listed in this specification (or set forth in an addendum) provided said equipment has all features which are inherent with the "Basis of Design" equipment, meets all requirements of the plans and specifications, has like electrical characteristics (e.g., same voltage, phase, ampacity/fusing/circuit breaker requirements, single or multiple points of connection as indicated on the electrical drawings), and will properly fit in the available spaces in the building. If the Contractor chooses to provide equipment which meets all of the aforementioned requirements, but has different characteristics, from that shown on the Contract Electrical Drawings, he shall bear all costs associated with that substitution. Electrical costs include, but are not limited to materials (breakers, fuses, disconnects, wiring, conduits, panels, starters, contactors, and the like) installation costs and re-engineering. All electrical connections shall be coordinated with the Engineer and with the electrical subcontractor. Other costs may include, but are not limited to, additional structural support for heavier equipment than basis of design.

B. Prior Approval: Substitutions of specified items and prior approvals of other manufacturers will not be considered.

C. Acceptable Products: Where a manufacturer has been listed as being acceptable in the various specification sections (or addenda) hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of their standard product. The manufacturer's product shall still comply with all of the requirements and standards of this specification and not necessarily their standard specification, to the extent that it might require

special custom manufacture to meet the requirements and standards of this specification, the requirements of the drawings and the inherent features of the "Basis of Design". Submitted products, not complying with the explicit requirement of these specifications and drawings and with the features of the "Basis of Design" will be rejected even if their manufacturer is listed in the specifications.

1.8 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.9 SPACE CONDITIONS AND SERVICE CLEARANCE

A. All equipment and materials shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. All equipment normally requiring service shall be made readily accessible by not locating it above (behind, etc.) piping, ductwork, conduit or other systems. Contractor shall also provide access by means of access panels, doors, etc. to be provided under this section of specifications where required or specified. Provide sufficient space to allow service (e.g. filter removal) of all new equipment. Coordinate with all trades to ensure accessibility and service of all equipment. Equipment located above lift out ceilings shall be considered to be accessible. Equipment located above hard (unremovable) ceilings shall be considered to be unaccessible and access panels shall be provided as specified herein.

B. The contractor shall be responsible for verifying that the particular manufacturer's equipment that he chooses will fit in the available space, and shall verify (prior to submitting equipment) that the service clearances that the manufacturer requires are available, and shall not submit equipment that will not allow the manufacturer's service clearances. During construction, the contractor shall install the equipment such that the manufacturer's service clearances are provided by reading the installation instructions. The contractors shall bear all costs associated with providing equipment that requires service clearances different from the basis of design equipment. If the manufacturer's service clearances are not provided, the contractor shall remove the equipment and provide equipment with service clearances equal to the basis of design equipment. The contractor shall submit a detailed sketch and description of any modifications to install the particular manufacturer's equipment that he chooses, to demonstrate that the equipment will fit and have the manufacturer's service clearances. The sketch is not submitted for review or approval or for confirmation that it is correct, only to certify that the contractor has completely considered the installation of substitute equipment.

1.10 MOISTURE INTEGRITY

A. Roof: All roof penetrations shall be watertight and comply with the roof manufacturer's requirements and recommendations so as to be covered by the roof "Bond". All roof penetrations shall be made inside roof curbs (conforming to the requirements of Division 22 - Hangers & Supports for Plumbing Piping & Equipment). Pitch pockets are not acceptable.

B. Wall: All wall penetrations shall be sealed and caulked watertight.

1.11 NOISE AND VIBRATION

A. When in operation, all systems included in this section of specifications shall be free from objectionable or abnormal noise and vibration. See Division 22 - Hangers & Supports for Plumbing Piping & Equipment of the specifications for specific vibration isolation requirements.

1.12 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. During Construction: Pipe openings shall be closed with caps or plugs. All equipment and material shall be stored in accordance with manufacturer's recommendations. No equipment, piping, or materials shall be stored inside or outside the building unless it is properly protected from the weather. The Engineer reserves the right to reject any items furnished under Division 22 which have been damaged or are not in "like-new" condition.

C. Suspended Equipment and Suspended Piping: Installation of suspended materials in areas where the roof is not "dried in" is only acceptable if the Contractor wraps suspended equipment and piping on three sides with a minimum 4 mil thickness polyethylene taped to the bottom of the equipment and piping. Polyethylene covering is required to protect from the weather, water, dirt, roof tar, concrete, etc.

D. Non-Suspended Equipment and Piping: Contractor is required to wrap equipment and piping that is not suspended with two layers of 4 mil polyethylene.

E. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in equipment casings shall be straightened or replaced.

F. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.13 ELECTRICAL

A. General: Motors, controls, relays and switches required for proper operation of equipment covered under this section shall be furnished and installed under this division of the specifications.

B. Wiring: All control and interlock wiring shall be furnished and installed under Divisions 22 - Plumbing. Power wiring through the disconnect and starter and to the motor shall be furnished and installed under Division 26. All control wiring and conduit shall conform to the material and installation requirements of Division 26.

C. Electrical Connections: Voltage, phase, ampacity and connection arrangement (e.g. single or multiple point) of each item of electrically driven equipment provided under this section of specifications shall conform to that shown on the Electrical drawings. Two speed motor winding arrangement shall match the starter type specified by Division 26.

D. Electrical Characteristics: The horsepowers, voltages and phases shown on the drawings and specified herein, are the estimated power requirements of all equipment furnished herein and is the basis of the design shown on the electrical drawings. If the Contractor provides equipment from the "Basis of Design" manufacturer or from other approved manufacturers with larger horsepowers, different voltages, different phases or ampacity, he shall coordinate with other trades to provide any additional wiring, circuitry, starters, breakers, transformers, etc., as required at no additional cost to the Contract.

1.14 PAINTING

A. All bare steel piping, pipe hangers, supports and miscellaneous metal exposed to view provided under this section of specifications, shall be cleaned and painted under the Architectural painting section of the specifications. Supports, hangers and accessories exposed to view shall not be electroplated, in order to allow them to be painted. All bare steel piping, pipe hangers, supports and miscellaneous metal on the roof shall be cleaned and painted under the Architectural Painting Section of the specifications. In the event that there is no Architectural painting section, painting shall be done under this division of the specifications in accordance with the requirement of ANSI A13.1.81.

1.15 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.16 HAZARDOUS MATERIAL ALERT FOR NEW MATERIALS

A. Contract Materials which are scheduled to be incorporated into the work under this Contract shall first either be certified by the Manufacturer to be free of hazardous materials or be inspected and tested by accredited laboratories and certified to be free of hazardous material content (e.g. Asbestos, PCBs, lead, etc.) in accordance with OSHA, EPA and AHERA Rules (and 1982 School Rules).

1.17 ACCESS PANELS

A. Some plumbing systems may be made inaccessible by the installation of "hard" ceilings or by walls above the ceiling. See the finish schedule and the floor plans (architectural drawings) for the location of all "hard" ceilings and walls which extend above the ceiling. Provide access panels in these ceilings or walls (and any other locations where plumbing items are made inaccessible by ceilings or walls) for access to plumbing equipment and items requiring access above these ceilings.

B. For all access panels in gyp board and masonry, provide in accordance with Division 8 - Access Doors and Frames.

C. For all access panels in masonry, construction shall be as follows: Panels shall be sized as required for proper access and removal of the equipment but as a minimum shall be 18" x 18". Access panels shall have concealed continuous hinge, flush (not recessed) door, 14 gauge galvanized steel frame with prime coated finish, with pre-drilled anchor holes in corners, 1/4 turn flush mounted screwdriver operated latch(es) (on maximum 8" centers) and 14 gauge steel door with prime coated finish and rounded corners. Entire panel shall be painted to match ceiling or wall. Provide fire-rated access panel where required. Access panels shall be manufactured by Venco Products, Inc., Elmdor or Cesco.

1.18 GENERAL DEMOLITION

A. General: Demolition shall include the wrecking and removal of certain plumbing components. See drawings for extent of demolition.

B. Disposal: All equipment shall be carefully removed during demolition. Equipment not retained shall become property of the Contractor and shall be lawfully removed from site. With regards to the salvage value of property that is to be demolished, Owner shall not be responsible for condition of or loss of, or damage to such property after award of contract.

C. Existing work to remain shall be protected by temporary covers, supports, etc. during demolition work. Should any item that is to remain be damaged during demolition work, it shall be repaired to its original condition or replaced with new.

D. Provide weather protection for all interior portions of the building during demolition work. Where existing wall mounted or roof top or other equipment is being removed and expose the building to the elements, have materials and workmen ready to install adequate temporary covering of the exposed area.

1.19 STRUCTURAL COORDINATION

A. The party responsible for the installation of the system furnished under Division 22 shall provide the General Contractor with the weight of all plumbing equipment and piping and the exact location. General Contractor shall then insure all structural members are properly sized and all plumbing penetrations are properly framed to support the full perimeter of the equipment. See also paragraph "Acceptable Products".

1.20 CONTRACTOR REQUESTS FOR ELECTRONIC COPIES OF CAD DRAWINGS

A. Electronic copies of CAD drawings will not be available.

END OF SECTION 220513

SECTION 220514 - CLOSEOUT DOCUMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing closeout document requirements which are specifically applicable to all Division 22 Sections, in addition to the requirements of Division 1 - General Requirements.

B. Plumbing Closeout document requirements.

C. Record Document Submittals "As-Builts".

D. Contractor Guarantee.

E. Manufacturer Warranties.

F. Operating Instructions and Training.

G. Operation and Maintenance (O&M) Manuals.

H. O&M Instruction Form.

I. Maintenance, Inspections, and Service.

J. Manufacturer's Field Services and Factory Start-up

1.2 RELATED WORK

A. All Division 22 sections.

1.3 RECORD DOCUMENT SUBMITTALS

A. The contractor shall be required to maintain a clean, undamaged set of blue or black line white prints of contract drawings and shop drawings.

B. The contractor shall mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind them with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.
5. "As-builts" shall be submitted to the architect/engineer for review of the plumbing systems as installed upon completion of the work. Changes on "as-builts" are to be shown using standard engineering drafting practices. Freehand drawn changes will not be accepted.

1.4 CONTRACTOR GUARANTEE

A. All equipment and materials furnished (and/or installed under this section) and all work performed under this section of specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after date of substantial completion. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.5 MANUFACTURER'S WARRANTIES

A. Provide as a minimum a one (1) year manufacturer's equipment warranty against defective components for each piece of equipment and its components installed under their respective specification section prior to final inspection in accordance with each of the trades listed below. Equipment warranties shall commence on the date of Substantial Completion as established in the Certificate of Substantial Completion issued by the Architect. Contractor shall note that there may be more than one certificate of Substantial Completion and date of Substantial Completion for this contract. Any parts which fail during the first year shall be replaced by the Contractor at no additional cost to the Owner.

B. Plumbing: Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work. Equipment and parts requiring warranties longer than one (1) year are listed below.
   1. Section 223300 – Electric, Domestic Water Heaters:
      a. Electric Water Heaters (80 Gallons and Smaller): 3 year heater and parts
   2. Section 224000 – Plumbing Fixtures:
      a. Flush Valves: 3 year parts only
      b. Water Coolers: 5 year refrigeration system

1.6 OPERATING INSTRUCTIONS AND TRAINING

A. Instructions: Instruct operating personnel as required (but a minimum of 16 hours) in operation and maintenance of all systems included in this Division (22) of the specifications. In addition, there shall be a quantity of dedicated instruction for certain specific pieces of equipment as specified in the individual specification sections herein. Provide signed O & M Instruction Verification Form as specified in later paragraph certifying instructions have been received.

B. Training: See each specification section for specific training requirements.

1.7 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Operating and maintenance manuals shall comply with Division 1 - Operation and Maintenance Data.

B. One bound and indexed Operating and Maintenance Manuals and one electronic copy (PDF format) shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binder shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

C. Each Manual shall contain the following information, data, and drawings. The exact format and order of the following information shall comply with Division 1's requirements. If no Division 1 requirement exists, format and order shall be as listed below.
   1. List of Contents. Insert under clear front cover of binder.
   2. Health Department Potable Water Systems Certificate.
   3. Contractors one (1) year guarantee.
   4. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
   5. Copy of O & M Instruction Form showing Contractor has instructed designated personnel in the proper operation of all Division 22 systems.
   6. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
   7. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
   8. Copy of approved submittals, shop drawings showing layouts and construction details.
   9. Video inspection of sanitary waste piping along with inspection firm report and written description of contractor corrections to address issues in the report.

1.8 MAINTENANCE AND SERVICE

A. Maintenance: The Contractor shall provide any necessary services for all systems installed under these contract specifications for one year from date of substantial completion.

B. Parts and Labor: Provide repair parts and all labor during maintenance periods.

1.9 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. After the potable water piping systems (hot, cold, and recirculating) have been completed, these piping systems shall be flushed to remove foreign materials from piping. The piping systems shall then be adequately disinfected as per federal specifications BB-C-120.

B. Subsequent to the disinfection, water samples shall be sent to the local health department (LHD) for testing. LHD approval shall be obtained before the system is put into service.

C. Repeat disinfection and/or flushing until the samples are approved by the local health department. Provide health department approved certificate in O&M manuals. All cost associated with disinfection and sample testing shall be borne by the Contractor.

1.10 MANUFACTURER'S FIELD SERVICES AND FACTORY START-UP

A. Refer to each specification section for additional requirements the manufacturer shall provide under the provisions of this specification.

B. Upon completion of the equipment installation the Contractor shall obtain the services of the factory authorized and trained representative at no additional cost to the owner to perform a start-up of the piece of installed equipment. The factory authorized and trained representative shall submit a certificate or letter stating the equipment has been successfully started, adjusted, and tested in accordance with the manufacturer's recommendations. Contractor shall refer to each specification section to determine which equipment/systems require start-up by factory authorized personnel. Some representative equipment/systems which require start-up are listed below.

1. Water Heater

1.11 O & M INSTRUCTION FORM

A. Contractor shall provide instruction to operating personnel for the minimum hours specified in each specification section.

B. Contractor shall coordinate a schedule of startup/operation and maintenance instruction meetings between the Owner's representatives, various subcontractors, and manufacturer's representatives. Submit the following completed form. Some representative systems and equipment are included in the form below, but contractor shall customize the form based on the specific systems and equipment on this project.

OPERATIONAL INSTRUCTION VERIFICATION FORM

Operation and maintenance procedures for major systems and equipment were thoroughly explained to the Representatives as follows:

Equipment Item	**Date Instruction Received**	**Owner's Representative Name (printed)**	**Owner Representative Initial or Signature**
PLUMBING			
Water Heating System			
"I certify that the operation and maintenance procedures of all the major systems have been thoroughly explained to the Owner's Representative."			
Company:			
Name:			
Title:			
Signature:			
Date:			

END OF SECTION 220514

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following meters and gauges for plumbing systems:
   1. Stem type thermometers.
   2. Separable socket wells.

1.2 SUBMITTALS

A. Product data shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment. For each type of product herein, include performance curves.

B. Shop Drawings: Schedule for thermometers indicating manufacturer's number, scale range, and location for each. Identify the specific ranges for the equipment used on this project for thermometers. Submittals showing thermometers and gauges with multiple sizes, ranges, materials, etc., without showing specific sizes, ranges, materials, etc., for this project will be rejected.

C. Operation and maintenance data shall be submitted under provisions of Division 22 - Closeout Documents for Plumbing.

PART 2 - PRODUCTS

2.1 STEM TYPE THERMOMETERS

A. General: Adjustable angle industrial type constructed of brass or cast aluminum (no plastic allowed) case, rattle-proof glass window, black scale graduations and red reading mercury tube. Stem to be constructed of brass or stainless steel, with 3/4" thread for use with separable socket well. Scale to be 7" long with 3-1/2" long stem.

B. Ranges:
   1. Domestic Hot Water: 30° to 240°F in 2° divisions.

C. Manufacturers: Stem type thermometers shall be manufactured by Ashcroft, Trerice, Weksler, Weiss, Palmer or Moeller.

2.2 SEPARABLE SOCKET WELLS

A. Provide for all thermometers and control bulbs mounted in piping. Wells shall be constructed of brass or stainless steel, be furnished complete with screwed cap and shall have lagging extension. Wells shall be suitable for 3-1/2" stems. Where wells are installed in straight runs of pipe smaller than 2-1/2", increase pipe size to 2-1/2" for minimum 4" either side of well. Wells shall be installed at 45 degrees or greater above horizontal and be filled with SAE 10 W oil.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. All thermometers shall be installed in accessible locations in accordance with manufactures instructions.

3.2 CONNECTIONS

A. Install thermometers adjacent to machines and equipment to allow service and maintenance for thermometers, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of thermometers to proper angle for best visibility.

END OF SECTION 220519

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following general-duty valves:
   1. Ball valves.
   2. Check valves.

1.2 SUBMITTALS

A. Product data for each type of valve indicated shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment. Provide certification that products comply with NSF 61 Annex G.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.
   1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF-372 Annex G for valve materials for potable-water service.

1.4 STORAGE

A. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 SHUT OFF VALVES

A. Shut off valves for the (domestic) hot water, recirculating hot water and cold water systems shall be:
   1. Ball Valves: 2" and smaller; 400 psi WOG; standard port, 2-pc. bronze construction, blow-out proof stem, solder or threaded ends as applicable. Provide chrome plated forged brass ball. Provide teflon (TFE) packing and packing nut to allow stem leakage correction. "O" ring seals are not allowed. Valve shall conform with MSS-SP110. Provide a stem extension on insulated piping. Length of extension shall be a minimum of 2-1/4". If stem extension is not factory installed, contractor shall field install stem extension.
      a. Nibco: S-FP-600A-LF
      b. Watts: ---
      c. Apollo Valves: 70LF-200-01, 70LF-100-01
      d. Milwaukee: UPBA400/UPBA450

2.2 CHECK VALVES

A. Check Valves 2" to 12": 200 psi WOG; horizontal swing 2" and smaller; regrinding type, renewable discs, Y-pattern, solder ends.
   1. 2" and Smaller:
      a. Nibco: S-413-LF or T-413-LF
      b. Apollo Valves: 161S-LF or 161T-LF
      c. Watts: --
      d. Milwaukee: UP1509

2.3 BALL VALVE WITH TAMPER SWITCH

A. 2" and Smaller: Bronze body, U.L. listed - F.M. approved, Full Port Ball Valve. NIBCO T-505-4 or equal by Crane or Milwaukee. Tamper switch shall be built in to the valves; U.L. Listed - F.M. Approved.
   1. Switch designed for installation on indicator valves with cased aluminum housing with red finish; U.L. Listed - F.M. Approved. Notifier, Simplex or equal.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install Swing Check Valves in horizontal position with hinge pin level.

F. Install valves with stems upright or horizontal, not inverted.

G. All valves, manually operated, 6-inches and larger located 12 feet or more above the finished floor elevation in the mechanical room shall be installed with their spindles horizontal and provided with chain wheels. Chains shall loop within four (4) feet of the finished floor. Provide holding clips to secure chains when the valve is not being used.

H. Use ball valves for shutoff and to isolate equipment, to isolate systems and vertical risers.

3.2 JOINT CONSTRUCTION

A. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

SECTION 220529 - HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following hangers, supports and accessories for mechanical system piping and equipment:
   1. Coatings
   2. Upper attachments
   3. Pipe attachment (hangers and clamps)
   4. Metal Framing Channel
   5. Hanger Rods
   6. Pipe Positioning Systems
   7. Insulation Shields
   8. Concrete Equipment Bases
   9. Flashings
   10. Sleeves
   11. Roof Mounted Pipe Supports

1.2 PERFORMANCE REQUIREMENTS

A. All supports utilized under Division 22 shall meet the sizing criteria specified herein. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5). All support sizes specified herein (for hanger rods, trapeze hangers, pipe attachments, etc.) are minimum sizes required. Contractor shall utilize larger size supports where actual loads dictate a larger support.

1.3 SUBMITTALS

A. Submit product data under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Submit product data on roof equipment curbs and supports, upper attachments, pipe attachments, lower pipe supports, metal framing channel, pipe positioning systems, and vibration isolators.

1.4 WELDING REQUIREMENTS

A. Welding Requirements: All welding performed to support Mechanical piping and equipment shall comply with AWS D1.1, "Structural Welding Code - Steel”. Welders shall be qualified per AWS and welding certificates shall be posted at the jobsite.

1.5 COATINGS

A. All supports for piping and equipment, hangers and accessories, including but not limited to bolts, nuts, washers, rods, beam clamps, etc., shall be galvanized, except as indicated in the following paragraphs.

B. Hangers and supports in direct contact with copper piping shall be copper plated.

PART 2 - PRODUCTS

2.1 UPPER ATTACHMENT

A. Poured in Place Concrete: Contractor may install concrete inserts or drill concrete anchors. Inserts shall be:
   1. B-Line: B 2500
   2. C&P: 75
   3. Anvil: 281
   4. Erico/Michigan: 355
   5. PHD: 950, 951

B. Concrete Anchors: Anchors shall be expansion "drop-in" type with an actual load less than 1/3 the manufacturers listed allowable working load for tension in 2,000 psi concrete. Anchors shall be installed in drilled holes per manufacturer's recommendations. Approved manufacturers:
   1. Hilti: 5490000
   2. Red Head: RM-Multi-Set II
   3. Rawl: 6300 Drop-In

C. Steel Beams:
   1. Piping 2" and smaller: Malleable Iron C-Clamp with Lock Nut.
      a. B-Line: B 3033 or B3034
      b. C&P: 192
      c. Anvil: 94
      d. Erico/Michigan: 280
      e. PHD: 350 or 360
      f. FNW: 7203 or 7204

D. Steel Bar Joist: Malleable Iron C-Clamp with Lock Nut.
   1. B-Line: B 3033 or B3034
   2. C&P: 192
   3. Anvil: 94
   4. Erico/Michigan: 280
   5. PHD: 350 or 360
   6. FNW: 7203 or 7204

2.2 PIPE ATTACHMENT

A. PVC and cast iron pipe hangers: Size sanitary waste, and vent pipe hangers to fit piping inside the insulation.
   1. B-Line: B3100
   2. C&P: 100
   3. Anvil: 260
   4. Erico/Michigan: 400, 401
   5. PHD: 450, 451

B. Copper tubing hangers: Size hot, cold and recirculating water pipe hangers to fit piping inside insulation.
   1. B-Line: B3170CT
   2. C&P: 800CT
   3. Anvil: CT-69
   4. Erico/Michigan: 101
   5. PHD: 152

C. Steel Pipe Hangers: Size steel pipe hangers to fit the piping.
   1. For Pipe Sizes 2" and Smaller:
      a. B-Line: B3170
      b. C&P: 800
      c. Anvil: 70
      d. Erico/Michigan: 100
      e. PHD: 151

D. Vertical supports shall be:
   1. Offset pipe clamp:
      a. B-Line: B3148
      b. C&P: 179
      c. Anvil: 103
      d. Erico/Michigan: 700
      e. PHD: 535

2. Riser clamp:
   a. Steel:
      1) B-Line: B-3373
      2) C&P: 126
      3) Anvil: 2612
      4) PHD: 500, 551
      5) Erico/Michigan: 510
   b. Copper:
      1) B-Line: 3373CT
      2) C&P: 126CT
      3) Anvil: CT121
      4) PHD: 552
      5) Erico/Michigan: 511

2.3 METAL FRAMING CHANNEL

A. Where possible and practical, piping shall be supported with trapeze hangers consisting of a metal framing system of channel, fittings, and hardware as defined in the Metal Framing Manufacturer's Association Standard Publication MFMA-1. Length of trapeze supports shall not exceed 4 feet unless contractor performs and submits calculations which indicate the channel is within the manufacturer's recommendations with a safety factor of 30% added to the load.

B. Vertical Pipe Supports: Where shown on the drawings, vertical routed piping shall be supported and/or stabilized by steel channel meeting the requirements for channel as specified herein.

C. Channel shall be constructed of 12-gauge steel. Nominal width shall be 1-5/8" x 1-5/8" with a 9/16" wide and 7/8" long slot face opening, with slots on 2" centers. Channel shall be pre-galvanized in accordance with ASTM A 653 G90, or have a factory applied electro-deposited epoxy finish.

D. Pipe clamps shall be sized as follows:
   1. Non-insulated Steel Piping: Sized to fit piping.
   2. Insulated Piping: Sized to fit outside of insulation.
   3. Copper Piping: Sized to fit outside of piping plus elastomeric isolation material.

E. Approved Manufacturers: B-Line Model B22SH, Elcen, Unistrut, and Superstrut by Midland-Ross.

2.4 HANGER RODS

A. Steel Hanger Rods: Continuous threaded rod. Size as indicated in individual piping specification sections.

B. Rods supporting trapeze hangers shall be 1/2" unless actual loads dictate a larger rod. Rods supporting mechanical equipment shall be sized in accordance with the manufacturer’s installation instructions. If no size is given, rod size shall be minimum 3/8", unless actual load dictates a larger rod. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5).

C. Rod couplings shall be:
   1. B-Line: B3220
   2. C&P: 167
   3. Anvil: 136, 136R
   4. Erico/Michigan: 26
   5. PHD: 100, 105

2.5 PIPE POSITIONING SYSTEMS

A. Definition: A combination of straps, brackets and clips designed to correctly locate pipes in walls relative to fixtures or equipment.

B. Metal Components: Metal components of the system must be pre-galvanized steel ASTM A446 Grade A or better. Metal parts in contact with copper pipe shall be copper plated steel ASTM A611 Grade C or better. All metal components must be stamped with the manufacturer's name and part number and the UPC certification mark.

C. Plastic Components: Plastic components shall be made of polypropylene or Lexan 141 with a flame-retardant rating UL94V2 or better. All plastic parts must be stamped with the manufacturer's name and part number.

D. Manufacturers: B-Line Rufflin®, Holdrite Corp by Hubbard or equal by Erico/Michigan.

2.6 INSULATION SHIELD

A. Provide insulation shields at all pipe hangers installed on the exterior of the insulation and at all pipe clamps and trapeze supports. Shields shall be fabricated from minimum 18-gauge galvanized steel. Shields at pipe hangers shall be 12" long with a 180-degree arc. Shields at pipe clamps shall cover entire pipe. Contractor may utilize the following shields:
   1. B-Line: B3151
   2. C&P: 265P
   3. Anvil: 167
   4. Erico/Michigan: 121
   5. PHD: 170

2.7 EQUIPMENT BASES

A. Bases shall be 3,000 psi concrete and provided in accordance with Division 3, Section Cast-In-Place Concrete.

B. Bases shall be rectangular, unless otherwise indicated, with vertical side 6 inches from centerline of anchor bolts or 4 inches from edge of equipment, whichever provides larger dimension. Provide 1 inch chamfer on edges and corners. Provide 6 inch x 6 inch 10/10 WWF reinforcing wire at mid-depth of slabs, 6-inch deep or less, or at 1/3 and 2/3 depth of slabs thicker than 6 inches. Provide 1" clearance from adjacent walls for pumps. All equipment shall be anchor bolted to the concrete pad unless noted otherwise. Base height shall be as follows:
   1. Water Heaters - 4 inches

2.8 FLASHING

A. Vents Thru Roof: Provideflashing as detailed on Architectural drawings.

2.9 SLEEVES

A. Pipe Sleeves: Pipe sleeves thru floors shall be fabricated from schedule 10 (minimum) steel pipe, and shall extend 1 inch above floor. Pipe sleeves thru walls shall be fabricated from Schedule 10 (minimum) steel pipe and shall be flush with both sides of walls, unless noted otherwise on drawings. Sleeves on copper piping through slab on grade shall be Schedule 40 PVC (minimum). Omit sleeves on sanitary waste and vent and storm drain pipe penetrations thru slabs on grade.

2.10 ROOF MOUNTED PIPE SUPPORTS (NON-PENETRATING TYPE)

A. Piping Supports on Roof: Where noted specifically on the drawings, piping shall be supported on the roof by a pre-manufactured engineered system designed for mounting atop the roof without penetrating the roof. Piping support shall consist of polycarbonate resin bases with UV stabilizers, stainless steel threaded rod vertical supports, self-lubricating roller system. Support shall conform to detail on drawings, and shall be Series RAH as manufactured by Miro or equal by Pate, Mapa Products, Curbs Plus, Roof Top Blox, PHP or RPS.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support spacing requirements are specified in Sections specifying piping systems and equipment.

B. Use galvanized hangers and supports for piping and equipment that will not have field-applied finish.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Hanger Shield Installation: Install shield in pipe hanger or shield for insulated piping.

D. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 - Plumbing Fixtures for plumbing fixtures.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2½" and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

3.3 CONCRETE EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete. To reduce vibration to adjacent walls, bases shall not be placed within 1/4" of adjacent walls. Obtain templates, anchor bolts, and accessories for mounting and anchoring equipment. Provide concrete bases at least 6" beyond the footprint of the equipment that the contractor provides, or as shown on the plans, whichever is larger.

3.4 PIPE HANGER ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Painting Section.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. In areas that are to be painted and also are exposed to view in public areas, supports for piping and equipment, hangers and accessories including but not limited to bolts, nuts, washers, rod, angle iron, beam clamps, etc. shall be plain steel with a coat of rust inhibiting primer. Primer shall be applier prior to installation of supports. Supports, hangers and accessories exposed to view shall not be galvanized or electroplated, in order to allow them to be painted in accordance with the Architectural painting section. Areas that are to be painted but that are not exposed to view to the public, such as mechanical rooms, shall be galvanized as required above.

3.6 SLEEVES AND PENETRATIONS

A. Provide pipe sleeves for all piping and conduit penetrations through floors and walls.

B. Set sleeves in position during construction of walls or floors prior to placement of brick, concrete block or cast-in-place concrete.

C. Piping and Conduit Penetrations through Rated Walls or Floors: Firestopping methods and materials shall be in accordance with Division 7 - Penetration Firestopping. Assembly shall meet the wall or floor rating as specified by the Architect. See Architectural drawings for rating requirements. Sleeve's size and material shall be coordinated with Division 7 - Penetration Firestopping.

D. Piping and Conduit Penetrations through Non-rated Walls or Floors: Pack space between pipe or conduit and sleeve with fiberglass batts and with a minimum of 1 inch thick, non-sagging caulking material on one side. Caulk material is not required to be fire rated, but shall comply with Division 7 - Penetration Firestopping.

E. Install chrome plated steel escutcheons at finished surfaces for piping.

F. Division 22 Contractor shall furnish the General Contractor with the clear opening dimensions and elevations and locations of all penetrations through walls and floors, so that the General Contractor may provide appropriate wall and floor openings for these penetrating items. Penetrating items include, but are not limited to, piping. Clear opening dimensions and elevations and locations shall be furnished in a timely manner to allow General Contractor to frame openings during wall and floor construction, and to prevent the need for removing new work. Contractor is warned that the project may contain shear walls which require steel reinforcing/framing around perimeter that must be installed during the construction of the wall, and which cannot be installed after the wall is constructed without significant demolition of the wall and reconstruction of the wall. Coordinate with General Contractor to determine location of shear walls.

3.7 SUSPENDED EQUIPMENT AND PIPING SUPPORTS

A. Provide steel drop rod supports or angle iron supports, secured (spot welded or clamped in bar joist areas) to building main structural components for all suspended equipment and piping. Supplemental angle iron framing shall be provided where required between bar joists and shall be minimum 3 x 3 x 1/4 for equipment and large piping (4" and larger), and minimum 2 x 2 x 1/4 for small equipment and small piping. 1-5/8 x 1-5/8 x 12-gauge channel may be used to span bar joist in lieu of 2 x 2 x 1/4 angle provided that previous paragraph “Performance Requirements” are met. Contractor shall note that supplemental angle sizes are minimum. Contractor shall provide larger size supplemental angle iron framing as appropriate to safely and appropriately support equipment. Provide vibration isolation where specified. Coordinate all equipment and pipe supports with steel fabricator/erector and do not overload any building structural members or supplemental framing members. Provide securely tightened lock nuts on all drop rod supports and connections.

END OF SECTION 220529

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
   1. Equipment markers.
   2. Pipe markers.

1.2 SUBMITTALS

A. Product data for each type of product included herein shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT MARKERS

A. Markers shall be Contractor fabricated to have equipment “tag” or number (e.g., WH-1, RP-2, etc.) on marker.

B. Designation:
   1. Equipment tag shall be etched in 1/2" maximum, 1/4" minimum height letters and mounted on or adjacent to device cover or attached to the item of equipment. For items above ceiling, marker shall be attached to ceiling on t-bar grid in location approved by Owner.
   2. Type: White core black bakelike secured with epoxy glue or screws, unless otherwise noted.

2.2 IDENTIFICATION OF PIPING

A. Piping shall be labeled with pre-tension pre-coiled semi-rigid plastic snap-on pipe markers equal to Seton "Setmark" pipe markers or by Brimer or Brady, or self adhesive plastic pipe markers with pressure sensitive, permanent type self-adhesive back, or field stenciled if pre-made marker is not manufactured. Provide arrow identifying direction and system description as listed below. Background and letter colors shall be in conformance with latest version of ANSI/ASME A13.1. The following piping systems shall be provided with pipe markers.
   1. Domestic cold water
   2. Domestic hot water
   3. Domestic hot water return
   4. Gas

B. Height of letters shall be as follows:
   1. Outside Diameter (Outside insulation on insulated piping)
      a. 1/2" - 1-1/4": Letter height shall be 1/2"
      b. 1-1/2" to 2": Letter height shall be 3/4"
      c. 2-1/2" to 6": Letter height shall be 1-1/4"

2.3 VALVE LOCATORS/MARKERS

A. Where valves are installed above lift out ceiling tiles, markers shall be permanently installed on the ceiling grid immediately below the valves. Markers shall be in ASNI/ASME 13.1 standard colors, round acrylic with adhesive backing. Seton ceiling markers are basis of design.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 22 Sections.

3.2 EQUIPMENT IDENTIFICATION

A. Install equipment markers with permanent adhesive on or near each major item of plumbing equipment.
   1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Equipment “tag”.
   3. Locate markers where accessible and visible.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
   1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
   2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided where manufactured pipe markers are not available. Install stenciled pipe markers with painted, color-coded bands or rectangles complying with ASME A13.1 on each piping system.
   1. Identification Paint: Use for contrasting background.
   2. Stencil Paint: Use for pipe marking.

C. Locate pipe markers and color bands as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. At access doors, manholes, and similar access points that permit view of concealed piping.
   4. Near major equipment items and other points of origination and termination.
   5. At 25 feet intervals on all straight runs of pipe.
   6. On both sides of walls or floors where pipe passes through walls or floors.

3.4 ADJUSTING

A. Relocate plumbing identification materials and devices that have become visually blocked by other work.

3.5 CLEANING

A. Clean faces of plumbing identification devices to an “as new” condition immediately prior to Architect’s Final Certification.

END OF SECTION 220553

SECTION 220716 - PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes plumbing insulation for equipment, and pipe, including the following:
   1. Insulation materials
   2. Fitting materials.
   3. Insulation finish materials
   4. Accessories

1.2 SUBMITTALS

A. Product data shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment for each type of product indicated; identify thermal conductivity, thickness, and jackets (both factory and field applied, if any). Provide a sheet that identifies each system (e.g., cold water piping, etc.), and the submitted material, thickness, and finish for each system.

B. Submit proof of three years' minimum experience in insulation installation.

1.3 QUALITY ASSURANCE

A. Insulation and related materials shall meet the requirements of NFPA-90A.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing products per ASTM E 84. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Applicator: Company specializing in insulation application with three years' minimum experience.

1.4 GENERAL INSULATION NOTES

A. Any equipment which is factory insulated, and which has sweating/condensation forming on the equipment while operating under design conditions, shall be replaced or field insulated by the contractor until the condensation is eliminated.

B. Piping is considered concealed for purposes of this Specification Section when located above ceilings or in chases.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Certain Teed, Owens-Corning, Johns Manville, Armacell, IMCOA, Nomaco, Knauf, Pittsburg Corning, The Dow Chemical Company, Foster, Childers and Hi-Therm.

B. Substitutions: Under provisions of Division 22 Section "Common Requirements for Plumbing Equipment."

2.2 INSULATION MATERIALS

A. I1: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F. Jacket shall be factory applied all service jacket with self sealing lap (ASJ-SSL). Provide ASJ tape where insulation butts. ASJ jacket shall be continuous. Provide insulation shield on exterior of insulation at all hangers.

B. I3: Blanket Insulation: Glass fiber blanket insulation minimum 3/4 lb. density, installed R3.5 per inch, with FSK facing. Wrap blanket insulation around piping, being careful not to compress it more than 25% at the corners, butting insulation and overlapping facing jacket 2" minimum at all joints. Two-inch (2") thick insulation shall have a minimum R5.3 at 25% compression. Staple the overlap with outward clinching staples a maximum of 3" on centers. Seal all joints with pressure sensitive FSK tape. Seal all penetrations, such as at supports, and all terminations of insulation with pressure sensitive FSK tape. Blanket insulation used on storm drain system, blanket shall cover roof drain body, vertical pipe from roof drain body to horizontal piping and all horizontal piping.

2.3 FITTING INSULATION MATERIALS

A. Type P1: Precut fiberglass insulation fitting inserts covered with PVC fitting covers. PVC fitting covers shall have a flame spread of 25 or less and a smoke development of 50 or less. Nominal 0.75 lb. density, K factor maximum 0.32 at 75°F for temperatures -20°F to 450°F.

2.4 INSULATION FINISH MATERIALS

A. F2: Pre-molded PVC jacket, maximum permeance of 0.09. PVC jacketing shall be minimum 0.02" thick (20 mils).

B. F4: 0.016" Aluminum jacketing and 0.024" aluminum fitting covers with joints sealed water tight with sealant, Foster Elastolar 95-44, Childers Chil Byl CP-76, or prior approved equal, installed over white vapor barrier mastic (Type F3) with 10 x 10 glass or polyester cloth reinforcing membrane to develop 37 mil dry film thickness.

C. F6: 0.010" Aluminum jacketing with joints sealed watertight with sealant, Foster Elastolar 95-44, Childers Chil Byl CP-76 or prior approved equal.

2.5 ACCESSORIES

A. Metal Jacket Bands: 1/2-inch wide; 0.015-inch thick aluminum.

B. Adhesives: Compatible with insulation materials, jackets and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

C. Insulation Shields: Provided in accordance with Division 22 - Hangers & Supports for Plumbing Piping & Equipment.

D. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates.

E. Tapes: FSK foil face, vapor retardant type tape matching factory applied jacket with acrylic adhesive; complying with ASTM C1136 and UL listed. Width shall be three inches; thickness shall be 6.5 mils.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 COORDINATION

A. Coordinate with contractor to confirm (based on contractor’s preference) which sections of piping will be welded and which sections of piping shall be grooved. See Part 3 - “Execution” herein for additional insulation requirements specific to grooved piping system.

B. Coordinate with trade installing piping to verify all piping has been pressure tested prior to application of insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation, fitting materials, finish materials and accessories in accordance with manufacturer’s installation requirements and recommendations.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of equipment, and piping including fittings, valves, and specialties.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

D. Keep insulation materials dry during application and finishing.

E. Install insulation with least number of joints practical.

F. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

G. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

H. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

I. Continue insulation with vapor barrier through penetrations.

J. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

K. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation with mastic at such locations.

L. For above ambient service, do not install insulation to vibration control devices, testing agency labels, nameplates or cleanouts ASME stamps, etc.

3.4 INSULATION SCHEDULE

Service/Location	INSULATION			FINISH	
	Pipe	Fitting	Thickness	Pipe	Fitting
PIPING:					
Hot, Cold & Recirculating Water Piping:					
Above Ceilings & Inside Exterior Walls	I1	P1	1"	--	--
Interior Walls & Chases	I1	P1	1"	--	--
Exposed	I1	P1	1"	F2	F2

END OF SECTION 220716

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes domestic water piping within 5'-0" of the building.

1.2 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment.

1.3 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Potable water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked "NSF-pw".

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Store and protect products under provisions of Division 22 - Common Requirements for Plumbing Equipment.

PART 2 - PRODUCTS

2.1 COLD WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Piping Sizes 3" and Smaller:
   1. Copper Tubing: ASTM B88 Type "K" hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints: AWS A5.8, BCUP silver braze. Use solder as specified herein.

2.2 120°F HOT, COLD AND RECIRCULATING WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88 type 'L' hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints 2" and smaller: ANSI/ASTM B32 Lead free solder, having a composition of 95.5% tin, 4% copper and 0.5% silver. Joints over 2": Braze using AWS A.58 BCUP – 4 silver (minimum 5.8%) filler metal. “Backing” with solder (melting temperature less than 1,100˚F) is prohibited.

B. On piping 2" and larger, the Contractor has the option of using grooved couplings and grooved fittings as manufactured by Victaulic, Anvil and Grinnell.
   1. Mechanical Couplings: 2"-8" for copper tubing consisting of ductile iron cast housings, complete with a synthetic rubber gasket of a pressure-responsive design, with plated nuts and bolts to secure unit together. Couplings shall be manufactured to connect copper tubing sized tube and fittings. (Flaring of tube and fitting ends to IPS dimensions is not allowed.)
   2. Coupling Housings: Ductile iron conforming to ASTM A-536, Grade 65-45-12, coated with copper colored alkyd enamel. Housings shall be cast with offsetting, angle-pattern bolt pads to provide rigidity.
   3. Coupling Gaskets: Gasket shall be Grade “EHP” EPDM compound designed for operating temperatures from -30 deg F to +250 deg F.
   4. Victaulic Style 607 or equal by prior approved manufacturers. Installation ready rigid coupling for direct stab installation without field disassembly.
   5. Installation ready fittings for copper systems manufactured by Victaulic or prior approved manufacturers are acceptable.

6. A factory-trained representative (direct employee) shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, product installation, and shall periodically visit the job site to review installed products. Contractor shall remove and replace any improperly installed products at contractor's expense.
7. All grooved end components shall be of a single manufacturer.

C. In lieu of manufactured copper tee fittings, the Contractor has the option of using mechanically formed tee connections. Mechanically formed tees shall conform to the following:
1. Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. The collaring device shall be fully adjustable as to ensure proper tolerance and complete uniformity of the joint.
2. The branch shall be notched to conform with the inner curve of the run tube and dimpled to ensure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the mainline tube. Dimples shall be in line with the run of the tube and visible through the braze. All joints shall be brazed with BCUP-2 braze. The method shall be provided by T-drill®.

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 EXCAVATION

A. Excavate trenches to the elevation required by the pipe. Trench shall not be undercut unless the trench bottom is in rock or hard strata, cinders, organic soils or injurious materials. Under cut shall be a minimum of 6" below the invert of the piping and shall be refilled with inorganic soil or sand tamped in place.

B. Contractor shall furnish all labor, materials, and equipment to keep the excavation free of water either from surface sources or from underground sources or from both. When underground water is encountered, undercut the trench 6" and backfill with graded aggregate base type C (crush and run gravel). The selections of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

C. After piping has been tested, inspected and approved, trenches shall be backfilled to the first 12 inches over the pipe in 4 inch lifts and hand tamped.

D. After the first 12 inches, lifts shall not exceed 8 inches. The backfill in all trenches shall be compacted to 95% of the maximum dry density determined by the standard Proctor Compaction Test (ASTD D 698). Field density shall be taken at the rate of 1 for each 50 feet of trench for each 2 feet of fill. Cost of test shall be borne by the contractor.

3.3 PIPE AND FITTING APPLICATIONS

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

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Install unions downstream of valves and at equipment or apparatus connections.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves for piping 2"and smaller.
   2. Hot-Water-Piping, Balancing Duty: Balancing valves.
   3. Drain Duty: Hose-end drain valves.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping 2" and smaller.

3.5 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Provide chrome plated escutcheon plates for all piping penetrations through walls exposed to view.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient.

E. Install piping to conserve building space and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Slope water piping and arrange to drain at low points.

J. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

L. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

M. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

N. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping after insulating, space permitting.

O. Coring: On new construction, pre-cast sleeves in all masonry and concrete walls, floor and ceiling slab. For a limited number of openings, contractor may core drill openings in masonry and concrete walls and floor slabs where sleeves were inadvertently not installed as the wall or floor slab was constructed. On existing construction, sleeve openings must be core drilled.

P. Grooved: Where specified herein, piping shall be grooved in accordance with ANSI/AWWA C-606, CSA B-242, and the manufacturers published specifications. Provide lubricant furnished or approved by the manufacturer. Lubricate the gasket exterior thoroughly (including lips).

Q. Install PVC sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 - Common Requirements for Plumbing Equipment.

R. Install water-pressure regulators downstream from shutoff valves. Water pressure regulators are specified in Division 22 - Domestic Water Piping Specialties.

3.6 JOINT CONSTRUCTION

A. General: Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Threaded: All threads shall be National Pipe Thread. Apply a commercial grade compound to the male threads only. Ream cut ends and remove all burrs.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.7 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 22 - Hangers and Supports for Plumbing Piping and Equipment.

B. Install supports according to Division 22 - Hangers and Supports for Plumbing Piping and Equipment.

C. Support vertical piping and tubing at base and at each floor.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. 3/4" and Smaller: 60 inches with 3/8-inch rod.
   2. 1" and 1-1/4": 72 inches with 3/8-inch rod.
   3. 1-1/2" and 2": 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials. Flush water piping prior to placing in service.

3.9 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:
   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
      b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 150 psig. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
b. Adjust calibrated balancing valves to flows indicated.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING AND DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. After all of the domestic potable water piping systems work has been completed, these systems shall be cleaned and disinfected

B. Clean and disinfect domestic potable water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system in accordance with the following:
1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction.
e. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:
   1. Dielectric Connections
   2. Solder
   3. Wall hydrants.
   4. Roof hydrants.
   5. Water hammer arresters.
   6. Trap primers

1.2 SUBMITTALS

A. Product Data: For each type of product indicated it shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals shall be submitted under provisions of Division 22 - Closeout Documents for Plumbing.

1.3 QUALITY ASSURANCE

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

B. NSF Compliance:
   1. Comply with NSF 61 Annex G.

PART 2 - PRODUCTS

2.1 DIELECTRIC CONNECTIONS

A. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier. Provide at connection of ferrous and Non-ferrous materials.

2.2 SOLDER

A. Solder shall be lead free having composition of 95.5% tin, 4% copper and 0.4% silver. Solder shall have a tensile strength of 6,900 psi at 70 degrees F. Solder shall conform to ASTM B-32 and shall be applied in conformance with ASTM B-828. Flux shall conform to ASTM B-813.

2.3 WALL HYDRANT

A. Wall Hydrant shall be freeze proof concealed box type, automatic draining with ASSE 1052 approved high flow double check backflow preventer, ¾" inlet and outlet. Hardened stainless steel operating stem and one-piece valve plunger to control both flow and drain functions. Exterior door and fascia finish to be rough brass. Provide loose key with each hydrant. Provide with a 5-year warranty. Woodford B67 or equal by Josam, J.R. Smith, Wade, Zurn, Watts, Mifab or Prier.

2.4 ROOF HYDRANT

A. Roof hydrants shall be Woodford model SRH-MS freeze-proof roof hydrant with ASSE 1052 double check backflow preventor, hydrant support and under deck flange or approved equal by MAPA or Josam.

2.5 WATER HAMMER ARRESTORS

A. PDI –“A”:
   1. Josam: ----
   2. Smith: 5205
   3. Zurn: 1250XL-A

4. Sioux-Chief: 652-A
5. Equals by Watts, Mifab or Precision Plumbing Products are acceptable.

2.6 TRAP PRIMERS

A. Flush Valve Type Trap Primer Assembly: Vacuum breaker trap primer with water deflector, 3/8" elbow and flex-bend connection, wall flanges and fittings to connect to 2" NPT pipe. All exposed surfaces shall be chrome plated Sloan VBF-72-A1 or Zurn Z-6000-TPO or equal by Delany.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install wall hydrants approximately 24" above finish grade unless noted otherwise.

D. Install water hammer arresters in water piping as indicated on drawings.

E. Install trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 - Grounding and Bonding for Electrical Systems.

C. Connect wiring according to Division 26 - Low-Voltage Electrical Power Conductors and Cables.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes waste, and vent piping within 5'-0" of the building.

1.2 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Cellular core/foam core piping is not allowed.

1.3 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

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

C. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Store and protect products under provisions of Division 22 - Common Requirements for Plumbing Equipment.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SANITARY WASTE, AND VENT PIPING, WITHIN 5 FEET OF BUILDING - BELOW SLAB AND INSIDE WALLS AND CHASES

A. PVC Pipe: ASTM D1785, Schedule 40. Fittings: ANSI/ASTM D2665, Drainage Pattern schedule 40 PVC. Joints ASTM D2855, Solvent Weld.

B. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16-23, cast bronze, or ANSI/ASME B16-22, wrought copper. Joints: Lead free solder as specified herein. Acceptable for water cooler, lavatory and sink fixture arms only.

2.2 SANITARY WASTE AND VENT PIPING, ABOVE GRADE - OUTSIDE OF WALLS AND CHASES AND ABOVE CEILINGS

A. Cast Iron Pipe: ASTM A888 and CISPI Standard 301, hubless, service weight. Fittings: Cast Iron. Joints: Heavy duty no hub couplings. Acceptable manufacturers: Clamp-All Hi-Torq 125, Husky SD-4000, Mifab MI-XHUB or Ideal Super Heavy Duty.

2.3 PROCESS DRAIN PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A888 and CISPI Standard 301, hubless, service weight. Fittings: Cast Iron. Joints: Heavy duty no hub couplings. Acceptable manufacturers: Clamp-All Hi-Torq 125, Husky SD-4000, Mifab MI-XHUB or Ideal Super Heavy Duty.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate trenches to the elevation required by the pipe. Trench shall not be undercut unless the trench bottom is in rock or hard strata, cinders, organic soils or injurious materials. Under cut shall be a minimum of 6" below the invert of the piping and shall be refilled with inorganic soil or sand tamped in place.

B. Contractor shall furnish all labor, materials, and equipment to keep the excavation free of water either from surface sources or from underground sources or from both. When underground water is encountered, undercut the trench 6" and backfill with graded aggregate base type C (crush and run gravel). The selections of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

C. After piping has been tested, inspected and approved, trenches shall be backfilled to the first 12 inches over the pipe in 4 inch lifts and hand tamped.

D. After the first 12 inches, lifts shall not exceed 8 inches. The backfill in all trenches shall be compacted to 95% of the maximum dry density determined by the standard Proctor Compaction Test (ASTD D 698). Field density shall be taken at the rate of 1 for each 50 feet of trench for each 2 feet of fill. Cost of test shall be borne by the contractor.

3.2 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

H. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum (unless noted otherwise). Maintain gradients.

I. Install bell and spigot pipe with bell end upstream.

J. Remove burrs and all loose material from the interior of piping prior to assembly.

K. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

L. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping, space permitting.

M. Coring: On new construction, pre-cast sleeves in all masonry and concrete walls, floor and ceiling slab. For a limited number of openings, contractor may core drill openings in masonry and concrete walls and floor slabs where sleeves were inadvertently not installed as the wall or floor slab was constructed. On existing construction, sleeve openings must be core drilled.

N. Horizontal piping shall be installed in uniform alignment (i.e. STRAIGHT) and at uniform slope.

O. Trenches in acceptable soils shall be dug to slope. If a trench is inadvertently over excavated, the trench shall be backfilled and compacted as specified in the "Excavation and Backfill" paragraph in this specification section.

P. Trenches in unacceptable soils shall be undercut as specified in the "Excavation and Backfill" paragraph in this specification section.

Q. Piping shall be supported the entire length on undisturbed earth or compacted backfill. Supporting piping on concrete block, brick, wood block or other similar items is unacceptable.

R. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

S. Make changes in direction for waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used for lavatories, sinks and water coolers on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double combination wye and 1/8-bend fittings when water closets are installed back to back or side by side with common drain pipe. Sanitary tees and double sanitary tees shall not be used for water closets. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

T. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

U. Install waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Waste Piping: One-quarter inch (1/4”) per foot in direction of flow for piping 2" and smaller; one-eighth inch (1/8”) per foot in direction of flow for piping 3" and larger.
   2. Vent Piping: One-eighth inch (1/8”) per foot down toward vertical fixture vent or toward vent stack.

V. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

W. Install PVC waste drainage and vent piping according to ASTM D 2665.

X. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

Y. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum caulked joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.4 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 - Hangers and Supports for Plumbing Piping and Equipment.

B. Install supports according to Division 22 - Hangers and Supports for Plumbing Piping and Equipment.

C. Support vertical piping and tubing at base and at each floor.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. 1-1/2" and 2": 60 inches with 3/8-inch rod.
   2. 3": 60 inches with 1/2-inch rod.
   3. 4" and 5": 60 inches with 5/8-inch rod.

E. Install supports for vertical cast-iron soil piping every 15 feet.

F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
   1. 1-1/2" and 2": 48 inches with 3/8-inch rod.
   2. 3": 48 inches with 1/2-inch rod.
   3. 4" and 5": 48 inches with 5/8-inch rod.

G. Install supports for vertical PVC piping every 48 inches.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

3.6 VIDEO INSPECTION OF SANITARY WASTE PIPING

A. Closed circuit television: Contractor shall utilize an independent third party to televise and provide video inspection of ALL waste piping 4" and larger (not including 4" piping to individual Fixtures or individual toilet batteries). Contractor shall record video inspection to color DVD and turn over a minimum of 3 copies to Architect. Video inspection shall be accomplished after all plumbing fixtures have been set and shall be complete with copies turned over to Architect prior to final inspection. Contractor shall provide a 1/8" = 1'-0" scale plan (one per DVD copy) indicating / labeling each section of piping that has been recorded. Each DVD shall be labeled indicating project name, videographer name and address, Project Architect, General Contractor, Plumbing Sub-Contractor, Date of Video, Indication of which sections of piping are included on tape with description of vantage point and direction by compass and elevation for each section. Video inspection firm shall provide a report indicating areas in question. Contractor shall make corrections to the system in accordance with the report. A minimum of three copies of the report and a description of each corrective action shall be turned over to the Architect.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 221316

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following drainage piping specialties:
   1. Floor drains.
   2. Cleanouts.
   3. Flashing

1.2 SUBMITTALS

A. Product Data: For each type of product indicated shall be submitted under provisions of Section 220513.

B. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals shall be submitted under provisions of Division 22 - Closeout Documents for Plumbing.

1.3 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

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

D. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Store and protect products under provisions of Division 22 - Common Requirements for Plumbing Equipment.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Provide and install floor drains as shown on the drawings and as specified herein. Floor drains shall have coated cast iron bodies with cast iron double drainage flanges and bottom outlet, inside caulk connections, with strainers and special items as indicated in Schedule. **All drains shall be provided with deep seal trap.** All drains shall also have a Pro Set Trap Guard alternative trap primer device installed.

B. Schedule (Basis of Design: Josam, equals by Watts, Sioux Chief or Mifab are acceptable)
   1. Floor Drain FD “A”:
      a. Josam: 30000-A
      b. Smith: 2010A
      c. Wade: W-1100-STD
      d. Zurn: ZN-415-B
      e. 7" satin finished Nikaloy top.
   2. Floor Drain FD “B”:
      a. Josam: 31100
      b. Smith: 2310
      c. Wade: W-1340

d. Zurn: Z-525
e. 8-1/8" cast iron top.

2.2 CLEANOUTS

A. Provide cleanouts where shown on the drawings.

B. All cleanouts shall be accessible and shall be installed allowing a clearance of not less than 18" for the purpose of rodding.

C. Cleanout Schedule: (Basis of Design-Josam, equals by Watts or Mifab are acceptable):
1. Location: Finished floor except on acid waste piping
a. Finish: Nickel bronze
b. Josam: 56000
c. Smith: 4025
d. Wade: W-6000
e. Zurn: Z-1400
2. Location: Wall
a. Finish: Stainless steel
b. Josam: 58600
c. Smith: 4710
d. Wade: W-8480-R
e. Zurn: Z-1469
3. Location: Outside
a. Finish: Cast iron
b. Josam: 58180
c. Smith: 4288
d. Zurn: Z-1449
4. Notes:
a. Floor cleanout shall be round.
b. Cleanout plugs shall be ABS.
c. Provide wrench with each type cleanout.
d. For final inspection, contractor shall remove all cleanout plugs and place next to cleanout. After inspection of cleanouts, grease threads and replace plugs.
e. Provide a carpet marker on all cleanouts installed in carpeted floors. See Architectural Drawings for finish schedule.
f. Provide 18" X 18" X 6" concrete pad around outside cleanouts.

2.3 FLASHING

A. Vents Thru Roof: Provide flashing as detailed on Architectural drawings.

2.4 CONDENSATE RECEIVER BOX

A. 20 gauge steel box with enamel finish and 2" drain outlet. Guy Gray model T-200-LV or equal by Water Tite or Oatley.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to 4". Use 4" for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at maximum intervals of 50 feet for piping 3" and smaller and 80 feet for 4" and larger piping.
   4. Locate at base of each vertical soil and waste stack.

C. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated. The Plumbing subcontractor shall coordinate the slope of the floor to floor drains with the quarry tile subcontractor. In general the tile floor shall uniformly slope from wall to floor drain 5/8" in rooms 10' x 10' or smaller and 3/4" in rooms larger than 10' x 10'. In the case of a floor drain serving a specific piece of equipment the floor drain and tile shall be set 1/2" lower than the surrounding floor and "dish-pan" in a 30" diameter around the floor drain.

D. Install deep-seal traps on all floor drains .

E. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 7 - Sheet Metal Flashing and Trim and Division 7 - Roof Accessories.

B. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 221423 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fuel gas piping. Products include the following:
   1. Pipe, tube, fittings, and joining materials.
   2. Protective pipe and fitting coating.
   3. Valves.

1.2 SUBMITTALS

A. Product Data for each type of product indicated shall be submitted under the provisions of Division 22 - Common Requirements for Plumbing Equipment.

B. Welding certificates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals shall be submitted under provisions of Division 22 - Closeout Documents for Plumbing.

1.3 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

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

C. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

B. Deliver products to site under provisions of Division 22 - Common Requirements for Plumbing Equipment.

C. Store and protect products under provisions of Division 22 - Common Requirements for Plumbing Equipment.

1.5 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 - Cast-in-Place Concrete.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING, BURIED AND BEYOND 5 FEET OF BUILDING

A. Contractor has the option of providing steel or plastic piping as follows (materials shall not be mixed):
   1. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ASTM A234, forged steel welding type, with factory installed ANSI/AWWA C105 polyethylene jacket. Provide double layer half-lapped 10 mil polyethylene tape on all joints. Joints: ANSI/AWS D1.1, welded.
   2. Plastic Pipe and Fittings: Wall thickness of plastic pipe shall meet the requirements of Standard Dimension Ratio (SDR) 11.
      a. Polyethylene Pipe and Fittings: ASTM D 3350; Manufactured and tested in accordance with ASTM D 2513. Pipe designation shall be PE 3408, SDR 11, designed for gas distribution. System shall conform to Specification ANSI 15LE.
      b. Fittings and Joints: ASTM D 3261; Fitting materials shall be compatible (Joints equal in strength with the pipe section) with the pipe material. Contractor shall install piping using as few joints as necessary.
      c. Pipe Locating: No. 14 insulated tracer wire and additional 6 inch wide warning tape shall be installed 12 inched above the top of polyethylene pipe for locating buried utilities. Tracer wire and warning tape shall be protected from corrosion. The tracer wire and warning tape shall be installed continuously and shall be accessible at test stations, valve boxes, and above ground valve stations. Tracer wire shall not be welded or fastened to casings. Allow the necessary length of tracer wire at each pit, valve box, and above ground station for accessibility. Installation procedures shall be in accordance with AGA Plastic Pipe Manual for Gas Service.
      d. Anodeless Service Line Risers: Provide polyethylene to steel pipe transition riser at all locations where piping rises to above grade. Risers shall meet ASTM D2513 Category 1 and NFPA 58. All gas carrying steel shall meet ASTM A513. All PE pipe and tubing shall meet ASTM D2513. Continental Industries, Elster Perfection or R.W. Lyall.

2.2 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron, Class 125 or ASTM A234, Class 125 forged steel butt weld type. Joints: Screwed for pipe two inches and under; ANSI/AWS D1.1, welded, for pipe over two inches.

2.3 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in contact with materials that may corrode the pipe.

2.4 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

2.5 VALVES

A. Shutoff Valves, 2" and Smaller: 400 psi WOG; conventional port, 2-piece construction, blow-out proof stem, threaded ends. CSA certified to ANSI/ASME B16.33.
   1. Nibco: T-580-70UL
   2. Hammond: 8204
   3. Milwaukee: BA-200
   4. Watts: FBV-3
   5. Kitz: 58

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for fuel piping system to verify actual locations of piping connections before equipment installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

D. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.3 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Provide chrome plated escutcheon plates for all piping penetrations through walls exposed to view.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient.

E. Install piping to conserve building space and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance for installation and access to valves and fittings.

I. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

K. Install valves with stems upright or horizontal, not inverted.

L. Provide a plug cock wrench for every plug cock.

M. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

N. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

O. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping after insulating, space permitting.

P. Install a gas valve within 3' of the gas connection of all gas using equipment.

Q. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

R. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes 2" and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

U. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

V. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.4 JOINT CONSTRUCTION

A. General: Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Threaded: All threads shall be National Pipe Thread. Apply a commercial grade compound to the male threads only. Ream cut ends and remove all burrs.

C. Welded: Welding procedures and welder qualifications shall be in accordance with ASME B31 Code for Pressure Piping:
   1. 1-1/2" and smaller: Gas weld with oxygen and acetylene.
   2. 2" and larger: Metallic arc weld.

D. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support and equipment support materials and installation requirements are specified in Division 22 - Hangers and Supports for Plumbing Piping and Equipment.

B. Install supports for horizontal steel piping on roof and outside above grade with the following requirements:
   1. Support shall be provided on maximum 8'-0" centers and within 18" of all elbows and tees. All supports on the roof shall have an extra piece of roofing material or walk pad under the support extending a minimum of 4" beyond support base in all directions. See Gas Pipe Support Detail on drawings.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 36 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment according to Division 26 - Grounding and Bonding.
   1. Do not use gas pipe as grounding electrode.

F. Connect wiring according to Division 26 - Conductors and Cables.

3.7 PAINTING

A. All bare steel piping exposed to view provided under this section of specifications, shall be cleaned, primed and painted under Division 9 - Painting. Also, all exterior piping, including piping on the roof and equipment yard, and piping in the mechanical room shall be painted in accordance with these requirements. All gas piping shall be painted yellow unless directed otherwise by the Architect.

3.8 FIELD QUALITY CONTROL

A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

D. Verify correct pressure settings for pressure regulators.

E. Verify that specified piping tests are complete.

END OF SECTION 221123

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes electric water heaters and the following accessories:
   1. Recirculating pumps

1.2 SUBMITTALS

A. Submit product data under provisions of Division 22 - Common Requirements for Plumbing Equipment. For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 22 - Closeout Documents for Plumbing. Data shall include but not limited to:
   1. Water heater data
   2. Circulating pump parts list
   3. Field quality control reports

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. See Division 22 - Closeout Documents for Plumbing for specific warranty information.

PART 2 - PRODUCTS

2.1 WATER HEATER

A. Water heater WH-1 shall be constructed as follows: Water heater shall be glass lined, electric heater and shall have minimum of two elements wired for simultaneous or non-simultaneous operation, as indicated below, each with its own thermostat set to maintain delivery temperature scheduled. The tank shall be insulated with R-16 foam which meets ASHRAE 90A for heat loss efficiency. Basis of design is Bradford White. Provide with an ASME approved temperature and pressure relief valve. Equals by A. O. Smith and Lochinvar are acceptable.
   1. WH-1:
      a. Tank Capacity: 50 gallon
      b. Wattage of Elements (Non-simultaneous):
         1) Upper: 4500
         2) Lower: 4500
      c. Voltage: 208V, 1Ø
      d. Delivery Temperature: 110°F
      e. Manufacturer:
         1) Bradford White Model No. LE350S3-3

2.2 RECIRCULATING PUMPS

A. Recirculating pumps shall be in-line, permanently lubricated specifically designed and guaranteed for quiet operation and suitable for 125 lb. working pressure. Motors shall be drip-proof with built-in thermal overload protectors. Pumps shall have steel shaft supported by permanently lubricated, sealed ball bearings. Pumps shall have water-tight seal to prevent leakage. Manufacturer shall be B & G. Equals by Wilo, Grundfos or Taco are acceptable.
   1. RP-1
      a. B & G Model No.: PL-30
      b. GPM: 5
      c. Head: 6
      d. Voltage: 115
      e. Horsepower: 1/12

B. Aquastat shall be immersion type with brass spud. Set aquastat to start circulating pump RP-1 when the temperature in the return piping reaches 105 degrees F and stop circulating pump when the temperature in the return piping reaches 110 degrees F. Honeywell L4006A or equal by Johnson or Robertshaw.

2.3 WATER HEATER ACCESSORIES

A. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than 3/4".

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases unless noted otherwise.
   1. Concrete base construction requirements are specified in Division 22 - Common Requirements for Plumbing Equipment.

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge as shown on drawings.

D. Install thermometer on outlet piping of water heaters. Refer to Division 22 - Meters and Gages for thermometers.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 - Grounding and Bonding.

D. Connect wiring according to Division 26 - Conductors and Cables.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports for inclusion in Operation and Maintenance Manuals:
   1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain electric water heaters. Refer to Division 22 - Closeout Documents for Plumbing for closeout requirements.

END OF SECTION 223300

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following conventional plumbing fixtures P-1 through P-6 and related components.

1.2 SUBMITTALS

A. Product data shall be submitted under provisions of Division 22 - Common Requirements for Plumbing Equipment. For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 22 - Closeout Documents for Plumbing. Data shall include but not limited to:
   1. Fixture trim exploded view and replacement parts list.
   2. Water cooler parts list

1.4 WARRANTIES

A. See Division 22 - Closeout Documents for Plumbing for specific warranty information.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61 Annex G, "Drinking Water System Components-Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

A. Provide all equipment, fittings, trim, and accessories required for a complete installation.

B. Kohler is basis of design. Equals by Sloan, Crane and Zurn shall be acceptable. Additional acceptable manufacturers for faucets are Moen and T & S Brass.

2.2 FIXTURE SCHEDULE

A. P-1:
   1. Water Closet: Elongated, Handicap with 1.28 GPF manual flush valve
      a. Kohler: K-96057
      b. American Standard: 3461.001
      c. Zurn: Z5665-BWL
      d. Sloan: ST-2029

2. Flush Valve: See Note 1
3. Seat: See Note 3

B. P-2
1. Lavatory: 20 x 18, Handicap
   a. Kohler: K-2006
   b. American Standard: 0356.015
   c. Zurn: Z5368
   d. Sloan: SS-3803
2. Faucet: With ADA lever handles, See Note 7, 0.5 GPM
   a. Kohler: K-800T20-4ANL
   b. American Standard: 6500.140
   c. Zurn: Z-831-R1-XL
   d. T & S Brass: B-2992-CR
3. Drain: 1-1/4" Offset Grid
   a. Kohler: K-13885
   b. American Standard: 7723.018
   c. Zurn: Z-8746
4. Trap: Size 1-1/4". See Notes 4 and 9
5. Supplies: See Notes 5 and 9
6. Carrier: See Note 6

C. P-3
1. Single Bowl Sink: 18 gauge stainless steel, 3 hole punching, maximum 5-1/2" deep with rear center drain punching
   a. Just: SL-ADA-2125-A-GR
   b. Elkay: LRAD-2521-A3
   c. Acorn: SDADA-2522-55-3
   d. Equal by Kohler
2. Faucet: See Notes 7 and 8
   a. Kohler: K-800T70-4AKL
   b. American Standard: 6530.140
   c. Zurn: Z-831-B1-XL
   d. T & S Brass: B-2851-CR
3. Drain: 1-1/2" offset grid
   a. Just: J-ADA-35FS
   b. McGuire: 1149WC
   c. Zurn: Z-8750.
4. Trap: Size 1-1/2". See Notes 4 and 9
5. Supplies: See Notes 5 and 9
6. Flow Control: See Note 10

D. P-4
1. Service Sink: Floor mounted
   a. Fiat: TSB-3000
   b. Stern Williams: HL-1810
   c. Acorn: TDF-24-SSC
2. Drain: 2" caulk connection
   a. Kohler: K-9147
   b. American Standard: 8303.076
   c. Eljer: 803-0640
3. Faucet: With 5' rubber hose and wall hook, See Note 7
   a. Kohler: K-8928
   b. American Standard: 8351.076

c. Zurn: Z842L1-LSI-WHK
d. T & S Brass: B-0669-POL

E. P-5
1. Water Cooler: Vandal resistant electric wall hung with push button on front with stainless steel cabinet and bubbler keyed into position to prevent rotation
a. Elkay: VRC8S
b. Oasis: PGV8AC
c. Murdock: A171408S-UG-VR
d. Equal by Halsey Taylor or Murdock.
2. Trap: Size 1-1/4". See Notes 4 and 9
3. Supply: See Note 5
4. Carrier: See Note 2

F. P-5A
1. Water Cooler: Vandal resistant electric wall hung handicap accessible with push button on front with stainless steel cabinet and bubbler keyed into position to prevent rotation. Bottle filling unit shall be sensor operated and include a 20 second automatic shut-off timer and a display count of plastic bottles saved from waste. Bottle filler shall provide 1.1 to 1.5 gpm flow rate with laminar flow to minimize splashing. Unit shall include filter. Unit shall meet ADA guidelines and shall be lead free certified to NSF/ANSI 61 and 372.
a. Elkay: LVRCGRN8WSK
b. Oasis: PGV8EBF
c. Murdock: A171408S-UG-VR-BF12-BCD-WF1EZ
d. Equal by Halsey Taylor or Murdock.
2. Trap: Size 1-1/4". See Notes 4 and 9
3. Supply: See Note 5
4. Carrier: See Note 2

G. P-6
1. Ice Maker Connection: 20 gauge white powder coated steel box and faceplate with 1/4 turn valve and water hammer arrestor installed.
a. Guy Gray: 88531
b. Equal by Water Tite or Oatey.

H. PLUMBING FIXTURE NOTES
1. Manual flush valves shall be diaphragm type. Flush valves for standard water closets shall be Sloan 115-1.28. Flush valves for handicap water closet shall be 111-1.28. Flush valves shall have vandal proof trim, ADA handle, solid ring pipe support, 1.28 gallon flush and sweat adapter kit. Mount 24" above bowl on standard water closets and 12" above bowl for handicap water closets. On handicap fixtures, handle shall be on the wide side of the water closet. Equals by Moen and Zurn are acceptable.
2. Water cooler carriers shall be Josam 17900, Smith 830, Wade W-400-AM11, Watts CA-321 or Zurn ZR-1225.
3. Water closet seats shall be white, solid plastic with self-sustaining check hinge. Bemis 1955SSC, Plumbtech 421SSC, Church 295SSC, or Olsonite 10-CC-SS.
4. Traps shall be 17 gauge adjustable "P" traps with cleanout and wall plate. Exposed surfaces shall be polished chrome. Manufacturers: Kohler, Eljer, EBC, McGuire, Brasscraft or Zurn. Provide tail piece pipe to equipment furnished under other sections or by Owner.
5. Stops shall be angle type 1/2" copper sweat extension tube inlet x 3/8" O.D. compression riser and loose key, lock shield. Risers shall be flexible copper one-piece with insert. Exposed surfaces shall be chrome plated. Provide bell escutcheon at wall. Brass Craft SCS400AC, McGuire LF170 LK, or Zurn Z-8808-LR-LK-XL.

6. Lavatories carriers shall be concealed arm type. Josam 17100, Smith 700, Wade 520, Zurn ZR 1231 or Watts WCA-411. Anchor to floor per manufacturer's recommendations with bolts equal to Hilti "Kwik Bolt II".
7. Provide quarter turn ceramic disc cartridge, rigid connector, and lever handles on faucets.
8. Provide a 7/8" fender washer with a 1/16 nominal thickness between the sink or lavatory and the spout nut. Discard the manufacturer's standard washer.
9. Insulate water supplies, offset grid drain and 'P' Trap on lavatories and drain and 'P' trap only on water coolers with fully molded Handi Lav-Guard insulation manufactured by Truebro., P.O. Box 429, Ellington, CT 06029; Phone (203) 875-2868. Color shall be white. Equals by Skal Gard, McGuire (ProWrap), Plumberex (Pro 2000) or EBC are acceptable.
10. Flow control shall be laminar flow, pressure compensating delivering 1.5 gpm on sink faucets over inlet pressure range of 40-120 psig. Device shall be vandal resistant. OMNI series 200, T & S Brass B-199-21 or equal by Kohler.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

C. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install counter-mounting fixtures in and attached to casework.

C. Install fixtures level and plumb according to roughing-in drawings.

D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball valves if supply stops are not specified with fixture. Valves are specified in Division 22 - General-Duty Valves for Plumbing Piping.

E. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

F. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

G. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

H. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

I. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

J. Install traps on fixture outlets. Traps shall be readily accessible for servicing and cleaning.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

K. Install chrome plated escutcheons at piping penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

L. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 - Joint Sealants.

M. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

3.3 CONNECTIONS

A. Wall Hung and Back Outlet Water Closets: Fixture carrier as specified with fixture.

B. Floor Mounted Water Closets: 4" PVC stub with PVC flange and preformed wax setting ring. Provide brass mounting bolts. Offset flanges shall not be acceptable.

C. Lavatories and Water Coolers: 1-1/4" type "M" copper arm with 1-1/4" C-PVC adapter at stack.

D. Service Sink: 2" caulk drain as specified herein.

E. Hot and Cold Water Supply Piping to Fixtures: Chrome plated when exposed.

F. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

G. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

B. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

C. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

D. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Adjust all wrist blade and lever handles to be parallel with the wall the fixture is mounted on when in the "off" position.

C. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 230513 - COMMON REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED WORK

A. All Division 23 sections.

1.2 WORK SEQUENCE

A. Install mechanical piping, duct, controls, equipment and accessories as construction progresses so cutting and patching of new construction will not be required. See also paragraph "Sequencing and Scheduling" herein.

B. The existing building will be occupied during construction. The Contractor shall schedule work so as to minimize disruption to the normal operation of the facility in accordance with instructions and schedules provided by the Architect and/or Owner.

1.3 SUBMITTALS

A. Provide submittals in accordance with Section 013300 - Submittal Procedures.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 230529 - Hangers and Supports for HVAC Piping and Equipment
      a. Upper attachments
      b. Pipe attachment (hangers and clamps)
      c. Lower pipe supports
      d. Metal framing channel
      e. Roof mounted equipment supports
         1) Roof curbs for RTAC units
         2) Roof curbs for pipe box assemblies and pipe box/hood assemblies
         3) Equipment support rail for ductless condensing units
         4) Equipment support rail for electrical disconnects.
         5) Pipe box assemblies
         6) Acoustic roof curbs
      f. Vibration isolators
      g. Non-penetrating type equipment supports
         1) Condensate pipe on roof
   2. Section 230593 - Testing, Adjusting, and Balancing for HVAC
      a. TAB Agent NEBB or AABC Certificate (Do not submit samples of TAB forms)
   3. Section 230716 - HVAC Equipment Insulation
      a. Insulation Product Information
      b. Jackets and Accessories Product Information
      c. Proof of Insulation Contractor's Three Years Experience

d. System sheet for each system identifying material, thickness and finish for each system.

4. Section 230900 - Instrumentation and Controls for HVAC
   a. Control Product Data
   b. Sequence of Control
5. Section 232300 - Refrigerant Piping
   a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
6. Section 233113 - Metal Ducts
   a. Fiberglass ductwork liner for interior duct
   b. Note Concerning Duct Shop Drawings: The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.
7. Section 233300 - Air Duct Accessories
   a. Backdraft dampers.
   b. Volume control dampers, manual type.
   c. 90-degree straight saddle tap.
   d. Fire dampers.
   e. Low pressure flexible ducts.
   f. Bellmouth take-off collars.
   g. 45-degree take-off collars.
8. Section 233423 - HVAC Power Ventilators
   a. Ceiling Mounted Exhaust Fans
9. Section 233713 - Diffusers, Registers, And Grilles
   a. Diffusers, Registers and Grilles
10. Section 233723 - HVAC Gravity Ventilators
    a. Wall caps.
11. Section 234100 - Particulate Air Filtration and Bi-Polar Ionization Units
    a. Medium Efficiency (MERV 6 & 8) Filters
    b. Bi-Polar Ionization Units
12. Section 238119 - Self-Contained Air-Conditioners
    a. Rooftop Air Conditioning Units
13. Section 238126 - Split-System Air-Conditioners
    a. Ductless Wall Mounted Fan Coil Units
    b. Ductless Heat Pumps and Condensing Units
14. Section 238240 - Electric Heaters
    a. Electric wall heaters
15. Letter from Contractor stating submittals have been checked and comply with the Contract Documents
16. Certification that all items are furnished under this contract are free of hazardous materials (e.g. asbestos, PCBs)

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Submittals shall only include the products relevant to this specific project. Submittals shall not include other products produced by the manufacturer which are not specified on this project. Submittals containing several products on the same sheet shall have an arrow or other marker to identify the specific product

submitted. Also, submittals for a single product that have options shall have an arrow or other marker to identify that the specified options are being provided. Submittals that include products not specified for this project, or that include several products on one sheet without being marked, or that do not show options selected shall be rejected. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Review, Corrections, or Comments made on the Submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addendums (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

K. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the “Submittal Review” sheet. Only one copy of the submittal review sheet is returned upon completion of the review for each trade.
   1. RNE - Reviewed, No Exceptions Noted
      a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
      b. No corrective action required at this time.
   2. FNC - Furnish with Noted Corrections
      a. Indicates the contractor shall ensure that all necessary or noted corrections are incorporated into equipment furnished to the project.
      b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
   3. RES - Revise and Resubmit
      a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
      b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
   4. PSD - Provide Submittal Data
      a. Indicates submittal data was not provided for this item or section.
      b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

L. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All items shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractor’s failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.4 REGULATORY REQUIREMENTS

A. All work installed under Division 23 shall conform to the current adopted Edition of Building/Mechanical Codes and their appropriate amendments:
   1. Life Safety Code, NFPA 101
   2. International Building Code with Georgia Amendments
   3. International Mechanical Code with Georgia Amendments

4. Standard for the Installation of Air Conditioning and Ventilating Systems, NFPA 90A
5. International Gas Code with Georgia Amendments
6. National Fuel Gas Code, NFPA-54
7. City of McDonough and Henry County Codes
8. Requirements of the State of Georgia Fire Marshall's Office.
9. ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality.
10. GA State Minimum Standard Energy Code.

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein. All fans shall be AMCA certified and bear that label for performance and sound. All air conditioning equipment shall be AHRI certified and bear that label.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.5 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

1.6 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 23 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g., ceiling plenums, mechanical rooms, etc.) are coordinated and installed to insure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than twelve-week fabrication schedules. See Division 1 - Summary for additional requirements.

D. Phasing: Contractor shall conform to phasing plans as stated in the Architectural contract documents.

1.7 ACCEPTABLE PRODUCTS

A. Basis of Design: Model numbers indicated herein or shown on the drawings are the Basis of Design and are based on the most recent literature provided to the Engineer from the Manufacturer's Representative. The Contractor may substitute equal and approved equipment from the basis of design manufacturer or manufacturers listed in this specification (or set forth in an addendum) provided said equipment has all features which are inherent with the "Basis of Design" equipment, meets all requirements of the plans and specifications, has like electrical characteristics (e.g., same voltage, phase, ampacity/fusing/circuit breaker requirements, single or multiple points of connection as indicated on the electrical drawings), and will properly fit in

the available spaces in the building or on the roof. If the Contractor chooses to provide equipment which meets all of the aforementioned requirements, but has different characteristics, from that shown on the Contract Electrical Drawings, he shall bear all costs associated with that substitution. Electrical costs include, but are not limited to materials (breakers, fuses, disconnects, wiring, conduits, panels, starters, contactors, and the like) installation costs and re-engineering. All electrical connections shall be coordinated with the Engineer and with the electrical subcontractor. Other costs may include, but are not limited to, additional structural support for heavier equipment than basis of design.

B. Prior Approval: Substitutions of specified items and prior approvals of other manufacturers will not be considered.

C. Acceptable Products: Where a manufacturer has been listed as being acceptable in the various specification sections (or addendums) hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of their standard product. The manufacturer's product shall still comply with all of the requirements and standards of this specification and not necessarily their standard specification, to the extent that it might require special custom manufacture to meet the requirements and standards of this specification, the requirements of the drawings and the inherent features of the "Basis of Design". Submitted products, not complying with the explicit requirement of these specifications and drawings and with the features of the "Basis of Design" will be rejected even if their manufacturer is listed in the specifications.

1.8 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.9 SPACE CONDITIONS AND SERVICE CLEARANCE

A. All equipment and materials shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. All equipment normally requiring service shall be made readily accessible by not locating it above (behind, etc.) piping, ductwork, conduit or other systems. Contractor shall also provide access by means of access panels, doors, etc. to be provided under this section of specifications where required or specified. Provide sufficient space to allow service (e.g. filter removal) of all equipment. Coordinate with all trades to ensure accessibility and service of all equipment. Equipment located above lift out ceilings shall be considered to be accessible. Equipment located above hard (unremovable) ceilings shall be considered to be unaccessible and access panels shall be provided as specified herein.

B. The contractor shall be responsible for verifying that the particular manufacturer's equipment that he chooses will fit in the available space, and shall verify (prior to submitting equipment) that the service clearances that the manufacturer requires are available, and shall not submit equipment that will not allow the manufacturer's service clearances. This also applies to roof-mounted equipment. During construction, the contractor shall install the equipment such that the manufacturer's service clearances are provided by reading the installation instructions. The contractors shall bear all costs associated with providing equipment that requires service clearances different from the basis of design equipment. If the manufacturer's service clearances are not provided, the contractor shall remove the equipment and provide equipment with service clearances equal to the basis of design equipment. The contractor shall submit a

detailed sketch and description of any modifications to install the particular manufacturer's equipment that he chooses, to demonstrate that the equipment will fit and have the manufacturer's service clearances. The sketch is not submitted for review or approval or for confirmation that it is correct, only to certify that the contractor has completely considered the installation of substitute equipment.

1.10 MOISTURE INTEGRITY

A. Roof: All roof penetrations shall be watertight and comply with the roof manufacturer's requirements and recommendations so as to be covered by the roof "Bond". All roof penetrations shall be made inside roof curbs (conforming to the requirements of Division 23 - Hangers and Supports for HVAC Piping and Equipment). Pitch pockets are not acceptable.

B. Wall: All wall penetrations shall be sealed and caulked watertight.

1.11 NOISE AND VIBRATION

A. When in operation, all systems included in this section of specifications shall be free from objectionable or abnormal noise and vibration. See Division 23 - Hangers and Supports for HVAC Piping and Equipment of the specifications for specific vibration isolation requirements.

1.12 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Maintenance of Filters: The Contractor shall be responsible for maintaining all air filters until Architect's Final Certificate. No air system shall be operated at any time without air filters and filters shall not be allowed to become overloaded with dust and dirt. For throwaway filters, new clean filters shall be installed. See also paragraph “Air Handling Equipment Operation During Construction Period”.

C. During Construction: Pipe openings shall be closed with caps or plugs. All open duct shall be sealed tight with polyethylene. All equipment and material shall be stored in accordance with manufacturer's recommendations. No equipment, ductwork, piping, or materials shall be stored inside or outside the building unless it is properly protected from the weather. The Engineer reserves the right to reject any items furnished under Division 23 which have been damaged or are not in "like-new" condition. To minimize the potential for humidity damage to ceiling tiles and other hygroscopic material, during construction all outdoor air intake openings at HVAC equipment shall be closed, and temporary means shall be used to ensure openings cannot be opened. Openings shall be opened immediately prior to turning work over to Owner.

D. Suspended Ductwork, Suspended Equipment and Suspended Piping: Installation of suspended HVAC ductwork in areas where the roof is not "dried in" is only acceptable if the Contractor coats each joint of the supply, return, outdoor air and exhaust duct with duct sealant as specified. Contractor is also required to wrap suspended ductwork, equipment and piping on three sides with a minimum 4 mil thickness polyethylene taped to the bottom of the ductwork, equipment and piping. Polyethylene covering is required to protect from the weather, water, dirt, roof tar, concrete, etc.

E. Non-Suspended Ductwork, Equipment and Piping: Contractor is required to wrap mechanical equipment, ductwork and piping that is not suspended with two layers of 4 mil polyethylene.

F. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in ductwork and equipment casings shall be straightened or replaced.

G. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.13 AIR HANDLING EQUIPMENT OPERATION DURING CONSTRUCTION PERIOD

A. For the purpose of this paragraph, air handling equipment shall include, but is not limited to, air moving equipment such as fan coil units, rooftop air conditioning units, PTAC units, etc. Air handling equipment shall not be operated for space heating or cooling or air filtering during construction. Equipment shall be operated only to provide start up, check out, balancing, testing etc., in order to meet “Substantial Completion” goals and provide a complete working system to turn over to Owner. If air handling equipment must be operated during construction to “dry out” the building or to maintain temperature conditions required by flooring, paint, or other building compartment products, mechanical contractor shall have written permission from General contractor and Owner prior to operating.

B. Permanently installed air handling equipment used during construction shall not be operated during sanding, masonry cutting, or other operations generating airborne particulate. Where air handling equipment is utilized during construction, units shall be provided with filtration media with a minimum efficiency reporting value (MERV) of 8 at each return grille/duct as determined by ASHRAE 52.2. Air filtration shall be replaced as specified prior to Occupancy. If air handling cooling/heating coils are found to be overloaded with dirt/dust it shall be the mechanical contractor’s responsibility to clean coils to ensure maximum performance. If equipment must be operated during these activities mechanical contractor shall have written permission from General contractor and Owner prior to operating.

C. Permanently installed supply duct and air handling equipment conveying 65°F or less supply air shall be insulated as specified and building construction shall be near completion (tightly sealed) prior to operating air handling equipment. This requirement is included to limit the possibility of condensation on ductwork, HVAC equipment, on the exterior of duct insulation, grilles, building structure, etc., especially in the presence of uncontrolled outdoor air entering the building prior to sealing. Mechanical contractor shall be responsible for any damage caused by duct/equipment condensation (e.g. insulation, building materials, ceiling tiles or sheetrock ceilings, flooring etc.). If equipment must be operated prior to duct insulation and vapor barrier on ducts/equipment being complete and building sealing not finalized, mechanical contractor shall have written permission from General contractor and Owner prior to operating.

1.14 ELECTRICAL

A. General: Motors, controls, relays and switches required for proper operation of equipment covered under this section shall be furnished and installed under this division of the specifications.

B. Wiring: All control and interlock wiring shall be furnished and installed under Divisions 23 - Mechanical. Power wiring through the disconnect and starter and to the motor shall be furnished and installed under Electrical Section. All control wiring and conduit shall conform to the material and installation requirements of Division 26.

C. Electrical Connections: Voltage, phase, ampacity and connection arrangement (e.g. single or multiple point) of each item of electrically driven equipment provided under this section of specifications shall conform to that shown on the Electrical drawings.

D. Electrical Characteristics: The horsepowers, voltages and phases shown on the drawings and specified herein, are the estimated power requirements of all equipment furnished herein and is the basis of the design shown on the electrical drawings. If the Contractor provides equipment from the "Basis of Design" manufacturer or from other approved manufacturers with larger horsepowers, different voltages, different phases or ampacity, he shall coordinate with other trades to provide any additional wiring, circuitry, starters, breakers, transformers, etc., as required at no additional cost to the Contract.

1.15 MOTORS

A. General: This paragraph is applicable to all Division 23 specification sections. Motors less than 250 watts and used for intermittent service may be manufacturer's standard.

B. Motor Enclosures: Motor enclosure shall be appropriate for the environment that the motor will be in. In the absence of specifically identified motor enclosure style, the following requirements shall apply. Motors located in exterior locations, wet air streams, etc. shall be totally enclosed fan cooled (TEFC). Motors located in interior locations, in mechanical rooms, in dry air streams, etc. shall be open drip proof (ODP).

C. Motors Efficiency: Each motor 1 hp and above shall have a guaranteed minimum efficiency complying with the Energy Independence and Security Act of 2007 (EISA), and as specified below, and a minimum power factor of 82.5. Multi-speed motors do not have to comply with these efficiencies. Each motor's NEMA nominal efficiency shall be shown on the motor nameplate. Efficiency and losses shall be determined in accordance with the latest revision of IEEE Standard 112, Method B, using "Accuracy improvement by segregated loss determination including stray load loss measurement." Motors shall meet the minimum NEMA premium motor efficiency, as outline in MG1 Table 12-12, which is higher than the EPACT efficiency. Each submittal shall show that motor meets this guaranteed minimum efficiency, and that efficiency was measured according to this specification. Minimum efficiencies for 4-pole 1750 rpm motors are listed below:
   1. Motor HP 1: Minimum Premium Efficiency: 85.5

D. Motor Service Factor: Motor service factor for all equipment 1/8 hp and above shall be 1.15 for ODP motors and 1.0 for totally enclosed motors.

E. Motor Speed: Maximum 1800 rpm. Single phase, ODP motors shall be equipped with speed controllers as specified on plans.

F. Motor Thermal Overload Protection: All single-phase motors shall be provided with integral overload protection. Internal protection shall automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

G. Bearings (Single Phase Motors): Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

H. Bearings (Three Phase Motors): Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

I. Motor Nameplate: Provide on all motors 1/4 hp and above a permanent visible engraved nameplate indicating horsepower, RPM, voltage, phase, amps, cycles, full load amps, locked rotor amps, frame size, service factor, power factor and efficiency.

J. Motor Type: All single-phase motors shall be provided with motor type suitable for starting and operating torque. Shaded pole motors shall be allowed on 1/20 hp or less motors only. Split-phase, capacitor start, permanent split capacitor and capacitor start/capacitor run shall be provided on all single-phase motors above 1/20 hp based on specific torque requirements.

K. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

L. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Whenever starting requirements exceed operating requirements, the motor shall be large enough to start the equipment without overheating. As a minimum, motors shall be sized at 120% of design BHP requirements, except that motors controlled by VFD’s shall be sized at 115% of design BHP. Each motor shall be sized to drive the equipment taking into account belt losses.

M. Motors controlled by Variable Frequency Drives: All motors that are controlled by a variable frequency drive shall be either premium efficiency type or inverter duty rated. Motor windings shall be insulated with Class F insulation or Class H insulation. General high efficiency motors and motors with Class B insulation shall not be allowed. Motor manufacturer shall certify in writing with motor submittal that motor is compatible with variable frequency drive usage.

N. Motor Hz Design Requirements: Manufacturer's that utilize variable frequency drives for fan control shall submit design operating frequency (Hz) of fan. Fans designed for constant speed operation, which utilize a VFD for balancing purposes, shall not be allowed to be above 65 Hz so that adjustment to increase fan speed may be made.

1.16 PAINTING

A. All bare steel piping, pipe fittings, pipe hangers, supports and miscellaneous metal exposed to view provided under this section of specifications, shall be cleaned and painted under the Architectural painting section of the specifications.

1.17 CLEANING

A. The Contractor shall keep the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements related to site cleanliness including dust control.

1.18 ACCESS PANELS

A. Some mechanical systems may be made inaccessible by the installation of "hard" ceilings or by walls above the ceiling. See the finish schedule and the floor plans (architectural drawings) for the location of all "hard" ceilings and walls which extend above the ceiling. Provide access panels in these ceilings or walls (and any other locations where mechanical items are made inaccessible by ceilings or walls) for access to mechanical equipment and items requiring access above these ceilings.

1.19 STRUCTURAL COORDINATION

A. The party responsible for the installation of the system furnished under Division 23 shall provide the General Contractor with the weight of all mechanical equipment and ductwork and piping and the exact location. General Contractor shall then ensure all structural members are properly sized and all mechanical penetrations are properly framed to support the full perimeter of the equipment. See also paragraph "Acceptable Products".

1.20 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers, and shall use these numbers wherever required. (For example, room numbers are used in programming of control systems, and shall match the Owner's final choice.)

END OF SECTION 230513

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230514 - CLOSEOUT DOCUMENT REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mechanical Closeout Document Requirements which are specifically applicable to all Division 23 Sections, in addition to the requirements of Division 1 - General Requirements.

B. HVAC Closeout document requirements.

C. Record Document Submittals "As-Builts".

D. Contractor Guarantee.

E. Manufacturer Warranties.

F. Operation and Maintenance (O&M) Manuals.

G. Manufacturer's Field Services and Start-up by Factory Authorized Personnel

1.2 RELATED WORK

A. All Division 23 sections.

1.3 RECORD DOCUMENT SUBMITTALS “AS-BUILTS”

A. The contractor shall be required to maintain a clean, undamaged set of blue or black line white prints of contract drawings and shop drawings.

B. The HVAC contractor shall mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
5. "As-builts" shall be submitted to the architect/engineer for review of the mechanical as installed upon completion of the work. Changes on "as-builts" are to be shown using standard engineering drafting practices. Freehand drawn changes will not be accepted.

1.4 CONTRACTOR GUARANTEE

A. All equipment and materials furnished (and/or installed under this section) and all work performed under this section of specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after date of substantial completion. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.5 MANUFACTURER'S WARRANTIES

A. Provide as a minimum a one (1) year manufacturer’s equipment warranty against defective components for each piece of equipment and its components installed under their respective specification section prior to final inspection in accordance with each of the trades listed below. Equipment warranties shall commence on the date of Substantial Completion as established in

the Certificate of Substantial Completion issued by the Architect. Contractor shall note that there may be more than one certificate of Substantial Completion and date of Substantial Completion for this contract. Any parts which fail during the first year shall be replaced by the Contractor at no additional cost to the Owner.

B. Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work. Equipment and parts requiring warranties longer than one (1) year will be listed below.
   1. All HVAC equipment containing compressors shall have a five (5) year manufacturer's parts only warranty on the compressor.
   2. Rooftop Air Conditioner: 5 year manufacturer's parts only warranty on refrigeration compressors, 10 year non-prorated materials only on gas fired heat exchangers
   3. Pipe Box Assembly: 20 year manufacturer's parts only warranty.

1.6 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Operating and maintenance manuals shall comply with Division 1 - Operation and Maintenance Data.

B. One bound and indexed Operating and Maintenance Manual and two electronic (PDF format on CD or thumb drive) copies shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binder shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

C. Each Manual shall contain the following information, data and drawings. The exact format and order of the following information shall comply with Division 1's requirements. If no Division 1 requirement exists, format and order shall be as listed below.
   1. List of Contents. Insert under clear front cover of binder.
   2. Contractors one (1) year guarantee.
   3. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
   4. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
   5. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.

1.7 MANUFACTURER'S FIELD SERVICES AND START-UP BY FACTORY AUTHORIZED PERSONNEL

A. Refer to each specification section for additional requirements the manufacturer shall provide under the provisions of this specification.

B. Upon completion of the equipment installation the Contractor shall obtain the services of the factory authorized and trained representative at no additional cost to the owner to perform a start-up of the piece of installed equipment. The factory authorized and trained representative shall submit a certificate or letter stating the equipment has been successfully started, adjusted and tested in accordance with the manufacturer's recommendations. Contractor shall refer to each specification section to determine which equipment/systems require start-up by factory authorized personnel. Some representative equipment/systems which require start-up are listed below.
   1. Rooftop Air Conditioning Units
   2. Controls

END OF SECTION 230514

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following hangers, supports and accessories for mechanical system piping and equipment:
   1. Coatings
   2. Upper attachments
   3. Pipe attachment (hangers and clamps)
   4. Metal Framing Channel
   5. Hanger Rods
   6. Insulation Shields
   7. Sleeves
   8. Roof Mounted Equipment Supports

1.2 PERFORMANCE REQUIREMENTS

A. All supports utilized under Division 23 shall meet the sizing criteria specified herein. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5). All support sizes specified herein (for hanger rods, trapeze hangers, pipe attachments, etc.) are minimum sizes required. Contractor shall utilize larger size supports where actual loads dictate a larger support.

1.3 SUBMITTALS

A. Submit and product data under provisions of Division 23 - Common Requirements for HVAC Equipment.

B. Submit product data on roof equipment curbs and supports and non-penetrating roof supports.

1.4 WELDING REQUIREMENTS

A. Welding Requirements: All welding performed to support Mechanical piping and equipment shall comply with AWS D1.1, "Structural Welding Code - Steel”. Welders shall be qualified per AWS and welding certificates shall be posted at the jobsite.

1.5 COATINGS

A. All supports for piping and equipment, hangers and accessories, including but not limited to bolts, nuts, washers, rods, beam clamps, etc., shall be galvanized, except as indicated in the following paragraphs.

B. Hangers and supports in direct contact with copper piping shall be copper plated.

PART 2 - PRODUCTS

2.1 UPPER ATTACHMENT

A. Steel Beams:
   1. Piping 2" and smaller: Malleable Iron C-Clamp with Lock Nut.
      a. B-Line: B 3033 or B3034
      b. C&P: 192
      c. Anvil: 92
      d. Erico/Michigan: 280
      e. PHD: 350 or 360
      f. FNW: 7203 or 7204

B. Steel Bar Joist: Malleable Iron C-Clamp with Lock Nut.
   1. B-Line: B 3033 or B3034
   2. C&P: 192
   3. Anvil: 92

4. Erico/Michigan: 280
5. PHD: 350 or 360
6. FNW: 7203 or 7204

2.2 PIPE ATTACHMENT

A. Copper tubing hangers: Size pipe hangers for refrigerant suction and condensate piping to fit outside insulation, with insulation shield installed between the hanger and the pipe insulation.
   1. B-Line: B3170CT
   2. C&P: 800CT
   3. Anvil: CT-69
   4. Erico/Michigan: 101
   5. PHD: 152
   6. FNW: 7015EC

2.3 METAL FRAMING CHANNEL

A. Where possible and practical, piping may be supported with trapeze hangers consisting of a metal framing system of channel, fittings, and hardware as defined in the Metal Framing Manufacturer's Association Standard Publication MFMA-1. Length of trapeze supports shall not exceed 4 feet unless contractor performs and submits calculations which indicate the channel is within the manufacturer's recommendations with a safety factor of 30% added to the load.

B. Vertical Pipe Supports: Where shown on the drawings, vertical routed piping shall be supported and/or stabilized by steel channel meeting the requirements for channel as specified herein.

C. Channel shall be constructed of 12-gauge steel. Nominal width shall be 1-5/8" x 1-5/8" with a 9/16" wide and 7/8" long slot face opening, with slots on 2" centers. Channel shall be pre-galvanized in accordance with ASTM A 653 G90, or have a factory applied electro-deposited epoxy finish.

D. Pipe clamps shall be sized as follows:
   1. Non-insulated Steel Piping: Sized to fit piping.
   2. Insulated Piping: Sized to fit outside of insulation.
   3. Copper Piping: Sized to fit outside of piping plus elastomeric isolation material.

E. Approved Manufacturers: B-Line Model B22SH, Elcen, Unistrut, and Superstrut by Midland-Ross.

2.4 HANGER RODS

A. Steel Hanger Rods: Continuous threaded rod. Size as indicated in individual piping specification sections.

B. If no size is given, rod size shall be minimum 3/8", unless actual load dictates a larger rod. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5).

C. Rod couplings shall be:
   1. B-Line: B3220
   2. C&P: 167
   3. Anvil: 136, 136R
   4. Erico/Michigan: 26
   5. PHD: 100, 105

2.5 INSULATION SHIELD

A. Provide insulation shields at all pipe hangers installed on the exterior of the insulation and at all pipe clamps and trapeze supports. Shields shall be fabricated from minimum 18-gauge galvanized steel. Shields at pipe hangers shall be 12" long with a 180-degree arc. Shields at pipe clamps shall cover entire pipe. Contractor may utilize the following shields:
   1. B-Line: B3151

2. C&P: 265P
3. Anvil: 167
4. Erico/Michigan: 121
5. PHD: 170
6. FNW: 7750

2.6 SLEEVES

A. Pipe Sleeves: Pipe sleeves thru walls shall be fabricated as shown on mechanical drawings. Sleeve shall be flush with both sides of walls, unless noted otherwise on drawings.

2.7 ROOF MOUNTED EQUIPMENT SUPPORTS (CURB TYPE)

A. General: Furnish and install roof mounted equipment supports as specified below. Unless otherwise indicated, the supports shall be installed on the roof deck before the application of roofing insulation materials. All roofing membranes shall be continuous up to the nailer.

B. Roof Curbs: 18-gauge galvanized steel, unitized construction with full mitered corners and all seams welded or bolted/screwed. Provide 1-1/2" thick, 3 lb. density rigid fiberglass insulation on the exterior or interior surfaces. Provide a 1-1/2" wide pressure treated wood nailer strip around the top perimeter above the insulation and below the top of the curb. 45° fiber cants, minimum of 4" high around perimeter of curb shall be provided under Architectural Section. Curbs shall have vertical sides. THESE CURBS SHALL NOT BE USED WHERE DRAWINGS INDICATE ACOUSTIC TYPE ROOF CURB. Provide curbs for the following roof mounted equipment:
   1. Rooftop air conditioning units
   2. Pipe Box Assemblies

C. Equipment Support Rails: 18-gauge galvanized steel, unitized construction with integral base plate and all seams welded. Provide continuous pressure treated wood nailer along the length of each support, 1-1/2" thick, minimum 4" wide (and minimum 10" wide for ductless heat pumps/condensing units), with counter flashing held in place with cadmium plated lag screws. Supports shall be internally reinforced as required for the equipment load. Provide 1-1/2" thick, 3 lb. density rigid fiberglass insulation on the interior of the support rail. Supports shall have vertical sides similar to Pate Style ES-2B. Provide supports for the following roof mounted equipment:
   1. Ductless heat pump/condensing unit
   2. Electrical disconnect support

D. Pipe Box Assembly: Pipe box assembly shall be constructed of heavy gauge powder coated welded aluminum with gaskets and stainless-steel hardware and minimum 20" tall curb. Unit shall be a three-piece configuration, consisting of a removable vandal resistant lid, middle housing, and wide flanged curb. Exit seals are of an aluminum, or stainless-steel configuration, utilizing SilX14 gasket seal, to accommodate the appropriate size of pipe, cable, or desired penetrant. The Exit Seals™ must be installed per the manufacturer’s installation instructions. Verify Exit Seal™ seal size and quantity before ordering. Exit seals and housing shall be warranted for 20 years for parts. Pipe box shall be "The Vault" model number AW201412 as manufactured by RPH, with Silx exit seals., or equal model number AL201412 by Alta with Sigrist exit seals. All penetrations must use the specified manufacturer furnished exit seals for the warranty to apply. All penetrants exiting the Vault™ must be supported within 12" after exiting. Penetrants must only pass through the housing portion of the assembly. Any deviations from the above requirements must be discussed with the factory before proceeding.

E. Height: Roof mounted equipment supports shall be a minimum of 14"high from the base plate to the top of the curb and 12" above the roof surface. Exact height shall be determined by the supplier, by selecting a curb height that will ensure the top of the flashing is a minimum of 12" above the highest elevation of adjacent roof surface.

F. Slope: Roof mounted equipment supports shall be fabricated to incorporate a slope to match the roof slope, so that the top of the curb is level with its base plate resting flat on the roof deck. Refer to the Architectural drawings for the exact roof slope. Where roof equipment is installed on moderately to steep sloped roofs (greater than 2 in 12 pitch), the shortest side of the curb may be reduced to 6" high.

G. Insulation: If roof curb provider does not furnish factory installed insulation, contractor shall notify insulation contractor so that insulation contractor can indicate this in submittals and provide insulation.

H. Manufacturer's: Pate, MicroMetl, A.E.S., Thy, Custom Curb, Curbs Plus, S & L Manufacturing, Creative Metals, Metal Form, Shipman, Roof Products and Systems or by the equipment manufacturer of the rooftop equipment.

2.8 ACOUSTIC TYPE ROOF CURB

A. 18-gauge galvanized steel with fully welded one-piece construction. Provide one-inch thick 3.0 lb./ft.^{3} density fiberglass insulation of four perimeter walls. Provide solid steel bottom (except at supply and return locations for units with supply and return duct connections located inside the curb). Bottom shall be covered with four layers of 1/2" (minimum) gyp board, then two-inches minimum of fiberglass or rock wool insulation. Provide full height rails from floor to top of curb around supply and return duct connections, with 2" thick insulation around rails. Provide pressure treated wood nailer around perimeter of curb. Curb shall have vertical sides with 45° cants provided under Architectural section. Acoustic curbs shall be a manufactured standard product of curb manufacturer, and may not be regular curb field constructed by the contractor or provided by the equipment manufacturer. Curb height shall be 14-inch minimum and 12" above finished roof. Slope shall match roof slope so that top of curb is level. Acoustic curb outer perimeter shall be same as rooftop manufacturers standard curb dimensions so that rooftop unit base overlaps curb, and allows for installation of roof membrane and flashing. Perimeter dimensions shall not be larger than RTAC footprint. Acoustic curbs with hat channels on top of curb (which elevate RTAC above roof curb) shall not be allowed. Acoustic type roof curbs shall be manufactured by AES, MGM Metal Products, Aladdin Metal Products, Kinetics or Vibro Acoustics or prior approved equal.

2.9 ROOF MOUNTED EQUIPMENT SUPPORTS (NON-PENETRATING TYPE)

A. Adjustable Condensate Pipe and Conduit Support on Roof: UV stabilized EPDM rubber block with tool free installation, minimum 4" long x 6" wide with adjustable height from 4" to 7" in 1/2" increments, spaced on maximum 7' centers and within 18" of fittings. Erico Caddy Pyramid Model #RPSE or equal by Pate, Curbs Plus or RPS.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support spacing requirements are specified in Sections specifying piping systems and equipment.

B. Use galvanized hangers and supports for piping and equipment that will not have field-applied finish.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Hanger Shield Installation: Install shield in pipe hanger or shield for insulated piping.

C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

D. Install lateral bracing with pipe hangers and supports to prevent swaying.

E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

3.3 PIPE HANGER ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Painting Section.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 SLEEVES AND PENETRATIONS

A. Provide pipe sleeves for all piping and conduit penetrations through walls.

B. Set sleeves in position during construction of walls, prior to placement of brick, concrete block or cast-in-place concrete.

C. Piping and Conduit Penetrations through Rated Walls or Floors: Firestopping methods and materials shall be in accordance with Architectural "Through-Penetration Firestop System" specification section. Assembly shall meet the wall or floor rating as specified by the Architect. See Architectural drawings for rating requirements. Sleeve's size and material shall be coordinated with Architectural "Through-Penetration Firestop System" specification section.

D. Piping and Conduit Penetrations through Non-rated Walls or Floors: Pack space between pipe or conduit and sleeve with fiberglass batts and with a minimum of 1-inch thick, non-sagging caulking material on one side. Caulk material is not required to be fire rated but shall comply with Architectural caulking specification section.

E. Install chrome plated steel escutcheons at finished surfaces for piping.

F. Duct Penetrations through Walls: All duct penetrations through non-rated walls shall be neatly finished off on both sides of the wall. Provide sheet metal angle around full perimeter of rectangular duct on both sides of the wall and provide sheet metal escutcheon around full perimeter of round duct on both sides of the wall and seal off with FSK tape. See also detail on the drawings. Penetrations through rated walls shall be provided with fire dampers, smoke dampers, or combination fire/smoke dampers as required to provide the appropriate protection for the wall penetration. See Architectural drawings for identification of rated walls. See Division 23 - Air Duct Accessories, for damper material and installation requirements.

G. Division 23 Contractor shall furnish the General Contractor with the clear opening dimensions and elevations and locations of all penetrations through walls and floors, so that the General Contractor may provide appropriate wall and floor openings for these penetrating items. Penetrating items include, but are not limited to, ducts and piping. Clear opening dimensions and elevations and locations shall be furnished in a timely manner to allow General Contractor to frame openings during wall and floor construction, and to prevent the need for removing new work. Contractor is warned that the project may contain shear walls which require steel reinforcing/framing around perimeter that must be installed during the construction of the wall, and which cannot be installed after the wall is constructed without significant demolition of the wall and reconstruction of the wall. Coordinate with General Contractor to determine location of shear walls.

3.6 SUSPENDED EQUIPMENT, DUCTWORK AND PIPING SUPPORTS

A. Provide steel drop rod supports or angle iron supports, secured (spot welded or clamped in bar joist areas) to building main structural components for all suspended mechanical equipment, ductwork and piping. Supplemental angle iron framing shall be provided where required between bar joists and shall be minimum 3 x 3 x 1/4 for equipment and large piping (4" and larger), and minimum 2 x 2 x 1/4 for large ductwork, small equipment and small piping, and 2 x 2 x 1/8 for small ductwork and refrigerant and condensate drain piping. 1-5/8 x 1-5/8 x 12-gauge channel may be used to span bar joist in lieu of 2 x 2 x 1/4 angle provided that previous paragraph “Performance Requirements” are met. Contractor shall note that supplemental angle sizes are minimum. Contractor shall provide larger size supplemental angle iron framing as appropriate to safely and appropriately support equipment. Provide vibration isolation where specified. Coordinate all mechanical equipment, duct and pipe supports with steel fabricator/erector and do not overload any building structural members or supplemental framing members. Provide securely tightened lock nuts on all drop rod supports and connections.

3.7 ROOF MOUNTED EQUIPMENT SUPPORTS

A. Coordinate with General Contractor to ensure full perimeter structural steel framing is provided either under Division 5 or herein, around all new roof mounted equipment supports. Framing must comply with requirements of Division 5.

B. All curb mounted equipment shall be anchored to the curb/nailer with cadmium plated anchors, minimum 5/16" x 1-1/2" hex head screws, on 12" centers. Provide minimum two screws per side. Where roof mounted equipment manufacturer’s requirements exceed the above requirements, provide installation complying with manufacturer’s requirements.

C. Coordinate with General Contractor for installation of roof curbs. See Architectural drawings and specifications for coordinating metal curb (under Division 23) with roof insulation, roof membrane, roof deck, roof blocking, etc. (under Architectural).

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
   1. Equipment nameplates.
   2. Equipment markers.

1.2 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General: Provide nameplates for all equipment and panel mounted controls. Location shall be accessible and visible.

B. Equipment Nameplates: Metal with data engraved or stamped, permanently attached to equipment. As a minimum, nameplate shall include manufacturer, model number, serial number and electrical data.

2.2 EQUIPMENT MARKERS

A. Markers shall be Contractor fabricated to have equipment “tag” or number (e.g., EF-1, RTAC-2, etc.) on marker.

B. Designation:
   1. Equipment tag shall be etched in 1/4" maximum, 1/8" minimum height letters and mounted on or adjacent to device cover or attached to the item of equipment. For items above ceiling, marker shall be attached to ceiling on t-bar grid in location approved by Owner.
   2. Type: White core black bakelike secured with epoxy glue or screws, unless otherwise noted.

PART 3 - EXECUTION

3.1 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
   1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Equipment “tag”.
   3. Locate markers where accessible and visible.

END OF SECTION 230553

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:
   1. Air Systems:
   2. Verifying that automatic control devices are functioning properly.
   3. Reporting results of activities and procedures specified in this Section.

1.2 SUBCONTRACTOR COORDINATION

A. Testing, Adjusting and Balancing (TAB) work shall be performed by NEBB/AABC agent as described in this section of the specifications; however, all devices that the TAB agent will be required to perform work on described in this section, shall be provided by the Contractors' Division 23 mechanical sub-contractor(s). These devices include, but are not limited to: balancing dampers, re-insulation of ductwork after duct test holes are drilled by TAB agent, adjustable sheaves, pulleys, belts, etc. and the labor to install these devices. Sub-contractor(s) providing the Division 23 HVAC systems must provide labor to support the TAB Agent. The mechanical systems shall be fully operational and ready for TAB work to begin a minimum of four weeks prior to the Contractual date of "Substantial Completion". Additionally, the Division 23 Contractor(s) shall furnish a qualified technician(s)/mechanic(s) to assist the TAB agent in the performance of his duties until all work specified herein is accomplished. The Division 23 sub-contractor(s) shall correct all deficiencies found by the TAB agent.

1.3 DEFINITIONS

A. Adjusting: The varying of system flows by partially closing balancing devices, such as dampers and varying fan speeds to achieve optimum system operating conditions within design and installation limits.

B. Balancing: The methodical proportioning of air flows through the system's main branches, and terminal devices using acceptable procedures to achieve the specified airflow within installation, testing and design limitations.

C. TAB: Testing, adjusting, and balancing. A systematic process or service applied to HVAC systems and other environmental systems, to achieve and document air and hydronic flow rates.

D. Test: A procedure to determine quantitative performance of systems or equipment.

E. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Sample Report Forms: Submit one set of sample TAB report forms. Forms are to be project specific for the systems to be TAB'd.

C. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

D. Certified Final TAB Reports: Submit four copies of reports prepared on approved forms certified by TAB firm.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB. Test and balancing by non-AABC or non-NEBB firms is not allowed.

B. TAB Report Forms: Use standard forms from AABC's "National Standards for Total System Balance" or NEBB's most recent "Procedural Standard for Testing, Adjusting, and Balancing of Environmental Systems."

C. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Total System Balance" or NEBB's most recent copy of "Procedural Standard for Testing, Adjusting, and Balancing of Environmental Systems," Section 4, "Standards for Instruments and Calibration."

D. Instrumentation Calibration: Calibrate instruments at least every twelve months or more frequently if required by instrument manufacturer.
   1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 OCCUPANCY DURING TAB PROCEDURE

A. Owner Occupancy: TAB agent shall verify if Owner will occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times. Test and Balance Agent shall contact Engineer and Owner 48 hours prior to test and balance work to allow (but not require) Engineer and owner to be present during TAB work.

1.8 WARRANTY

A. Performance Guarantee:
   1. Provide one of the following:
      a. For AABC Certified Firms: Provide a guarantee stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents.
      b. For NEBB Certified Firms: Provide a guarantee stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee for either AABC or NEBB shall include the following provisions:
         1) The certified TAB firm has tested and balanced systems according to the Contract Documents.
         2) Systems are balanced to optimum performance capabilities within design and installation limits.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment. Provide Contract Documents Examination Report to report on acceptability and/or deficiencies in Contract Documents.
   1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
   2. Verify that balancing devices, such as manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

D. Examine HVAC system and equipment installations to verify that indicated manual volume dampers are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

E. Report deficiencies discovered before and during performance of TAB procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's most recent "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 GENERAL PROCEDURES FOR TESTING ADJUSTING AND BALANCING

A. Air and Hydronic systems shall be Tested and Balanced using the procedures outlined in NEBB’s most recent copy of “Procedural Standard for Testing Adjusting and Balancing of Environmental Systems”, or AABC’s “National Standards for Total System Balance”.

3.4 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent to minus 10 percent.
   2. Air Outlets and Inlets: Plus 10 percent to minus 10 percent.

3.5 CERTIFIED FINAL TAB REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. The content for the Certified TAB Report shall include all content and data required by the firms certifying agency (AABC or NEBB) for each system or component included in the scope of work. In addition to this data and content, the Final TAB Report shall contain all content and data listed in this section.

C. Functional Performance Testing: Provide written verification of complete sequence of control system operation.

3.6 INSPECTIONS

A. Initial Inspection:
   1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
   2. Randomly check the following for each system:
      a. Measure airflow of at least 10 percent of air outlets.
      b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
      c. Verify that balancing devices are marked with final balance position.
      d. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:
   1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner and Architect.
   2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner and Architect.
   3. Owner and Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
   4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than +-10%, the measurements shall be noted as "FAILED."
   5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
   6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
   7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.7 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

3.8 REPORT

A. Provide four copies of the Test and Balance report to the Architect/Engineer by the earlier of the following two dates:
   1. A minimum of 48 hours prior to the semi-final on-site project construction site review by the Architect/Engineer.
   2. Four weeks prior to the date the facility is scheduled to be turned over to the Owner.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB National Headquarters.

END OF SECTION 230593

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230716 - HVAC EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes mechanical insulation for duct, equipment, and pipe, including the following:
   1. Insulation materials
   2. Fitting materials.
   3. Insulation finish materials
   4. Accessories

1.2 SUBMITTALS

A. Product data shall be submitted under provisions of Division 23 - Common Requirements for HVAC Equipment for each type of product indicated; identify thermal conductivity, thickness, and jackets (both factory and field applied, if any). Provide a sheet that identifies each system (e.g., supply duct, etc.), and the submitted material, thickness, and finish for each system.

B. Submit proof of three years minimum experience in insulation installation.

1.3 QUALITY ASSURANCE

A. Insulation and related materials shall meet the requirements of NFPA-90A.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing products per ASTM E 84. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Applicator: Company specializing in insulation application with three years minimum experience.

1.4 GENERAL INSULATION NOTES

A. Any HVAC equipment which is factory insulated, and which has sweating/condensation forming on the equipment while operating under design conditions, shall be replaced or field insulated by the contractor until the condensation is eliminated.

B. Piping and ductwork is considered concealed for purposes of this Specification Section when located above ceilings or in chases.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Certain Teed, Owens-Corning, Johns Manville, Armacell, IMCOA, Nomaco, Knauf, Pittsburg Corning, The Dow Chemical Company, Dyplast, Foster, Childers and Hi-Therm.

B. Substitutions: Under provisions of Division 23 - Common Requirements for HVAC Equipment.

2.2 INSULATION MATERIALS

A. I2: Preformed flexible elastomeric expanded closed-cell pipe insulation having a flame spread rating of 25 or less and a smoke density of 50 or less when tested by ASTM E-84 method. Temperature range -40°F to 220°F. Insulation shall be CFC and HCFC free and formaldehyde free. Thermal conductivity of 0.27 btu-in/hr sq. ft °F at 75°F mean temperature. All seams and butt joints shall be sealed with factory applied adhesive. Provide insulation shield on exterior of insulation at all hangers.

B. I3: Blanket Insulation: Glass fiber blanket insulation minimum 3/4 lb. density, installed R3.5 per inch, with FSK facing. On ductwork, wrap blanket insulation around duct, being careful not to compress it more than 25% at the corners, butting insulation and overlapping facing jacket 2" minimum at all joints. Two-inch (2") thick insulation shall have a minimum R5.3 at 25% compression. Staple the overlap with outward clinching staples a maximum of 3" on centers. For ducts over 30" wide, additionally support insulation on bottom of horizontal ducts and sides of vertical ducts with rows of welded or adhered clips and washers on not more than 18" centers. Seal all joints and clips with pressure sensitive FSK tape. Seal all penetrations, such as at duct supports, and all terminations of insulation with pressure sensitive FSK tape.

2.3 INSULATION FINISH MATERIALS

A. F1: Two coats of Armacell Armaflex finish or equal

2.4 ACCESSORIES

A. Adhesives: Compatible with insulation materials, jackets and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Insulation Shields: Provided in accordance with Division 23 - Hangers and Supports for HVAC Piping and Equipment.

C. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates.

D. Tapes: FSK foil face, vapor retardant type tape matching factory applied jacket with acrylic adhesive; complying with ASTM C1136 and UL listed. Width shall be three inches; thickness shall be 6.5 mils.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 COMMON INSTALLATION REQUIREMENTS

A. Install insulation, fitting materials, finish materials and accessories in accordance with manufacturer’s installation requirements and recommendations.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs. Install multiple layers of insulation with longitudinal and end seams staggered. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

D. Keep insulation materials dry during application and finishing.

E. Install insulation with least number of joints practical.

F. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

G. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

H. Continue insulation with vapor barrier through penetrations. At fire dampers, smoke dampers, and fire/smoke dampers, extend insulation to wall on both sides of wall and seal.

I. Insure duct access panels are not blocked by the installation of external duct insulation.

J. Internal Acoustical duct liner is specified in certain ducts for acoustical purposes to reduce high frequency noise. These ducts may also be specified with external duct insulation. The Contractor is not permitted to omit specified external duct insulation (duct wrap, duct board, etc.) just because the duct is also lined.

3.3 INSULATION SCHEDULE

Service/Location	INSULATION Pipe/Duct	Fitting	Thickness	FINISH Pipe/Duct	Fitting
PIPING:					
Refrigerant Suction and Liquid Piping Serving Ductless Split Systems	I2	I2	3/4"	F1	F1
Condensate Piping:					
Rooftop A/C Unit Condensate Piping	--	--	--	--	--
All Other Condensate Piping, Concealed Copper	I2	I2	1/2"	--	--
All Other Condensate Piping, Exposed Copper	I2	I2	1/2"	F1	F1
All Other Condensate Piping, Exposed PVC	--	--	--	--	--
All Other Condensate Piping, Concealed PVC	I2	I2	1/2"	--	--
DUCT:					
General Exhaust Duct	--	--	--	--	--
Return Air Duct	--	--	--	--	--
Supply Duct Concealed	I3	I3	2"	--	--
Transfer Air Duct	--	--	--	--	--

EQUIPMENT:	
Mechanical Equipment	Shall have factory installed insulation to prevent condensation or excessive heat loss/gain
Supply Diffusers	Provide 2" of I3 insulation blanket atop ceiling supply diffusers that are not specified to be factory insulated
Roof Curbs	If contractor utilizes roof curbs furnished by equipment manufacturers, and if roof curbs are not factory insulated, insulation contractor shall insulate curbs with 1-1/2" thick 3 pound density rigid fiberglass insulation on the interior or exterior surfaces.

END OF SECTION 230716

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for equipment not supplied with factory-wired controls.

1.2 WORK INCLUDED

A. Project Scope Description: New RTAC units, exhaust fans, and other HVAC equipment is being installed in the existing building. All new HVAC equipment shall be controlled by new DDC system that is connected to the existing county wide DDC system as described herein.

B. All control components shall be provided under this section of the specifications unless specifically provided elsewhere.

C. This system shall include all devices specified herein and shall include, but is not limited to; conventional thermostats, humidity sensors, relays, switches, contactors, transformers, etc.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 23 - Common Requirements for HVAC Equipment to the Owner and Architect/Engineer.

B. Controls contractor shall not order material or begin field installation until receiving approved submittals.

C. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and terminal to terminal control wiring, clearly indicating factory-installed and field-installed wiring associated with all equipment. Wiring diagrams shall show all point-to-point wiring connections between all components of the control system. **No devices, conduit or wiring shall be installed until Contractor has received approved shop drawings from the Architect/Engineer.**

D. Space Temperature Sensor Confirmation Letter: Prior to submitting control submittal to the Architect/Engineer for review, the controls contractor shall confirm with the Owner's HVAC maintenance department supervisor the type of sensor (wired or wireless) that the Owner desires, and all features (flat plate with no adjustment, adjustable, pushbutton override, wireless, etc.) that the Owner desires. Some sensor features may be indicated in this specification section or on the drawings for certain areas, but contractor shall arrange meeting with Owner to obtain sensor information for all areas. Provide signed letter from Owner's HVAC maintenance department supervisor with sensor submittals confirming Owner has approved sensor types and features for all sensors.

1.4 COORDINATION

A. Coordinate location of thermostats, humidity sensors, override timers, and other exposed control sensors and devices with plans and room details before installation.

1.5 WARRANTY

A. See Division 23 - Closeout Document Requirements for HVAC for warranty information.

B. Emergency Service: The controls contractor shall restore the control system to proper operating condition within 24 hours after receiving a request for service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Since the Henry County School System has a county-wide Delta “iNTREO” energy management and control system, The Contractor shall provide Delta iNTREO BACnet controls (no equal) as the sole manufacturer and Controls Concepts, Inc. (contact Rob Blain at 770-296-3236) shall be the sole installer of the control system for all work specified herein. These controls, including field installed microprocessors at each piece of HVAC equipment.

2.2 WIRING

A. All control wiring (including but not limited to control, interlock, sensor, thermostat, etc.) shall be provided under this section of these specifications. The control contractor is responsible for providing 120-volt AC as specified herein.

2.3 CONTROL COMPONENTS AND THEIR FUNCTION

A. Cabinets: Provide and install control cabinets constructed of heavy gauge steel or aluminum and consisting of a one piece rectangular or square ring, a sub-panel and a door with continuous hinge, and quick turn latch with keyed lock. Unless otherwise specified, all controllers, and other equipment furnished as part of the control system which are not required to be mounted on mechanical equipment shall be cabinet mounted. All wiring connections shall be made inside the cabinet. All electrical devices shall be wired to a numbered terminal strip. No field wiring shall be required within the cabinet except to the terminal strip.

B. Conduit and Raceway: Provide and install under this section.
   1. Refer to Division 26 - Electrical for material requirements for conduit and flexible conduit. Conduit sleeves with bushing shall be provided at all control wiring penetrations through walls.
   2. Outlet Boxes: Refer to Division 26. Provide and install under this section.

C. Conductors:
   1. 50 to 600 volts: Refer to Division 26 for requirements.
   2. Below 50 volts: Minimum size for individual conductors is AWG. No. 18. Minimum conductor sizes for multiconductor cables is AWG No. 22. Provide shielded cable as required to avoid EMI where conduits natural shielding effect is insufficient. Conductors shall be sized within acceptable voltage drop parameters.
   3. Plenum Rated Cable: Plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84.
   4. Conductor Insulation: “TFFN”, unless noted otherwise.
   5. Taps and Joints: Mechanically and electrically sound.
   6. Tape: Per Division 26. Provide and install under this section.
   7. Lacing: Per Division 26. Provide and install under this section.
   8. Lubricants: Per Division 26. Provide and install under this section.
   9. Color Code: All low voltage control conductors shall be color coded by factory or provided with numbered ends.

D. Contactors and Disconnects:
   1. All contactors for equipment specified in Division 23 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings. Provide herein all relays and contactors necessary for the proper operation of all Division 23 equipment.
   2. All electrical disconnects for equipment specified in Division 23 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings.

3. Control Relays and Contactors: Relays for control purposes shall be the plug-in type with plastic enclosure surrounding the relay with contacts rated for a minimum of 110VAC and 24VDC. Relay shall operate properly over -25°C to 55°C ambient. Relay shall be UL recognized. Pick up voltage shall be a maximum of 80% of nominal and drop off voltage shall be a maximum of 30% of nominal. Contact rating, in-rush current, number of poles, coil voltage, etc. shall be appropriate for the application. Provide neon or LED “ON” indicator lamp.

E. Conventional Thermostats: All conventional thermostats shall be mounted on wall at 4'-6" above finished floor, unless noted otherwise. All setpoints shall be adjustable.
1. Ductless Fan Coil Unit Thermostats: Shall be provided by ductless fan coil unit manufacturer and shall be 24V standalone digital wired controller with LCD display to operate all aspects for the equipment.

F. Control Transformer: Provide transformers at all equipment as necessary to power control system. Transformers shall be protected with in-line fuses on both the primary and secondary sides in accordance with Table 450.3(B) of the National Electric Code unless the following primary current conditions apply. Transformers with a primary current less than 2 amperes shall be permitted to be fused on the primary side only provided the fuses do not exceed 300% of the transformer’s rated primary current. Transformers with a primary current less than 9 amperes shall be permitted to be fuse protected on the primary side only provided the fuses do not exceed 167% of the transformer’s rated primary current. If control contractor intends to utilize any on board transformer provided by the HVAC equipment manufacturer, he shall provide signed statement from the equipment manufacturer indicating the allowable additional “VA” load that is available for additional devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 54 inches above the floor, unless noted otherwise.

3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install all systems in accordance with manufacturer’s installation instructions, NFPA-70 and NFPA-90A.

B. Installation of Conduit and Wiring:
1. All wiring and conduit installed under this section of the specifications shall be installed by a state-licensed contractor(s) and all work shall be done by state-certified technicians. All wiring systems shall be color coded and conductors shall be tagged at all junctions and terminals. Label cables identification numbers as directed by Owner. The Engineer and Owner reserves the right to move any device fifteen (15) feet without additional costs before the device is installed. All wiring and conduit shall be installed in accordance with Division 26 - Electrical.
2. All wiring shall be installed in conduit, except for plenum rated cable as specified below.
3. All conduit shall be concealed, except in mechanical/ electrical rooms.
4. All control wiring above suspended ceiling, not made inaccessible by equipment, ductwork or structure, may be plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84. This plenum rated cable is not required to be installed in conduit, but shall be run in a workmanlike manner, parallel to the building lines, properly supported at regular intervals, and not draped over conduit, piping and ductwork. Attach cable above ceiling to structure using appropriate fasteners for type of construction involved. Cable shall not lay atop ceiling. Where physical damage is possible, mechanical protection shall be used. All splices or connections shall be made at equipment served. Where communication loops are run, terminations shall be

at terminal strip on equipment. No splices in field shall be allowed. The use of snap in bushings or connectors is required where cable is entering a knockout or equipment housing. All penetrations through wall sleeves shall be sleeved with conduit with bushings on both ends.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, commission and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

3.4 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

3.5 SEQUENCE OF OPERATION

A. Sequence of Operation for Rooftop Air Conditioners with Gas Heat:
   1. Unit functions will be enabled for operation by the DDC system.
   2. Supply Fan Control: The supply fan shall run continuously when the DDC system is in the occupied mode. Supply fan shall be staged to operate at lower speed during first stage of cooling. Supply fan cycles as required during unoccupied periods.
   3. Compressor Control: The compressor(s) and outdoor fan(s) shall be energized in stages as scheduled upon a call for cooling.
   4. Safety Shutdown Control: The units shall be subject to shut down by the following:
      a. Internal safeties
      b. Duct mounted smoke detector on units over 2000 cfm.
   5. Gas Heating System Control: The gas heating system shall be energized in stages or modulated as scheduled upon a call for heating.
   6. For certain units as indicated on the drawings, an internal hot gas reheat coil and internal dehumidification package is specified. For these units, the dehumidification circuit shall be started/stopped by a space humidity sensor.

B. Sequence of Operation for Exhaust Fans: EF-1 through EF-6 shall be started/stopped by a motion detector provided by the fan manufacturer.

C. Sequence of Operation for Ductless Fan Coil Units/Ductless Condensing Units (DFCU-1): DFCU shall operate under the dictates of its own wall mounted low voltage space thermostat to cycle the compressor and reversing valve to maintain space temperature setpoint.

D. Sequence of Operation for Bi-Polar Ionization Unit: Bi-polar ionization unit shall be enabled whenever airflow is enabled at associated equipment (e.g. RTAC units). Once airflow is enabled, bi-polar ionization units shall operate to produce ions to kill mold, bacteria, viruses, and neutralize odors. (No work required by controls contractor)

E. Sequence of Operation for Electric Wall Heater: Electric wall heater(s) shall cycle their blower (after heating element warm up) and heating element to satisfy integral thermostat.

F. Additional System Monitoring and Control Functions:
   1. General: In addition to the equipment previously specified to be controlled by the control system, the following additional items shall be monitored and/or controlled by the control system. All points shall be available for display from the operator interface. All alarms shall be sent to the Owner’s on site and remote off site central computer.
   2. Supply Air Temperature Monitoring: On certain pieces of HVAC equipment as specified herein, provide a supply duct mounted temperature sensor to allow for diagnostics and troubleshooting. The following equipment shall be provided with supply duct mounted temperature sensors:
      a. Rooftop Air Conditioning Units (RTAC-1 thru RTAC-4)

3. IDF Space Temperature Monitoring: DDC system shall monitor space temperature in data rooms as noted on drawings. DDC system shall send alarm signal to Owner if space temperature rises above Owner's setpoint.

END OF SECTION 230900

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pipe and fitting materials, joining methods and piping specialties as described below:
   1. Air conditioning condensate-drain piping.

PART 2 - PRODUCTS

2.1 SOLDER

A. Solder shall be lead free having composition of minimum 94% tin, 4% to 5% copper and 0.4% to 0.2% silver or selenium. Solder shall have a minimum tensile strength of 6,900 psi at 70°F, melting temperature of between 410°F and 440°F maximum to protect valve seat material. Solder shall conform to ASTM B-32 and shall be applied in conformance with ASTM B-828. Flux shall conform to ASTM B-813. Solder shall be manufactured for the HVAC industry not circuit board industry. Solder shall be Taramet Sterling Lead Free as manufactured by Taracorp, Dutch Boy Silver as manufactured by Taracorp or Lenox Sterling Lead Free.

2.2 AIR CONDITIONING CONDENSATE DRAIN PIPING

A. Copper Tubing: ASTM B88 type "L" hard drawn copper tubing. Fittings: Sweat type, wrought copper. Joints: Lead free solder as specified herein.

B. PVC Pipe: ASTM D1785, Schedule 40 PVC. Fittings: ASTM D2665, Schedule 40 PVC, Drainage pattern. Joints: ASTM D2855 Solvent Weld.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise. Route piping in an orderly manner.

D. Install piping at indicated slopes.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Install piping to allow application of insulation.

H. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

3.2 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 - Hangers and Supports for HVAC Piping and Equipment. Comply with the following requirements for maximum spacing of supports.

B. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
   2. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
   3. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.

C. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions and also maximum span of five feet. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

D. Install a hanger within 12-inches of each horizontal elbow.

3.3 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems. Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Non-pressure Piping: Join according to ASTM D 2855.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   3. Use threaded pipe only in accessible locations.

3.4 INSTALLATION OF CONDENSATE DRAIN PIPING

A. General: Slope piping a minimum of 1/4" per one foot of run. As a minimum, drain piping size shall match unit connection, but size shall be increased where shown on the drawings. For equipment discharging condensate inside the building, discharge at nearest drain as shown on drawings. Do not install the condensate drain pipe in a manner which interferes with equipment access panels or restricts access to equipment. Install condensate drain piping in a manner which will minimize the possibility of pipe being a tripping hazard or walking obstruction. At each piece of equipment, provide minimum 3" deep open (cleanable) trap at condensate connection. Trap shall be constructed as shown on drawings. Piping material shall be copper or PVC as shown on the drawings or as specified in this specification.

B. Roof Mounted Equipment Condensate Installation: Roof mounted unit's condensate drain shall be routed to spill at roof drain. Condensate shall be supported by non-penetrating type supports as specified in Section 230529 - Hangers and Supports for HVAC Piping and Equipment. Roof mounted unit’s condensate piping shall be PVC unless specifically identified otherwise on the drawings.

C. Ductless Wall Mounted Fan Coil Unit Condensate Installation: Condensate trap shall not be provided for ductless wall mounted fan coil units. Connect piping directly to unit or to external condensate pump as shown on the drawings. Provide clear transparent PVC drain pipe and stainless steel worm gears to transition from unit connection to drain pipe.

END OF SECTION 232113

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications and associated refrigerant piping specialties, brazing alloy and refrigerants.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Suction Lines for Heat-Pump Applications: 535 psig.
   3. Hot-Gas and Liquid Lines: 535 psig.

1.3 SUBMITTALS

1. Product Data: Submit under provisions of Division 23 Section “Common Requirements for HVAC Equipment.”

1.4 QUALITY ASSURANCE

A. Brazing: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR, either soft temper annealed seamless coil or hard temper drawn seamless hard straight lengths. Tube shall be cleaned and dehydrated and positively pressurized with nitrogen, and ends capped.

B. Wrought-Copper Fittings: ASME B16.22.

2.2 BRAZING ALLOY

A. Brazing alloy shall be copper and phosphorous with minimum 15% silver, minimum melting temperature of 1190°F. Brazing alloy shall meet AWS BcuP-5 classification.

2.3 VALVES AND SPECIALTIES

A. Manufacturers: Alco, Henry or Sporlan.

B. Provide all solenoid valves, thermostatic expansion valves, moisture/liquid indicators as required by manufacturer. Items shall be approved by HVAC equipment manufacturer.

C. Permanent Filter Dryers: Comply with ARI 730.
   1. Body and Cover: Painted-steel shell.
   2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
   3. Desiccant Media: Activated alumina or charcoal.
   4. Designed for reverse flow (for heat-pump applications).
   5. End Connections: Socket.
   6. Working Pressure Rating: 500 psig.
   7. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Provide and install all refrigeration piping and specialties in accordance with manufacturer's recommendations and instructions. Refrigeration piping shall be brazed, and shall be installed in accordance with ASME Standard B31.5, "Refrigeration Piping."

B. Refrigerant piping indicated on Drawings is schematic only. Contractor shall size piping and design actual piping layout, including oil traps, double risers, slopes of horizontal runs, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

D. Install refrigerant piping according to ASHRAE 15.

E. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping to conserve building space and not to interfere with use of space. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

H. Install piping adjacent to machines to allow service and maintenance.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Insulate piping in accordance with Division 23 Section “HVAC Equipment Insulation.”

M. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

N. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.

O. Slope refrigerant piping as required by manufacturer.

P. When brazing, do not apply heat near components prohibited by manufacturer.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 7 Section “Through-Penetration Firestop Systems."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 7 Section “Joint Sealants” for materials and methods.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install valves and refrigerant specialties as required in manufacturer’s installation manual and recommendations.

B. Install moisture/liquid indicators in liquid line for all systems 7-1/2 nominal tons and greater.

C. Install filter dryers in liquid line between compressor and thermostatic expansion valve, unless prohibited by equipment manufacturer.

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
   1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
   2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

E. Compression Joints: Compression joints shall be allowed only for ductless split systems and shall be torqued as required in manufacturer’s installation instructions.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section “Hangers and Supports for HVAC Piping and Equipment.”

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
   2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
   1. NPS 1/2: Maximum span, 5 feet; minimum rod size, 3/8inch.
   2. NPS 5/8: Maximum span, 5 feet; minimum rod size, 3/8inch.
   3. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8inch.
   4. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
   5. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

3.5 PRESSURE TESTS

A. Piping systems shall be subjected to constant inspection and final approval of the Owner, Engineer and Code Authorities having jurisdiction. Contact Architect/Engineer and all code authorities 48 hours before making any pressure tests. Tests, in addition to those included in this section required to show compliance, shall be performed as directed at no additional cost.

B. Tests and Inspections:
   1. Comply with ASME B31.5, Chapter VI.
   2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
   3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
      a. Fill system with nitrogen to the required test pressure.
      b. System shall maintain test pressure at the manifold gage throughout duration of test.
      c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
      d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
   2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   3. Fully charge system with refrigerant

3.7 ADJUSTING

A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

END OF SECTION 232300

SECTION 233113 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch w.g. Metal ducts include the following:
   1. Low pressure galvanized steel ducts
   2. Ductwork liner.

1.2 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select the air-moving equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.3 SUBMITTALS

A. Submit product data under provisions of Division 23 - Common Requirements for HVAC Equipment for duct liner. The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.

1.4 QUALITY ASSURANCE

A. Construct ductwork to International Mechanical Code.

B. Construct ductwork to ASHRAE Handbook.

C. Fabricate ductwork in accordance with SMACNA HVAC Duct Construction Standards.

D. NFPA Compliance:
   1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
   2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCTWORK ACOUSTICAL LINER

A. "Heavy Duty" Fiberglass Duct Liner: Glass fiber duct liner shall conform to the requirements of ASTM C1071; have a minimum noise reduction coefficient (NRC) value of 0.45 for 1/2" thickness (note that this is thickness associated with noise rating not required thickness for all applications. See insulation specification for required liner thickness.); have a maximum thermal conductivity (k) at 75°F of 0.27 and shall be tested in accordance with ASTM C518 and/or ASTM C177. The duct/plenum liner shall also comply with NFPA 90A and 90B. Sound

attenuation of liner shall be tested in accordance with ASTM E477. Sound absorption shall be tested in accordance with ASTM C423. Liner's composite surface on the air stream surface shall serve as a barrier against infiltration of dust and dirt into the insulation, reducing the potential for microbial growth. Liner shall meet the requirements of ASTM C655 (corrosiveness) and odor emission and fungal resistance, ASTM G21 (fungal) and G22 (bacteria) for resistance to fungal and bacterial attack. Liner shall conform to ASHRAE 62-89. Liner surface shall provide an extremely cleanable surface during the life of the duct system. Heavy duty liner shall be "ToughGard" as manufactured by CertainTeed, "Permacote Linacoustic" as manufactured by Johns Manville, “Aeroflex Plus” as manufactured by Owens Corning, EM as manufactured by Knauf, or prior approved equal. The glass fiber liner shall have a coated or mat-faced, abrasion resistant air stream surface. The liner shall be adhered to the sheet metal ductwork using an adhesive meeting the requirements of ASTM C 916. Adhesive shall be Foster 85-65 Stick Fas, Childers CP-127 Chil Quik or prior approved equal. Mechanical fasteners of the specified type and length shall be used assuring no greater than 10% compression of the liner thickness. Flat black, minimum 26 gauge galvi-grip metal nosings shall be used on the upstream transverse edges when air velocities exceed 2000 fpm or where liner is exposed to view (e.g. at supply/return grille, etc.). Also, all other traverse edges shall be completely sealed and adhered to the duct to prevent corrosion or dust accumulation.

2.3 SEALANT MATERIALS

A. General: All sealants shall have a maximum flame spread of 25 and smoke development rating of 50. Sealants shall be designed for service temperature that the duct is expected to see.

B. Water-Based Duct Joint and Seam Sealant Mastic: Flexible, adhesive sealant, and complying with NFPA requirements for Class 1 ducts. Sealant shall be low odor/low VOC with less that 32 grams/liter VOC per ASTM D-6886 or EPA Method 24. Sealant shall be SMACNA pressure class rated for -0.5" w.g. to +10.0" w.g., and shall meet SMACNA class seal for A, B and C classes. Service temperature limits of sealant shall be -10°F to 190°F. Sealant shall be fiber reinforced, and shall meet UL-181A-M and UL-181B-M for mold growth test. Sealant shall use soap and water for clean up. Sealant shall be RCD #6, Foster 95-90 Vapor Safe, Childers CP-181 Comfort Seal or prior approved equal.

C. Solvent-Based Duct Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant. Sealant shall contain maximum 420 grams/liter VOC, and comply with ASTM D-2202 and be LEED compliant with SCAQMD Rule 1168 under Sealant category “other” with VOC max of 420 g/l. Sealant shall be SMACNA pressure class rated for +0.5" w.g. to +10.0" w.g., and shall meet SMACNA class seal for A, B and C classes. Service temperature limits of sealant shall be -20°F to 200°F. Sealant shall be Sure Grip 404 by Hard Cast, 32-14 Duct Fas by Foster or prior approved equal.

D. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

E. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Structural-steel fasteners appropriate for construction materials to which hangers are being attached.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
   1. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
   1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

E. Upper Supports: Provide supplemental angle iron (minimum size: 2" x 2" x 3/16") or Uni-Strut channels between primary building structural members to support rods and straps connected to ductwork. Size supplemental supports and hanger to adequate support load without overloading or excessive deflection.

2.5 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
   2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details. Contractor has the option of using prefabricated slide-on joints and components for transverse joints, constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement. Prefabricated slide on joints shall be manufactured by Ductmate Industries, Inc., Nexus Inc., or Ward Industries, Inc.

C. Longitudinal Seams: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-5.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359-inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
   1. Supply Ducts: 1-inch w.g.
   2. Return Ducts (Negative Pressure): 1-inch w.g.
   3. Exhaust Ducts (Negative Pressure): 1-inch w.g.

B. All ducts shall be galvanized.

3.2 DUCT INSTALLATION

A. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.

B. Provide pilot tube openings where required for testing of systems, complete with neoprene plug.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped 5 mil polyethylene on open ductwork to prevent construction dust from entering ductwork system. Ductwork may not be hung prior to "drying in" of the facility unless all joints are sealed with mastic.

E. Branches from trunk duct and tap-in connection shall be constructed in accordance with Paragraph "Low Pressure Galvanized Steel Ductwork".

F. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

G. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

H. Install ducts with fewest possible joints.

I. Install fabricated fittings for changes in directions, size, and shape and for connections.

J. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

K. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

L. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

M. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

N. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

O. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

P. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

Q. Electrical Equipment Spaces: Contractor shall not route ducts over electrical panels.

R. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

S. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 - Air Duct Accessories. Firestopping materials and installation methods are specified in Division 7 - Through-Penetration Firestop Systems.

T. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

U. Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 - Painting.

3.3 APPLICATION OF FIBER LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the air stream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   1. Fan discharges.
   2. Intervals of lined duct preceding unlined duct.
   3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

J. Install in accordance with NAIMA Fibrous Glass and Duct Liner Standard AHS-124 and SMACNA HVAC Duct Construction Standards. Liner shall be kept clean and dry. Liner that has become wet shall be replaced. Duct dimensions indicated on the drawings are net inside dimensions required for airflow, and duct size shall be increased to allow for liner thickness.

3.4 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

B. Seal all circumferential and longitudinal duct joints in low pressure supply and return ducts with sealant as specified herein in accordance with the manufacturer's installation instructions. This includes, but is not limited to Pittsburgh connections, snap locks (all types), etc. Duct tape is not suitable as a substitute. Notify Engineer for on-site review of ductwork joints prior to insulation application. Where gaps exceed manufacturer’s recommendations for sealant only, provide fibrous backing tape.

C. Seal ducts before external insulation is applied.

3.5 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Use double nuts and lock washers on threaded rod supports. Duct hangers shall be constructed in accordance with Figures No. 4-1,2,4,5,6,7 and 8 as well as tables 4-1,2 and 3. Duct shall not be supported directly from metal decks. Provide upper supplemental framing as required between building structural members.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 23 - Air Duct Accessories.

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline (Figure 2-2, Type RE-3 and Figure 2-5,2-6). Where there is not sufficient space and at the Contractor's option in all other locations, rectangular elbows with turning vanes may be substituted.

D. For turning vane construction see Figure 2-2, Type RE-2 and Figure 2-3 and 2-4. Provide at all square elbows in supply, return and exhaust ductwork and where noted.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees. Provide Type 2 or Type 3 offsets where required. See Figure 2-9.

F. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area. See Figure 2-10 for easement construction.

G. All branch take-offs of rectangular ducts shall be made with "45-degree entry" fitting in accordance with Figure 2-8 or by means of "parallel flow branches" with turning vanes and locking splitter dampers (Figure 2-7) where indicated. All branch take-offs of round ducts shall be made with "Bellmouth take-off collar," or “45° take-off collars" as specified in Division 23 - Air Duct Accessories.

3.7 DUCT CLEANING

A. New Duct Systems: Contractor shall ensure interior of all ductwork is clean and free of dust at the time the Certificate of Occupancy is issued and building is turned over to the Owner. Clean duct system and force air at high velocity through duct to remove accumulated dust. Close duct outlets to obtain sufficient air velocities or use portable blowers. Protect coils and equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning. Clean duct systems with vacuum machines as required to remove dust.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Backdraft control dampers.
   2. Volume control dampers, manual type.
   3. 90-degree straight saddle tap.
   4. Fire dampers.
   5. Turning vanes.
   6. Duct access doors.
   7. Flexible connectors.
   8. Low pressure flexible ducts.
   9. Duct accessory hardware.
   10. Bellmouth take-off collars.
   11. 45-degree take-off collars.

1.2 SUBMITTALS

A. Product Data: Submit under provisions of Division 23 - Common Requirements for HVAC Equipment for the following:
   1. Volume control dampers, manual type.
   2. 90-degree straight saddle tap.
   3. Fire dampers.
   4. Low pressure flexible ducts.
   5. Bellmouth take-off collars.
   6. 45-degree take-off collars.

B. For fire dampers dampers, provide UL ratings for fire resistance, leakage velocity, differential pressure and elevated temperature. Include pressure drop data in accordance with AMCA 500-D.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Install in accordance with International Mechanical Code.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Fabricate multi-blade, parallel action backdraft dampers of 18 gage galvanized steel or extruded aluminum, with center pivoted roll formed aluminum blades with felt or flexible vinyl blade seals, linked together with 20-gauge galvanized tie bar in rattle-free manner with 90 degree stop, synthetic (acetal) sleeve bearings, and plated steel pivot pin axles.

B. Damper manufacturer’s printed application and performance data including maximum pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 2” w.g., velocities to 2,500.0ft/min. and temperatures to 180°F. Testing and ratings to be in accordance with AMCA Standard 500. Backdraft damper shall have maximum 3-1/2” depth when blades are in the closed position. Backdraft damper shall be suitable for horizontal air flow (vertical mount) or vertical up or vertical down air flow (horizontal mount) based on the arrangement shown on the drawings. Backdraft dampers shall be provided with no flanged frame unless flange is specifically identified on the drawings. If so, see drawings for location of flange (flange on discharge or flange on intake). Backdraft damper shall be gravity

type, opening by air pressure differential and closing by gravity, unless a motor pack is specified on the drawings. When motor pack is specified, backdraft dampers shall be powered open, spring closed. Motor voltage shall match fan voltage, and quantity and torque requirements of motors shall be determined by manufacturer's installation instructions. Multiple section dampers shall be assembled per manufacturer's installation instructions.

C. Backdraft dampers shall be manufactured by Airstream, Air Balance, Pottorff, Greenheck, American Warming, Dowco, Louvers and Dampers, Empco, Industrial Louvers, Cesco or Arrow-United. Gravity backdraft dampers, furnished with air moving equipment, may be provided by equipment manufacturer, provided the damper meets the specification above.

D. Backdraft Dampers Serving Industrial Duty Sidewall Propeller Exhaust Fans: See Division 23 - HVAC Power Ventilators.

2.2 VOLUME CONTROL DAMPERS, MANUAL BALANCING TYPE

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated. See Division 23 - Instrumentation and Control for HVAC for air control damper specifications for automatic dampers. Provide corrosion resistant end bearings. On multiple blade dampers, provide oil-impregnated nylon, molded synthetic or sintered bronze bearings. Provide hexagonal or square steel axles positively locked into the damper blade. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Mark final position(s) of all damper handles with magic markers on side of duct/insulation after TAB is complete. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

B. Single Blade: Fabricate single blade rectangular dampers for duct sizes up to 12 inches in height and 36 inches in width. Duct sizes over 12 inches in height and over 36 inches in width shall require multiple blades arranged in opposed blade style. Fabricate single blade round dampers for duct sizes up to 16-inches diameter. Single blade damper frames shall be constructed of 22-gauge steel and blades shall be 20-gauge steel, minimum.

C. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware. Frame shall be 16-gauge galvanized steel structural hat channel. Blades shall be single skin 16-gauge galvanized steel.

D. Performance: Dampers shall be designed for 1500 fpm maximum system velocity; maximum 65 cfm/ft^2 leakage at 1 inch w.g. pressure per AMCA Standard 500. Wide open pressure drop shall not exceed 0.1" w.g. at scheduled size and airflow.

E. Manual volume control dampers shall be manufactured by Ruskin, Pottorff, Nailor, Louvers and Damper, Dowco, Prefco, United Air, Arrow, Vent Products, Air Control Products, Phillips-Aire, National Controlled Air, Greenheck, Air Balance or Cesco. Single blade dampers shall be Ruskin Model MD25 (rectangular) or MDRS25 (round), Greenheck Model MBD-10 (rectangular) or Model MBDR-50 (round) or equal by the other above listed manufacturers. Multi-blade damper shall be Ruskin Model MD35 or equal by the above listed manufacturers.

2.3 90 DEGREE STRAIGHT SADDLE TAP

A. Round take-offs from low pressure round ducts shall be made with 90° side take-off fitting constructed of galvanized G90 steel. Fittings shall have 1-inch wide turned out mounting flange with adhesive coated gasket and shall be contoured to fit duct. Fitting shall have a balancing damper with operator handle. Damper shall be factory installed with locking quadrant operator handle. On insulated ducts, provide optional extended neck for damper handle to allow handle to clear specified insulation thickness. Fitting that have air scoops, tab collars, or "spin-in" design are not acceptable.

B. Manufacturers: 90° pressed saddle tap with damper by Sheet Metal Connectors, Inc., Crown Model #314DSO Take-Off Collar or Southwork Model ATRPWD, Royal Model 173 with Duro Dyne #7206 Sandoff, or equal by Buckley.

2.4 FIRE DAMPERS

A. Fire dampers shall be tested and classified by Underwriters' Laboratories for 1-1/2 or 3-hour rating (as appropriate based on fire rating of wall or floor as shown on architectural drawings) and shall bear the UL 555 label and meet the requirements of UL Standard 555, 6th Edition, issued June 1, 1999. Fire dampers shall be static rated, unless shown otherwise on the drawings. Dampers shall be the folding blade steel curtain type and shall be fabricated from minimum 24-gauge roll-formed galvanized steel. Each damper shall incorporate a UL listed fusible link rated at 165 degrees F and dampers intended for horizontal installations (vertical airflow) shall include stainless steel closure spring. Dampers shall be type "B" unless otherwise indicated except that type "A" dampers shall be used when connecting directly to wall register or grille, unless otherwise indicated. Each type "B" damper shall be provided with a factory fabricated steel wall sleeve. Wall sleeve length and gauge shall be determined by the contractor, based on the specific conditions of the penetration to be installed in accordance with the fire damper manufacturer's U.L. installation instructions. These specific conditions include, but are not limited to; size of connecting duct, type of duct to sleeve connection, wall or floor thickness, etc. Fire dampers shall be attached to sleeve in accordance with manufacturer's U.L. installation instructions. Clearances required between fire damper sleeves and wall/floor openings shall be in accordance with manufacturer's U.L. installation instructions. Each fire damper shall be furnished with factory provided retaining angles. Angle size and gauge shall be determined by the contractor, based on the specific conditions of the penetration, to be installed in accordance with the fire damper manufacturer's U.L. installation instructions. These specific conditions include but are not limited to; duct size, wall or floor construction, etc. Retaining angles shall be attached to the sleeve in accordance with the manufacturer's U.L. installation instructions. Provide single side retaining angles unless conditions require retaining angles on both sides of the partition. Where round or oval ducts penetrate a wall or floor and require a fire damper, provide a rectangular fire damper with a factory furnished rectangular to round or oval transition on each side of the wall or floor connected to the sleeve. Transition shall be minimum 1" offset type. Transition shall be provided with blade stack out of air stream, and with transition positioned 1" from bottom sleeve. Rectangular damper size shall be appropriate to fit inside sleeve and allow blade stack out of air stream.

B. Differential Pressure Rating and Velocity Rating: Dampers shall have a minimum UL 555 differential pressure rating of 4" w.g. When project conditions exist that have higher differential pressure conditions, provide dampers with 6" w.g. or 8" w.g. as appropriate. Dampers shall have a minimum UL 555 velocity rating of 2000 fpm. When project conditions exist that have higher velocities than 2000 fpm, provide dampers with minimum UL 555 velocity ratings of 3000 fpm or 4000 fpm as appropriate.

C. Manufacturers: Fire dampers shall be manufactured by Prefco, Pottorff, Nailor-Hart, National Controlled Air, Phillips, Louvers and Dampers, Safe Air, Ruskin, Carnes, Air Balance, Greenheck, Cesco or United Air.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate single or double-vane, curved blades of galvanized sheet steel set 2" or 3-1/4" o.c. and set into vane rail runners suitable for duct mounting.
   1. Turning Vanes shall be manufactured by Ductmate Industries, Inc., Areo/Dyne Company, Duro Dyne Corp., METALAIRE, Inc., or Ward Industries, Inc.

2.6 DUCT ACCESS DOORS

A. Doors shall be factory fabricated, meeting requirements of SMACNA HVAC Duct Construction Standards. Contractor has the option of using either hinged/cam type doors or sandwich type doors. Insulated ducts shall be provided with factory insulated duct access doors. Access doors with sheet metal screw fasteners are not acceptable.

B. Provide rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. Provide ½" wide door to frame gasket and frame to duct gasket. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover. Provide seals from frame to door and frame to duct.

C. Hinged/camp type access doors smaller than 12-inches square may be secured with sash locks only (not continuous hinge).

D. Provide continuous piano type hinge and two sash locks for sizes up to 18 x 18 inches, and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide double wall door construction. Access door and frame shall be fabricated from 24-gauge galvanized steel.

E. Hinged/Cam Type Duct Access Doors for Low Pressure Round Ducts: Access doors shall be factory fabricated, with minimum 16-gauge galvanized steel door and continuous steel piano hinge. Provide plate steel strike and catch locks. Access door shall have factory installed 1" wide x 3/8" thick polyethylene gasket. Contractor shall field cut hole one inch smaller than door width and height.

F. Sandwich Type Access Doors: Doors shall consist of layers of stamped steel. The inside panel, installed inside duct, shall consist of metal plate with closed cell full perimeter neoprene gasket, bonded to the inside door. Service temperature of gasket shall be -20°F to 200°F. Outer door shall consist of steel, with polypropylene hand knobs with threaded metal inserts, such that door is removable without tools. Springs shall be conical zinc plated, and bolts shall be zinc plated sealed to the inner door. A self-adhesive template shall be provided for the exact size of duct opening required. Doors shall be tested to 20-inch positive and 10-inch negative static pressure with no leakage noted. Doors shall be factory insulated with two layers of interior metal with insulation between the two when duct is specified to be insulated.

G. Manufacturer:
   1. Hinged/cam type doors shall be Model #HAD-10 by Venco or DT by Elmdor or equal by Ductmate, Phillips-Aire, Air Balance, Kees, Pottorff, Ruskin, Nailor, Greenheck, Cesco, National Controlled Air or Safe Air.
   2. Sandwich type doors shall be Model D (rectangular) or DR (round) as manufactured by Ductmate or equal by Phillips-Aire, Air Balance, Kees, Pottorff, Ruskin, Nailor, Greenheck, Cesco, National Controlled Air or Safe Air.

2.7 FLEXIBLE CONNECTORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated. Flexible connections must be in compliance with appendix "D" NFPA 90A requirements.

B. Manufacturers:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Corp.
   3. Ventfabrics, Inc.
   4. Ward Industries, Inc.

C. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Select metal compatible with ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz. /sq. yd.
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

2.8 FLEXIBLE LOW PRESSURE ROUND DUCTWORK

A. General: Insulated low pressure flexible duct shall be a factory fabricated assembly consisting of a non-perforated polyester film inner liner, zinc-coated spring steel helix, wrapped with fiberglass insulation and a bi-directional reinforced metalized polyester film outer vapor barrier wrap. The insulation shall have a minimum R of 6.0 except that a R value of 8.0 shall be provided for all flex ducts located outside of the building insulation boundary (for example in attics, crawl spaces, etc.). R value of 8.0 shall also be provided for any flex ducts specifically identified on the drawings with R-8 insulation requirements. Insulation shall have a maximum conductance (C) of 0.238 at 75°F. The insulations thermal performance shall be measured in accordance with the ADC Flexible Duct Performance and Installation Standards (1991) using ASTM C518. The composite assembly, including insulation and vapor barrier, shall meet the Class 1 requirements of NFPA 90-A and be labeled by Underwriters' Laboratories, Inc., with a flame spread rating of 25 or less and a smoke developed rating of 50 or less. Low pressure flexible ductwork shall be manufactured by Certain Teed, Thermaflex, Genflex, Metraflex, Atco or Flexmaster. Flexible duct with R value of 8.0 shall be model G-KM-R-8 as manufactured by Certain Teed, Model UPC-031 as manufactured by Atco, or equal by Thermaflex, Genflex, Metraflex or Flexmaster.

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.10 BELLMOUTH TAKE-OFF COLLARS

A. General: All take-offs for round ducts from trunk ducts which are minimum 4" deeper than round duct take-off size shall be fabricated in the shape of a "bellmouth" entrance of 26 gauge galvanized G90 steel with 28-gauge body and 26-gauge balancing damper with operator handle. Damper shall be factory installed with quadrant operator handle, retractable spring-loaded threaded bearings and wing lock nut. On insulated ducts, provide optional extended neck for damper handle to allow handle to clear specified insulation thickness. Bellmouth shall include neoprene gasket and a minimum of 5 pre-drilled mounting holes. "Spin-In" fittings with air scoops and dampers are unacceptable unless specifically called out on drawings for ducts 5" and smaller.

B. Manufacturers: "Bellmouth" fitting shall be model number BM-D (uninsulated ducts) or model number BMD-ISG (insulated ducts) as manufactured by Buckley Air Products or model number 3210-BD (uninsulated ducts) or model number 3210-BDS (insulated ducts) as manufactured by Crown or Model BMD (uninsulated ducts) or Model BMD-E (insulated ducts) as manufactured by United Enertech or Model ATDBM by Southwork. Mini “bellmouth” fittings shall be Model M-BMD by Buckley or Model BTOBD by Stamped Fittings, Inc. No substitutions are permitted.

2.11 45° TAKE-OFF COLLARS

A. General: Take-offs for round ducts from trunk ducts which are less than 4" deeper than the round duct take-off size shall be made with a 45° side take-off fitting constructed of 26-gauge galvanized steel with G90 lock-forming quality. Fittings shall have 1" wide mounting flange with pre-drilled mounting holes and an adhesive coated gasket to minimize leakage. Fitting shall have a balancing damper with operator handle. A locking quadrant shall be provided for damper rod. On insulated ducts, provide optional extended neck for damper handle to allow handle to clear specified insulation thickness.

B. Manufacturers: Crown 3300D (uninsulated ducts) or 3300-DS (insulated ducts), Flexmaster STO-D (uninsulated ducts) STO-D-B02 (insulated ducts), Sheet Metal Connectors, Inc. model HET (uninsulated) or model HET with 1.5-inch standoff (insulated), Buckley Model 3300D (uninsulated ducts) or Model 3300D-ISG (insulated ducts), Jer-Air Model AT-502, or Model AT63WD by Southwork.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure systems where branches are taken from larger ducts and as required for air balancing. Use splitter dampers where indicated.

C. Provide air turning devices in all elbows in supply, return, outdoor air and exhaust ducts.

D. Some branch duct take-offs to ceiling diffusers may be indicated on the plans to be made with square or rectangular duct take-offs out the bottom of the supply ducts due to space restrictions. At these take-offs, provide equalizing grids behind the diffusers to insure uniform airflow behind the diffuser.

E. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, use stainless-steel accessories in stainless-steel ducts, and use aluminum accessories in aluminum ducts.

F. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

G. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

H. Fire Dampers: Fire dampers shall be installed in accordance with the recommendations of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems and NFPA 90A and International Mechanical Code. Installation shall also conform to the UL installation instructions furnished by the manufacturer. Provide submittal data on dampers and installation instructions. Provide fire dampers where ducts penetrate fire rated walls. See architectural drawings for location and hour rating of all fire rated walls. Provide fire dampers where ducts penetrate floors.

I. Duct Access Doors:
   1. Access doors shall be sized by contractor to provide appropriate access for service. Access door material and pressure rating shall match ductwork. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories as follows:
      a. Adjacent to fire dampers, providing access to reset or reinstall fusible links.
      b. Any other systems requiring access inside duct.

J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment unless specifically noted otherwise. Flexible connectors are not required on equipment that has internal flexible connectors.

K. Install duct test holes where required for testing and balancing purposes.

L. Branch take-offs of sheet metal ductwork from truck ducts shall be made with 45-degree branch entries or splitter dampers and elbows with turning vanes as indicated. See Division 23 - Metal Ducts. Air scoops, deflectors, extractors and other devices are prohibited unless noted otherwise.

M. Bellmouth and 45° Branch Entry Fitting Installation: Gasketed Bellmouth and 45° branch entry fitting take-off collars shall be screwed into the side of sheet metal duct with a minimum of 5 screws. Provide duct sealant around perimeter of take off connection to trunk duct; integral gasketing is not a substitute for duct sealant. Where the supply duct is not 4" deeper than the diameter of the take-off collar, the protruding edges of the bellmouth shall be bent over the top and bottom of the duct with a vice-grip hand brake in accordance with the manufacturer's recommendations. Inner core of flexible duct shall be connected to the bellmouth and 45° branch entry fitting take-off collar with a stainless-steel band and outer vapor barrier with minimum 1/2" wide nylon zip strip. When associated ducts are insulated, insulate entire bellmouth and 45° branch entry fitting (except operator handle) with 2" thick ductwrap. Thickness of ductwrap shall match insulation thickness for the connecting ducts as specified in Section 230716 “HVAC Equipment Insulation.”

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Division 23 - Testing, Adjusting, and Balancing for HVAC.

3.3 CONNECTION OF FLEX DUCTS

A. Secure all flexible ducts with ½" wide stainless-steel draw bands with worm gear assembly and hardened tightening screw, or secure with heavy-duty polymer straps by Panduit, Hellerman or Tyton. Polymer straps shall be covered by UL181 tape. After metal band or heavy-duty polymer strap is installed on the inner duct, the exterior vapor barrier shall then be secured with nylon "zip-strip" bands. Flexible duct support width shall be minimum 4" wide and shall extend at least ½ of the circumference of the flexible duct. Flexible ducts shall be installed in a fully extended condition free of sags and kinks, using only the minimum length required to make the connection. Ends of flex duct shall be secured with metal draw bands (nylon "zip-strips" are not acceptable). Installation, including attachment and support, shall be in accordance with the manufacturer's written instructions and with the latest edition of SMACNA Flexible Duct Installation Standards. Flexible duct runs shall be a maximum of 8', unless a longer length is specifically shown on the drawings.

END OF SECTION 233300

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Ceiling mounted ventilators.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on 1,000-foot site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product data shall be submitted under the provisions of Division 23 - Common Requirements for HVAC Equipment. Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Fan speed controllers.
   7. Vibration isolators, if furnished by fan manufacturer.

B. Operation and Maintenance Data: For power ventilators, submit operation and maintenance data under the provisions of Division 23 - Closeout Document Requirements for HVAC.

1.4 QUALITY ASSURANCE

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

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

PART 2 - PRODUCTS

2.1 CEILING MOUNTED VENTILATORS

A. Cabinet-mounted centrifugal type complete with ½" acoustically lined steel cabinet, direct drive permanently lubricated motor and a single centrifugal blower and housing. Discharge arrangement shall be horizontal or vertical as indicated with a gravity operated backdraft damper mounted in the discharge opening. The motor shall have a plug-in cord set for easy

disconnect and removal for service. Provide in line adapter as required on drawings. Provide removable molded polymer or painted steel or aluminum grille. Where scheduled, provide unit mounted or field installed motion detector for fan start/stop control.

2.2 ROOF CURBS

A. Refer to Division 23 - Hangers and Supports for HVAC Piping and Equipment.

2.3 TESTS

A. Wheels shall be statically balanced before assembly and the assembled fans shall be dynamically balanced at the speeds at which they are scheduled to operate.

2.4 ACCESSORIES

A. Provide the accessories noted or shown in the schedule. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification. Speed controllers shall be solid state type designed to reduce speed from 100% to 50%. Backdraft dampers shall be parallel blade type, either gravity or motorized as scheduled. Motion detectors shall be integral, or field mounted as scheduled, and shall be passive infrared type to automatically turn on the fan when a change in motion is sensed. Motion detectors shall have a viewing area of 180 degrees, and shall have an adjustable time delay shutoff of 30 seconds to 30 minutes.

2.5 FINISH

A. All non-corrosion resistant ferrous metal fan parts shall be cleaned and painted with a heavy coat for primer finish and two coats of enamel paint.

2.6 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

2.7 MANUFACTURERS

A. Fan capacities shall be as scheduled on the drawings and shall be manufactured by Twin City, Cook, Greenheck, Penn or Acme.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and International Mechanical Code.

B. Install power ventilators level and plumb.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 - Identification for HVAC Piping and Equipment.

E. Speed controllers for fans shall be field mounted and wired by Division 26. Exact location of speed controllers for fans shall be as shown on the mechanical drawings. If no specific location is shown on the mechanical drawings, the location shall be determined by the contractor, with the following requirements to be adhered to:

1. Unless specifically shown otherwise, speed controllers shall not be mounted on wall below the ceiling and accessible by building occupants. Speed controllers are intended to be adjusted by the Test and Balance agent and left in the same position to maintain specified airflow rates.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product data shall be submitted under the provisions of Division 23 - Common Requirements for HVAC Equipment. For each product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate grille designation (i.e., tag), model number, size, and accessories furnished. Do not indicate quantity in the submittal.

1.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The grilles, registers, and diffusers shall be manufactured by Carnes, Krueger, E. H. Price, Air Devices, Nailor-Hart, Kees, Air Louvers, Anemostat, Tuttle and Bailey, Titus/J & J or Metal*Aire.

2.2 GRILLES AND REGISTERS

A. Side Wall Registers: Side wall registers and grilles shall be steel, stainless steel or aluminum construction, as indicated, double deflection type for supply and single deflection type for return, with indicated blade spacing and the front set of blades horizontal. Each blade on supply grilles/registers shall be individually, manually adjustable to provide for varying air flow patterns. Blades shall be airfoil shaped where indicated on the schedule on the drawings. Return grilles/registers shall have fixed blade setting. Supply registers and return registers shall match. Finishes shall be as indicated on the schedule. Provide a gasket between the flange and wall. Opposed blade volume dampers shall be aluminum or steel construction, operable through the front face of the register. Screw holes shall be countersunk with countersunk steel screws. Flange of grille shall be approximately 1-1/4 inches wide to cover duct and wall opening.

B. Egg Crate Grilles and Registers: All aluminum extruded grille with aluminum opposed blade damper, where scheduled, 1" x 1" x 1" egg crate grid and baked enamel finish. Where specified, transfer grilles for air movement from room to above ceiling shall be 1/2" x 1/2" x 1/2" egg crate grid and baked enamel finish with 45-degree angled blades to prevent line of sight viewing above ceiling.

2.3 CEILING DIFFUSER OUTLETS

A. Louver Face Diffusers: Louver face ceiling diffusers shall be of extruded aluminum or steel construction as scheduled, composed of a minimum of three square concentric cones. Finishes shall be as indicated on the schedule. Necks shall be square or round as indicated. Where round flex ducts are shown connected to square neck diffusers, provide insulated round to square neck sheet metal adapters. Where round flex ducts are shown connecting to a different diameter round neck size, provide round to round adapter. Diffusers shall have lay-in frame (outer cone ± 23-3/4" x 23-3/4") or flange frame as scheduled. Cone shall be adjustable where scheduled, allowing adjustment from horizontal to vertical. Back pan shall be factory insulated.

B. Thermally Operated Diffusers - Thermafuser Type: Designed to vary the supply air volume between minimum and maximum flow rates within 1-1/2 degrees F of temperature setting. The temperature heating and cooling settings shall be field adjustable within an 8-degree F. range. Individual, thermally powered elements (2), shall vary the supply air volume (VAV) to maintain the room heating and cooling setpoints. A changeover element which will reverse the action from VAV cooling to VAV heating shall be included to change-over based on supply air temperature. Diffuser shall be manufactured by Acutherm or Rickard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. See architectural reflected ceiling plan for location of ceiling grid. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Provide round to square adapters at all round duct connections to square neck diffusers. For supply diffusers, adapter shall be insulated.

E. Install items in accordance with manufacturer's instructions.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 234100 - PARTICULATE AIR FILTRATION AND BI-POLAR IONIZATION UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications. This section also includes bi-polar ionization units designed to kill or inactivate mold, virus, bacteria, and to neutralize odors and create particle agglomeration for improved filter effectiveness.

1.2 SUBMITTALS

A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; for each model indicated. Submit under the provisions of Division 23 - Common Requirements for HVAC Equipment, for the following:

1. Medium Efficiency (MERV 8) Filters
2. Bi-polar ionization units

B. Operation and Maintenance Data: For each type of filter and rack, submit operation and maintenance data under the provisions of Division 23 - Closeout Document Requirements for HVAC.

C. Submit product data for bi-polar ionization units published by the manufacturer, including dimensions, wiring diagrams, installation and operation manuals, material specifications, and data to confirm units comply with all aspects of specifications.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air filters and are based on the specific system indicated. Refer to Division 1 - Product Requirements.

B. Comply with ASHRAE 52.1 and ASHRAE 52.2 as specified herein for method of testing and rating air-filter units.

C. Comply with NFPA 90A and NFPA 90B.

1.4 EXTRA MATERIALS

A. Furnish extra materials under the provisions of Division 23 - Closeout Document Requirements for HVAC.

PART 2 - PRODUCTS

2.1 MEDIUM EFFICIENCY MERV 8 30% FILTERS

A. Filters shall be 1", 2" or 4" deep medium efficiency, pleated, disposable type, as noted in the specification for each product, or as noted on the drawings. Each filter shall consist of synthetic fiber media bonded to an electro-finish wire which itself is bonded to a heavy-duty fiberboard frame. The filter shall be listed by Underwriter's Laboratories as U.L. Class 2. The filter media shall be 100% synthetic continuous fiber. Filters shall have a minimum efficiency reporting value of MERV 8 when evaluated under the guidelines of ASHRAE 52.2-1999. When tested in accordance with the ASHRAE 52.1-92 standard, the media shall have an average dust spot efficiency of 25-30%. Efficiency on 1.0-micron size particles shall not be less than 40% using the laser particle counter. The filter media wire support shall be 24 ga. 1" x 1" electro-finish wire with a 96% open area. The welded wire backer shall be bonded to the media to prevent media movement. The pleated wire support shall allow total use of the filter media. The filter frame shall be heavy duty fiberboard, die cut for dimensional accuracy. The frame webbing shall be bonded to the filter pack, upstream and downstream, to ensure even pleat spacing. All ends of the filter shall be bonded to the inside of the frame to prevent air bypass. The filter shall be capable of withstanding 2.0" w.g. without failure of the media pack. The 2" deep filter shall have not less than 15 pleats per linear foot with an average effective media area of 4.6 square

feet per square foot of filter face area. The 4" deep filter shall have not less than 11 pleats per linear foot with an average effective media area of 7.0 square feet per square foot of filter face area. Media thickness shall be minimum 0.15 inches. Dust holding capacity when evaluated using ASHRAE test dust shall be at least 170 grams. The initial resistance at 500 fpm shall not exceed 0.30" w.g. Filter shall be Camfil-Farr model Aeropleat IV + or equal by approved manufacturer listed herein.

B. Manufacturers: Filters shall be manufactured by American Air Filter, Camfil-Farr, Airguard, Flanders, Continental, Purolator or EcoAir.

2.2 NEEDLEPOINT TYPE BI-POLAR IONIZATION UNITS (COMPACT TYPE)

A. Needlepoint type compact type ionizer designed to produce positive and negative ions to kill mold, bacteria, viruses, and neutralize odors. Tube type bi-polar ionization units shall not be allowed. Technologies that do not address gas disassociation such as UV lights, powered particulate filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. “Plasma” particulate filters shall not be acceptable. The bipolar ionization system shall operate in such a manner that equal amounts of positive and negative ions are produced. Single pole ion devices shall not be acceptable. Bipolar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time and corrosion. Ionization output from each electrode shall be a minimum of 160 million positive and negative ions. Manufacturer shall demonstrate that no voltage potential exists due to exposed electrical components in the duct system or plenum. Ion generators shall be installed in a convenient location for visual inspection, removal, and servicing. All plasma ion generators shall include internal short circuit protection, overload protection, and automatic fault reset. Needlepoint type units shall be designed for mounting within HVAC equipment, as scheduled on the drawings. Interior mounted units shall include integral mounting tabs or magnet. Housing materials of unit shall be ABS plastic or 18-gauge powder coated steel, with carbon or stainless-steel ionization needles. Unit shall accept 24 VAC. Units shall have LED indicating operating status. Units shall be powered from the 24 VAC transformer integral with HVAC equipment. Power consumption shall be maximum 18 watts up to 2400 cfm during operating cycle. Unit shall not require airflow to operate properly, but units shall be wired to only operate when airflow is present. Units shall be suitable for -20° to 160°F temperature range, and 0-99% non-condensing humidity range. Unit shall be UL 867 approved. Unit shall be equipped with dry contact output capable of connection to BAS for monitoring a fault condition. Monitoring of the fault condition dry contact is not included in the scope of this project. Contact rating shall be 5 amp at 120V maximum. Unit shall be UL-2998 certified for no ozone. Bi-polar ionization unit shall be manufactured by Plasma Air International, Aerisa, Phenomenal Air, Global Plasma Solutions or Bioclimatic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install filter and filter frames according to manufacturer's written instructions.

B. Position each filter unit with clearance for normal service and maintenance. Provide adequate clearance for filter access door opening.

C. Install filters in position to prevent passage of unfiltered air. Provide filter blanks as required to prevent bypass of unfiltered air between filters.

D. All filter racks and filter housings, whether integral with HVAC equipment or manufactured by filter manufacturer, shall be provided with a neoprene gasket seal on filters with MERV 8 or greater rating. Contractor shall field install gasketing if not provided by HVAC manufacturer. Urethane gasket shall not be allowed.

E. Contractor shall refer to the drawings and equipment specification sections for product type of filter for each piece of equipment. If no product type is indicated, contractor shall provide filter media efficiency and standard thickness as required by the manufacturer, and filter shall be, as a minimum, medium efficiency 20% filters.

F. Bi-Polar Ionization Installation and Start-Up: Bi-polar units shall be installed inside equipment as shown on the drawings. Install in accordance with bi-polar ionization unit manufacturer's installation instructions. For units mounted inside equipment, contractor shall not mount units in a location that will interfere with the supply fan's performance. Contractor shall verify operation for each bi-polar ionization unit. For compact type, contractor shall verify LED is illuminated after supply fan is energized, and verify power is cut off when fan is de-energized. Provide a start-up form showing all the above specified requirements have been performed. Provide form signed by Owner as shown below:

BI-POLAR IONIZATION UNIT START UP FORM		
Tag	Equipment Served	Unit is Powered/LED Illuminated When Fan Is Energized/De-energized
Equipment listed below is an example		
BPIU-1	RTAC-1	Yes
BPIU-2	RTAC-2	Yes
Owner Representative's Signature:		
Date Verified:		

G. Air Filters: During construction, filter shall be pleated type as specified. Immediately prior to occupancy by Owner, Contractor shall remove pleated filters and furnish and install new clean pleated filters at all equipment.

END OF SECTION 234100

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 238119 - SELF-CONTAINED AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged air-conditioning units (e.g., rooftop air conditioning units (RTAC)) with refrigerant compressors and controls, intended for outdoor installations, with integral air-cooled condensers.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, color samples where specified, and accessories for each type of product indicated. Provide data in submittals that each unit is run tested as described herein. Product data shall be submitted under the provisions of Division 23 - Common Requirements for HVAC Equipment.

B. Operation and Maintenance Data: For self-contained air-conditioning units, submit operation and maintenance data under provisions of Division 23 - Closeout Document Requirements for HVAC.

1.3 QUALITY ASSURANCE

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

B. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Run Testing: Each unit shall be 100% run tested at the factory. Each RTAC unit shall be run tested for cooling. Each RTAC unit shall be run tested for heating. Refrigerant suction and discharge pressures shall be checked to insure proper performance. All safety devices shall be checked. Each electrical component shall have the amperage and voltage checked to insure acceptability.

1.4 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 23 - Hangers and Supports for HVAC Piping and Equipment.

B. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings or illustrated by the manufacturer. Verify additional structural framing is installed between building structural members to support entire perimeter of roof curb.

C. Verify unit is provided with metal engraved nameplate indicating unit model and serial number and all technical data. Obtain and attach such nameplate from unit manufacturer if unit is not so equipped. Verify that proper gas and power supply matching unit nameplate is available.

1.5 WARRANTY

A. See Division 23 - Closeout Document Requirements for HVAC for warranty information.

1.6 EXTRA MATERIALS

A. See Division 23 - Closeout Document Requirements for HVAC for the supply and transfer of extra materials to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Unit shall be manufactured by Trane, Carrier, Daikin or Aaon.

2.2 MANUFACTURED UNITS

A. Provide roof-mounted units having gas heating or reverse cycle heat pump heating with auxiliary electric heating coil (as scheduled), and electric refrigeration. Unit shall be self-contained, packaged, factory assembled and pre-wired, consisting of cabinet and frame, supply fan, outdoor air damper (as scheduled), dehumidification circuit (as scheduled), heat exchanger and burner controls for gas fired units, air filters, refrigerant cooling coil and compressor, condenser coil, condenser fan and automatic temperature controls. Unit shall be designed for single point electric power connection. Unit shall be rated and certified in accordance with ARI-210/240/360 (for cooling performance) and ARI-270 (for sound) and bear the ARI seal. Unit shall be UL-465 designed and certified to ANSI Z21.47 and NFPA 90A.

2.3 CASING

A. Cabinet: Galvanized steel with baked enamel finish, and hinged access panels with quick 1/4 turn fasteners. Unit's surface shall be tested 500 hours in a salt spray test in compliance with ASTM B117. Structural members shall be minimum 18 gauge (1.20 mm), with access doors or removable panels of minimum 20 gauge. Top cover shall be one piece or where seams exist, shall be double hemmed and gasket sealed to prevent water leakage. Hinged access panels shall provide access to filters, heating section, fan section, evaporator coil and units controls. Down flow units shall have a raised 1-1/8" (minimum) high lip around supply and return openings for water integrity. Roof cabinet shall be sloped to ensure water runoff.

B. Insulation: Minimum ½ inch thick neoprene coated glass fiber on surfaces where conditioned air is handled and foil faced in the furnace compartment. Protect edges from erosion.

2.4 SUPPLY FAN

A. Forward curved centrifugal type, resiliently mounted with adjustable variable pitch motor pulley or multi-speed direct drive. Motor shall be permanently lubricated, thermally protected and vibration isolated from unit. Motor shall be 1750 rpm maximum and shall meet EPA requirements for motor efficiency. See also Division 23 - Common Requirements for HVAC Equipment for motor efficiency. Fan shall be statically and dynamically balanced. Evaporator fan shaft bearings shall have average life of 200,000 hours. Fan shafts shall be solid hot roll steel.

B. Fans shall be two-speed or staged as required to meet current Department of Energy requirements. Where manufacturers utilize variable frequency drives for controlling fan speed or fan staging, manufacturer shall furnish an operator interface to allow changing operating parameters for the VFD(s) and check fault codes. Operator interface may be permanent type inherent in the VFD or a remote keypad kit. Remote keypad kit shall consist of a handheld keypad, with LCD display, and CAT 5 data cable. Manufacturer may furnish only one remote keypad kit when that kit will be compatible with all rooftop air conditioners specified for the building. Provide appropriate number of kits to allow Owner to interface with all rooftop air conditioners provided on this project.

2.5 AIR FILTERS

A. Filter frame and filter media shall be one inch thick for units 5 tons and less, and two inches thick for units above 5 tons.

B. Filter shall be pleated type.

2.6 BURNER (FOR GAS FIRED UNITS ONLY)

A. Gas Burner: Aluminized steel or stainless steel forced or induced draft type burner with adjustable combustion air supply, pressure regulator, two stage (high-low) gas valves (10 tons or larger), manual shut-off; direct intermittent spark ignition, flame sensing device, and automatic 100 percent shut-off pilot. Tubular heat exchanger with turbolators shall be minimum 20-gauge steel coated with nominal 1.2 mill aluminum-silicon alloy or 22-gauge stainless steel. Drum and tube heat exchanger shall be minimum 18-gauge steel.

B. Gas Burner Safety Controls: Energize spark ignition, 90 second limit time for establishment of flame, sensor prevent opening of main gas valve until pilot flame is proven, stop gas flow on ignition failure, energize induced draft blower motor, and after air flow proven and slight delay, allow gas valve to open after sensor detects flame. On call for heat, combustion blower shall purge heat exchanger before ignition. Main gas valve will not be allowed to open unless combustion blower is operating.

C. High Limit Control: Temperature sensor (limit switch) with fixed stop at maximum permissible setting, deenergize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, or adjustable time delay relays with switch for continuous fan operation.

E. Gas Source: Unit shall be designed for use with natural gas. A factory installed gas pressure regulator shall be furnished integral with this equipment to regulate the incoming gas pressure to the manifold pressure recommended by the manufacturer. This regulator shall be capable of, and the equipment shall function properly, over an inlet pressure range of 5" w.c. (minimum) to 14" w.c. (maximum).

2.7 EVAPORATOR COIL

A. Provide copper tube, aluminum fin coil assembly with sloped corrosion resistant drain pan and threaded connection. Provide trap and discharge as shown on drawings. Coil shall be factory leak tested at 150 psig and pressure tested to 450 psig. Down flow units shall have a raised 1-1/8" (minimum) high lip around supply and return openings for water integrity.

2.8 COMPRESSOR

A. Provide hermetic scroll compressors, 3500 RPM maximum, resiliently mounted with positive lubrication via an oil pump, crankcase heater, high and low pressure safety controls on the refrigerant circuit, motor overload protection, high and low voltage protection, over temperature protection, suction and discharge service valves and gage ports and filter drier. Compressors shall be vibration isolated.

B. Five-minute timed off circuit shall delay compressor start and prevent short cycling.

C. Provide step capacity control by cycling compressors or cycling unloading. Provide minimum of two steps of capacity control for units eight tons or larger, and where scheduled on drawings.

2.9 CONDENSER

A. Provide copper tube, aluminum fin coil assembly or aluminum microchannel type coil assembly. Provide louvered coil guards to protect condenser coils from damage. Wire type shall not be acceptable. Copper tube type coils shall be factory leak tested at 150 psig and pressure tested at 600 psig.

B. Provide direct drive propeller fans, permanently lubricated, resiliently mounted with fan guard, statically and dynamically balanced with motor overload protection, wired to operate with compressor. Fan shafts shall be solid hot rolled steel.

2.10 CONTROLS

A. General: Unit shall be controlled as specified in Division 23 - Instrumentation and Control for HVAC. Unit shall be provided with internal controls for connection to a standard thermostat, or shall be provided with a field installed or factory installed DDC controller as specified in Division 23 - Instrumentation and Control for HVAC. Appropriate control points include, but are not limited to:
   1. Fan On/Off
   2. Heat (stages as specified)
   3. Cooling (stages as specified)
   4. Outdoor Air Damper Open/Close or Economizer enable/disable (as applicable)
   5. Reversing Valve (as applicable)

6. Humidity Sensor (as applicable)

B. All units shall include a 24-volt transformer sized adequately for internal controls. All required contactors and starters shall be factory installed.

C. Economizer Exhaust Fan Control: Where economizer exhaust fans are scheduled, provide factory installed controls to start economizer exhaust fan(s) to prevent building over-pressurization.

2.11 INTAKE AND RELIEF REQUIREMENTS

A. Intake Hood and Damper Arrangement: Intake hoods shall be waterproof and have a bird screen. For units with economizers, outside and return air damper shall be powered to open or closed position. For units without economizers, outside air damper shall be manually adjustable fixed type, unless a motorized two position damper is scheduled on the drawings.

2.12 PERFORMANCE

A. Scheduled performance is based on ARI 210 test conditions except as indicated otherwise. Sound Rating Numbers are in accordance with ARI 270.

2.13 DEHUMIDIFICATION PACKAGE

A. Rooftop air conditioners shall be provided, where scheduled, with controls and components to allow the unit to run in a dehumidification mode. These controls include a controller that will accept a space humidistat input. When humidity rises above setpoint, factory installed controls will energize the compressor, and hot gas solenoid valve will open to reheat air after passing through the evaporator coil. Controls also include all relays and programming to allow proper operation of the dehumidification sequence. Components include DX heating coil in the reheat position, hot gas piping and solenoid valve, thermal expansion valve, crankcase heater, and frostat. This dehumidification package is designed to allow dehumidification at mild ambient temperature conditions where sensible load is low but latent load is high.

2.14 CONVENIENCE OUTLET

A. Provide, where scheduled, factory installed powered convenience outlet. Outlet shall be GFCI (ground fault circuit interrupting) 120-volt 2 plug type. Outlet shall be powered type, meaning that the outlet is designed to be wired to a factory installed step down transformer.

2.15 ROOF CURBS

A. Roof Curbs: All units shall be provided with a roof curb designed to mate with the unit and to provide for complete weathertight installation. Roof curb construction shall comply with the requirements of Division 23 section "Hangers and Supports for HVAC Piping and Equipment". If equipment manufacturer provides roof curbs, and if factory insulation of curb is not provided, manufacturer shall notify contractor so that insulation contractor can include field insulation of curbs in their submittal data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb on factory furnished roof curb.

B. Anchor units to structure.

C. Install in accordance with manufacturer's instructions.

D. Mount units on manufactured roof mounting curb (vibration isolating type where scheduled) providing gasketed watertight enclosure to protect ductwork and utility services (electrical power, and control routed inside curb), constructed in accordance with Division 23 - Hangers and Supports for HVAC Piping and Equipment. Install roof mounting curb with top level. See architectural drawings for roof slope. Refer to Division 23 - Instrumentation and Control for HVAC for complete control requirements. Gas piping connection shall be outside of casing, unless otherwise noted on the drawings.

E. Seal all spaces between duct penetrations and roof slab with required thickness of closed cell neoprene flexible seal to minimize sound transmission to building.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install gas and condensate piping adjacent to unit to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service and Start Up: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Provide startup report from representative to document start-up has been performed in accordance with Division 23 - Closeout Document Requirements for HVAC.

B. Perform the following field tests and inspections and prepare test reports:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 - Demonstration and Training.

END OF SECTION 238119

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ductless split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics. Submit under the provisions of Division 23 - Common Requirements for HVAC Equipment.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For ductless split-system air-conditioning units, submit in operation and maintenance data in accordance with Division 23 - Closeout Document Requirements for HVAC.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 - Product Requirements.

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

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

1.4 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 23 - Hangers and Supports for HVAC Piping and Equipment.

1.5 WARRANTY

A. See Division 23 - Closeout Document Requirements for HVAC for warranty information.

PART 2 - PRODUCTS

2.1 DUCTLESS WALL MOUNTED FAN COIL UNIT

A. General: Furnish and install slim silhouette, wall mounted fan coil unit of the ductless, split type designed for air-to-air heat pump application.

B. Casing: Cabinet discharge and inlet grilles shall be high-impact polystyrene. Cabinet shall be fully insulated for thermal and acoustic performance.

C. Fans: Fans shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic motor-driven horizontal air sweep shall be provided. Air sweep operation shall be user selectable. Vertical direction may be manually adjusted and horizontal air sweep may be manually set.

D. Motor: Motors shall be open drip proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be three-speed.

E. Coil: Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins will be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header.

F. Filters: Unit shall have filter track with factory-supplied cleanable filters.

G. Controls: Controls shall consist of a microprocessor based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 64°F to 84°F. The unit shall have the following functions as a minimum:
   1. An automatic restart after power failure at the same operating conditions as at failure.
   2. A timer function to provide a minimum 15-hour timer cycle for system Auto. Start/Stop.
   3. Temperature sensing controls shall sense return air temperature. Indoor air high discharge temperature shutdown shall be provided.
   4. Evaporator coil freeze protection.
   5. Wired remote control to enter set points and operating conditions (required accessory).
   6. Filter status indication after 250 hours of indoor fan operation.
   7. Test mode button to run self-diagnostics and aid in trouble shooting.
   8. Auto. Stop features shall have integral setback control.
   9. Automatic air sweep control provides on or off activation of air sweep louvers.
   10. Dehumidification mode provides increased latent removal capability by modulating fan speed and set point temperature.
   11. Fan only operation provides room air circulation when no cooling is required.
   12. Diagnostics provides continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit and at the remote controller.
   13. A 35-foot indoor to outdoor thermistor connection cable shall be provided with the fan coil unit.
   14. Fan speed control shall be user-selectable; high, medium, low, or microprocessor automatic operation during all operating modes.
   15. A time delay shall prevent compressor restart in less than three minutes.
   16. Condenser high temperature protection shall be provided to detect excessive condenser discharge temperatures.

H. Wired remote controller shall allow control of fan coils. The remote shall provide two-way communication capability of system inputs and outputs. The liquid crystal display (LCD) shall provide continuous status of the system operating conditions. The kit shall include 15 feet of interconnecting cable and can be located inside the conditioned space.

I. Manufacturers: The ductless wall mounted fan coil units shall be manufactured by L.G., Mitsubishi, Samsung, Trane, Daikin or Carrier.

2.2 DUCTLESS HEAT PUMP

A. General: Furnish and install factory assembled air cooled condensing units (heat pump) of the size and capacity as indicated on the drawings.

B. Cabinet:
   1. Unit shall be constructed of galvanized steel, bonderized and coated with a baked enamel finish.
   2. Unit access panels shall be removable with minimal screws and shall provide full access to the compressor, fan, and control components.
   3. Compressor compartment shall be isolated and have an acoustic lining to ensure quiet operation.

C. Fans:
   1. Condenser fans shall be direct-drive propeller type, shall discharge air horizontally, and shall blow air through the condenser coil.

2. Condenser fan motors shall be totally enclosed, single phase motors with class B insulation and permanently lubricated sleeve bearings. Motor shall be protected by internal thermal overload protection.
3. Shaft shall have inherent corrosion resistance.
4. Fan blades shall be corrosion resistant and shall be statically and dynamically balanced.
5. Condenser fan openings shall be equipped with PVC coated protection grille over fan and coil.

D. Compressor:
1. Compressor shall be DC rotary compressor with variable speed inverter drive technology.
2. Compressor shall be equipped with oil system, operating oil charge, and motor. Internal overloads shall protect the compressor from over temperature and overcurrent. Scroll compressors shall also have high discharge gas temperature protection if required.
3. Motor shall be NEMA rated class F, suitable for operation in a refrigerant atmosphere.
4. Compressor assembly shall be installed on rubber vibration isolators and shall have internal spring isolation.

E. Condenser Coil: Coil shall be constructed of aluminum fins mechanically bonded to internally enhanced, seamless copper tubes which are cleaned, dehydrated and sealed. Refrigerant flow from condenser shall be controlled by a linear expansion valve (LEV) metering device. LEV shall be controlled by a microprocessor controlled step controller.

F. Controls and Safeties: Operating controls and safeties shall be factory selected, assembled and tested. The minimum control function shall include:
1. Controls:
a. Time delay restart to prevent compressor reverse rotation on single-phase scroll compressors.
b. Automatic restart on power failure.
c. Three-pole contactors on three phase units.
d. Safety lockout if any condensing unit safety is open.
e. A time delay control sequence is also provided standard through the fan coil board on wall mounted and ceiling suspended fan coil units.
f. High and low pressure switches.
g. Automatic condenser fan motor protection.
h. Start capacitor and relay (single phase units without scroll compressors).
2. Safeties:
a. High condensing temperature protection (when matched with wall mounted or ceiling suspended fan coils).
b. System diagnostics (when used with wall mounted or ceiling suspended fan coils).
c. Compressor motor current and temperature overload protection.
d. High pressure relief.
e. Condenser fan failure protection.

G. Options: Listed is a description of possible options. See Schedule on plans for individual options specified with each unit.
1. Low Ambient Kit: Control shall regulate fan motor cycles in response to saturated condensing pressure of the unit. The control shall be capable of maintaining a condensing temperature of 100°F +/- 10°F with outdoor temperatures to -20°F. Installation of kit shall not require changing the condenser fan motor.
2. Compressor Cycle Delay (when matched to in-ceiling cassette): Compressor shall be prevented from restarting for a minimum of five minutes after shutdown.
3. Winter Start Control: Unit shall be equipped with winter start control, which shall permit start-up for cooling operation under low-load conditions and at low-ambient temperatures by bypassing the low-pressure switch for a three-minute delay period.
4. Note: Winter start control shall be required when unit is equipped with low-ambient kit.

5. Crankcase Heater: Unit shall be equipped with a clamp-on compressor oil sump heater. Heater shall be used in all long-line applications.

H. Manufacturers: The ductless condensing units (heat pumps) shall be manufactured by L.G., Mitsubishi, Samsung, Trane, Daikin or Carrier.

2.3 REFRIGERANT CIRCUIT

A. Provide each unit with refrigerant circuit, factory supplied and internally piped.

B. Provide the following for each refrigerant circuit:
1. Piping and specialties in accordance with Division 23 - Refrigerant Piping.
2. Provide reversing valve (for heat pump) and filter dryer (as required by manufacturer). Provide factory installed external liquid and suction line service valves with service gauge port for checking pressure.
3. Provide linear expansion valve (LEV) refrigerant metering control as required for proper operation. LEV shall be controlled by a microprocessor controlled step motor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install roof-mounting compressor-condenser components on equipment supports specified in Division 23 - Hangers and Supports for HVAC Piping and Equipment. Anchor units to supports.

C. Install and connect refrigerant tubing to component's fittings. Install tubing to allow access to unit.

3.2 DFCU INSTALLATION

A. Provide insulated condensate piping trap on DFCU(s) not specified with integral condensate pump.

B. Install unit and associated piping, conduits, etc. so that all access panels are completely removable and unit can be easily serviced. Clearance shall be provided to allow for easy removal of unit filters.

C. Make connection to thermostat and program with start/stop times and set points as directed by Owner.

3.3 DHP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of controls with Division 23 - Instrumentation and Control for HVAC.

C. Install units level, anchored as specified in Division 23 - Hangers and Supports for HVAC Piping and Equipment.

D. Provide connection to refrigeration piping system and evaporators.

3.4 MANUFACTURER'S AND CONTRACTOR'S FIELD SERVICES

A. Supply initial charge of refrigerant and oil for each refrigerant circuit. Installing Contractor shall replace any refrigerant and oil lost during the first year of system operation.

END OF SECTION 238126

SECTION 238240 - ELECTRIC HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes heaters with integral fans and electric heating elements.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories. Product data for each type of equipment shall be submitted under the provisions of Division 23 - Common Requirements for HVAC Equipment.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For electric heaters, submit operation and maintenance data under provisions of Division 23 - Closeout Document Requirements for HVAC.

1.3 QUALITY ASSURANCE

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

1.4 WARRANTY

A. See Division 23 - Closeout Document Requirements for HVAC for warranty information.

PART 2 - PRODUCTS

2.1 ELECTRIC WALL HEATERS

A. General: Furnish and install surface or recessed mounted, heavy-duty architectural electric wall heaters as indicated on the drawings. Each unit shall be completely factory assembled consisting of a cabinet, electric heating element, fan and controls as specified below. All heaters shall be UL listed and meet the requirements of the National Electrical Code.

B. Cabinet: The wall housing shall be fabricated from 20 gauge galvanized steel and the architecturally styled front grille fabricated from 16 gauge steel with closely spaced down flow discharge bars. Finish shall be baked enamel paint and the front grille shall be attached with partially concealed screws. All units shall be recessed mounted into concrete block wall which has been cut only to sufficient depth for insertion of the unit, unless indicated otherwise.

C. Heating Element: Electric heating element shall be copper clad steel sheath type with aluminum fins. Fan motor shall be totally enclosed and permanently lubricated, with the statically and dynamically balanced aluminum propeller fan direct connected to the motor shaft.

D. Controls: Operating and safety controls for each heater shall include thermostat, automatic reset thermal overload protector, contactors, fan delay switch to energize fan motor only after element is heated, thermal limit switch and double pole disconnect switch complying with NEC requirements. The built-in comfort thermostat shall have an adjustable range between 55 degrees and 85 degrees F with manually set "no heat" position. Thermostat shall be tamper-resistant, requiring the use of a long blade screwdriver to accomplish adjustment through the front grille.

E. Manufacturers: Electric wall heaters shall be of the capacities indicated on the drawings and shall be manufactured by Q-Mark, Redd-i, Indeeco, Electromode, Erincraft, Chromalox, Markel, Raywall or Berko.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before wall and ceiling heater installation. Verify proper power supply is available.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly.

B. Install heaters to comply with NFPA 90A.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Operate electric heating elements to verify proper operation and electrical connections.
   3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION 238240

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Basic electrical requirements, which are specifically applicable to all Division 26 Sections, in addition to the requirements of Division 1 - General Requirements.

1.2 SUBMITTALS

A. Provide submittals in accordance with Section 013300 - Submittal Procedures.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 260519 - Low-Voltage Electrical Power Conductors and Cables
      a. Building wire and cable (600 volts and less)
      b. Connectors, splices and terminations (600 volts and less)
      c. Sleeves
   2. Section 260529 - Hangers and Supports for Electrical Systems
      a. Steel slotted support systems
      b. Non-metallic slotted support systems
      c. Fastening hardware
      d. Plywood backboards
      e. Sleeves
   3. Section 260533 - Raceways and Boxes for Electrical Systems
      a. Rigid steel conduit
      b. IMC
      c. PVC coated steel conduit.
      d. EMT
      e. Flexible metal conduit
      f. Liquidtight flexible metal conduit
      g. Nonmetal conduit
      h. Conduit fittings and bodies
      i. Surface metal raceway
      j. Two compartment raceway
      k. Surface raceway fittings
      l. Outlet boxes
      m. Junction boxes
      n. Floor boxes
      o. Hinged cover enclosures
      p. Cabinets
      q. Handholes

r. Sleeves

4. Section 260537 - Cable Hooks Support System
   a. J-Hooks
   b. Brackets and fittings
5. Section 260553– Identification for Electrical Systems
   a. Product Data
   b. Identification Schedule
   c. Samples
6. Section 260941 – Digital Lighting Controls
   a. Product data
   b. Shop Drawings
   c. Qualification Data
   d. Certification
   e. Field Quality Control Test Reports
7. Section 260943 – Building Lighting Controls
   a. Product data
   b. Shop Drawings
   c. Qualification Data
   d. Certification
   e. Field Quality Control Test Reports
8. Section 262416 – Panelboards
   a. Product data
   b. Shop drawings
9. Section 262726 – Wiring Devices
   a. Convenience receptacles
   b. Isolated ground receptacles
   c. GFCI receptacles
   d. Twist locking receptacles.
   e. Pendent cord receptacles
   f. Cord & Plug sets.
   g. Light switches
   h. Pilot light switches
   i. Key operated switches
   j. Key operated momentary contact switch
   k. Wall plates
10. Section 262813 – Fuses
    a. Product data
    b. Shop drawings
11. Section 262816 - Enclosed Switches and Circuit Breakers
    a. Product data
    b. Shop drawings
12. Section 263213 – Engine Generators
    a. Rated capacities (data)
    b. Operating characteristics (data)
    c. Overall dimensions (shop drawings)
    d. Weight (shop drawings)
    e. Required clearances (shop drawings)
    f. Location of connectors (shop drawings)
    g. Wiring diagrams (shop drawings)
    h. Warranty

13. Section 263600 – Transfer Switches
    a. Product data
    b. Shop drawings
14. Section 265100 – Interior Lighting
    a. Product data
    b. Coordination drawings
    c. Qualification data
    d. Warranties

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Only manufacturers listed in specifications or addendums will be considered.

K. Review, corrections, or comments made on the submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addendums (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

L. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the submittal review.
    1. RNE - Reviewed, No Exceptions Noted
        a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
        b. No corrective action required at this time.
    2. FNC - Furnish with Noted Corrections
        a. Indicates the contractor shall ensure that all necessary or noted corrections are incorporated into equipment furnished to the project.
        b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
    3. RES - Revise and Resubmit
        a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
        b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
    4. PSD - Provide Submittal Data
        a. Indicates submittal data was not provided for this item or section.
        b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

M. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All sleeves must be precast in concrete or concrete block and accordingly provided to the mason in a timely manner. Accordingly, all items such as these shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractor's failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.3 REGULATORY REQUIREMENTS

A. All work installed under Division 26 shall conform to the current adopted Edition of Building/Electrical Codes and their appropriate amendments:
   1. NFPA 70 2023 National Electrical Code
   2. Life Safety Code, NFPA 101
   3. Requirements of the State of Georgia Fire Marshall's Office.
   4. GA State Energy Code.
   5. Standard Building Code
   6. Standard Mechanical Code (Georgia Edition)
   7. Standard for Health Care Facilities, NFPA 99
   8. National Fire Alarm Code NFPA 72
   9. Standard for Emergency and Standby Power Systems NFPA110
   10. City of McDonough and Henry County Codes

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.4 CONTRACTOR GUARANTEE

A. All equipment and materials furnished and all work performed under these specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after Architect's Final Certificate. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.5 OPERATING AND MAINTENANCE (O&M) MANUALS

A. One bound and indexed Operating and Maintenance Manuals and one electronic copy (PDF format) shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binders shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

B. Operating and maintenance manuals shall also comply with Division 1 Section "Operation and Maintenance Data.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Drawings, unless prevented by project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

D. Electrical items are shown on drawings in approximate locations unless dimensioned. Install at location required to serve intended purpose. Include installation within ten (10) feet of location shown.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 26 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g., ceiling plenums, mechanical rooms, etc.) are coordinated and installed to ensure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than six-week fabrication schedules. See Section 01100 - Summary for additional requirements.

1.8 ACCEPTABLE PRODUCTS

A. Where a manufacturer has been listed as being acceptable in the various specification sections hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of his standard product. His product shall still comply with all of the requirements and standards of this specification and not necessarily his standard specification, to the extent that it might require special manufacture to meet the requirement and standards of this specification.

B. Prior Approval: Substitutions of specified items and prior approvals of other manufacturers will not be considered.

C. Addenda: If the substitution is allowed, such approval will be set forth in an Addendum.

D. Costs: All costs incurred by the acceptance of substitutions shall be borne by the contractor.

1.9 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.10 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match.

C. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.11 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.12 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers and shall use these numbers wherever required. (For example, room numbers are used in programming of fire alarm systems and intercom system, and shall match the Owner's final choice.)

END OF SECTION 260500

SECTION 260501 - ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition of existing facilities shall consist of, but is not limited to, the removal of cable and wiring, conduit, fixtures and outlets, and associated abandoned or removed equipment.

B. Visual Appearance: Demolition shall be accomplished so as to not degrade the visual appearance and structural soundness of the facility.

C. Surfaces exposed by the removal of equipment and equipment connections shall be restored to match existing adjacent surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.

C. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

B. Existing Electrical Services: Maintain existing systems in service during construction. Disable systems only to make connections and change-over to new service. Obtain permission from Owner at least 14 days before partially or completely disabling any existing system. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations which remain active.

H. Extend existing installations using materials and methods as specified.

I. If circuit serves only the device or equipment to be removed, then remove conductors back to supplying panel and remove all accessible conduit.

J. If circuit serves some devices or equipment to be removed and some devices or equipment to remain, remove conductors back to nearest junction box or equipment to remain and rework remaining conductors to maintain power to devices to remain. Remove accessible conduit to same box or equipment. Plug all openings in box or equipment.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.5 INSTALLATION

A. Install relocated materials and equipment, as noted on drawings, under the provisions of Division 26.

END OF SECTION 260501

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:
   1. Division 27 Section "Voice and Data Communication Cabling and Network Equipment" for cabling used for voice and data circuits.

1.2 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

B. Determine required separation between this and other work.

C. Determine routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Only products of domestic manufacturer will be accepted.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. American Insulated Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
   6. Allied
   7. Carol.
   8. Pirelli.
   9. Rome.
   10. Triangle.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Hubbell Power Systems, Inc.
   3. O-Z/Gedney; EGS Electrical Group LLC.
   4. 3M; Electrical Products Division.
   5. Tyco Electronics Corp.
   6. Burndy Hydent.
   7. Ilsco.
   8. Thomas and Betts.
   9. Ideal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
   1. Solderless Pressure Connectors: 3M Skotch-loks, T & B Freespring, or Ideal Wing Nut for 10 AWG and smaller.
   2. Compression Connectors: Burndy Hydent, Ilsco or Thomas and Betts, Color-Keyed for 8 AWG and larger.
   3. Terminal Lugs: Thomas and Betts STA-KON for 10 AWG and smaller; Thomas and Betts Color-Keyed for 8 AWG and larger. Equal product as manufactured by Burndy or Ilsco are acceptable.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW, single conductors in raceway and ductbank.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway,

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

G. Class 1 Control Circuits: Type THHN-THWN, in raceway.

H. Class 2 Control Circuits: Type THHN-THWN, in raceway.

I. Insulation: ANSI/NFPA 70; Type XHHW insulation for circuits 6AWG and larger; Type THHN/THWN insulation for circuits 8 AWG and smaller. At the contractors option, type THHN/THWN insulation may be utilized throughout for all feeders and branch circuits.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Identify and color-code conductors and cables according to Division 26 Section "Electrical Identification."

E. Install products in accordance with manufacturers' instructions.

F. Use conductor not smaller than 12 AWG for power and lighting circuits.

G. Pull all conductors into raceway at same time.

H. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards using nylon cable ties by Thomas and Betts, Panduit or Ideal.

3.4 CONNECTIONS

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

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. Clean conductor surfaces before installing lugs and connectors.

E. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

F. Where compression connectors are used for conductor splices and taps; tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

G. Use terminal lugs for connecting all stranded conductors and for all multiple connections to terminals.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
   2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
      a. Verify continuity of each branch circuit.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

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. Power system grounding.

B. Communication system grounding.

C. Electrical equipment and raceway grounding and bonding.

1.3 QUALITY ASSURANCE

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Exothermic Connections: Exothermic connections shall be suitable for direct burial without degradation over the lifetime of the grounding system. Manufacturers of exothermic connections shall be National Lightning Protection "Powerweld", Lightning and Grounding Systems "Therm-o-weld" or Erico "Cadweld".

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4-inch by10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Ground the electrical service system neutral at service entrance equipment to building steel, water main and to supplementary grounding electrodes.

B. Ground each separately-derived system neutral to building steel.

C. Provide communications, computer and other low voltage distribution system grounding conductor and connect to the inter-building grounding bus in the main electrical room. Use code minimum No. 6 AWG copper conductor. Leave six feet slack conductor at terminal board.

D. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and receptacle ground connections.

E. Provide a separate grounding conductor in all conduits, no exceptions. Connect outlet boxes to grounding conductors with screw fastened bonding jumper.

F. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger, unless otherwise indicated.

G. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

H. Grounding Bus: Install in electrical and data network equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.

I. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors.
   3. Connections to Ground Rods: Welded connectors.
   4. Connections to Structural Steel: Welded connectors.

3.2 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Supplementary Grounding Electrode: Use driven ground rods on exterior of building.

F. Where multiple grounding electrodes are required or where other grounding electrodes are located within 6 feet each grounding electrode shall be interconnected below grade using code size bare copper conductor, minimum 6 AWG.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Conduit and equipment supports.

B. Fastening hardware.

C. Plywood backboards.

D. Housekeeping pads and curbs.

E. Sleeves

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted metallic support systems.
   2. Fastening hardware.
   3. Plywood backboards.
   4. Sleeves

B. Indicate hanger and support framing and attachment methods.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

C. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.6 COORDINATION

A. Coordinate size and location of concrete bases.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

C. Coordinate with Division 23 contractor to route conduit concealed within curb of rooftop mounted HVAC equipment.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.
   g. Wesanco, Inc.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.
2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
4. Toggle Bolts: All-steel springhead type.
5. Hanger Rods: Threaded steel.

F. Plywood: Exterior glue, type AC.

G. Do not use powder-actuated anchors.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Structural steel or steel channel rigidly welded or bolted to present a neat appearance.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 3/8inch in diameter.

C. Multiple Raceways: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

D. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Provide 3/4-inch plywood backboards with angle iron frame for all surface mounted equipment and as noted or specified.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
   5. To Light Steel: Sheet metal screws.
   6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

C. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts or double nuts jammed tight.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete.

C. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

D. Install free standing equipment atop concrete housekeeping pads, minimum 4 inches.

E. Provide concrete housekeeping curbs, minimum 4 inches, to surround exposed conduit below surface mounted equipment and backboards.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:
   1. Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.
   2. Section 260526 – Grounding and Bonding
   3. Section 260529 – Hangers and Supports
   4. Section 260553 – Identification

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.
   2. For handholes and boxes for underground wiring, including the following:
      a. Duct entry provisions, including locations and duct sizes.
      b. Frame and cover design.
      c. Grounding details.
      d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
      e. Joint details.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.

2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.
10. Anaconda
11. Triangle
12. LTV

C. Rigid Steel Conduit: ANSI C80.1.

D. IMC: ANSI C80.6.

E. EMT: ANSI C80.3.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight) and EMT: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum installation.

2.4 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.

3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
14. Steel City

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover. Provided threaded hubs.

D. Metal Floor Boxes: Cast metal for on grade and Sheet metal for above grade Cast or sheet metal, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Floor Boxes
1. Floor Boxes: Fully adjustable, multi-service recessed floor box.
2. Material: Cast iron for on grade installation and Steel base with PVC housing for above grade installation.
3. Shape: Rectangular.
4. Activations: Recessed activation complete with brushed aluminum carpet or wood trim plate and wire management blocks.
5. Manufacturer: Basis of design - Wiremold RFB4-CI and RFB4-4DB, or equal by Steel City, Hubbell, or FSR.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1, galvanized steel.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

J. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceway: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
1. Basis of Design: Wiremold V2000 Series.
2. Finish: Ivory enamel. Beige finish is unacceptable.
3. Fittings: Couplings, elbows, and connectors designed for use with raceway systems.
4. Boxes and Extension Rings: Designed for use with raceway systems.
5. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Thomas & Betts Corporation.
   b. Walker Systems, Inc.; Wiremold Company (The).
   c. Wiremold Company (The); Electrical Sales Division.

B. Two Compartment Aluminum Raceway
1. Surface Metal Raceway: Decorative, low profile, twin cover, two compartment (50/50) multi-outlet raceway system.
2. Material: Extruded aluminum #6063-T5 alloy with minimum wall thickness meeting UL requirements.
3. Finish: Brushed aluminum, clear anodized.
4. Fittings: Covers, couplings, elbows, end caps, etc. designed for use with raceway system.

C. Manufacturers: Wiremold AL4320 or equal by Mono-Systems SWA 2200 Series and Airey-Thompson #AT-522 Series

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.
1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Armorcast Products Company.

b. Carson Industries LLC.
c. CDR Systems Corporation.
d. NewBasis.

2.8 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:
   a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
   b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
7. Use cast outlet box in exterior locations exposed to the weather and wet locations.

B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, less than or equal to 11/4”: EMT.
2. Exposed, greater than 11/4”: IMC.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: Plenum-type, optical fiber/communications cable raceway.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
   3. Electrical metal Tubing:
      a. Description: ANSI C80.3; galvanized tubing.
      b. Fittings and Conduit Bodies: ANSI/NEMA FB 1; insulated throat steel compression type. Set screw or indenter type are unacceptable.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 CONDUIT INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

C. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

D. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
   1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
   2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
   3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

E. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by NFPA 70.

F. Do not pull wiring into conduit until building is dried-in and conduit systems are complete.

G. Install nonmetallic conduit in accordance with manufacturer's instructions and as specified herein.
   1. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

H. All conduit shall be routed concealed where possible.

I. Arrange supports to prevent misalignment during wiring installation.

J. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

K. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

L. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.

M. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

N. Do not attach conduit to ceiling support wires.

O. Arrange conduit to maintain headroom and present neat appearance.

P. Route exposed conduit parallel and perpendicular to walls.

Q. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

R. Route conduit under slab from point-to-point.

S. Do not install conduits in slab.

T. Nonmetallic conduit will be allowed to penetrate floor slab, in on-grade construction, provided all of the following criteria are met:
   1. Conduit will be concealed within wall construction.
   2. Conduit terminates in an outlet at no more than 18 inches above finished floor. Otherwise, a transition to specified materials shall be made within this region.
   3. Conduit stubs are inspected by Architect following concrete pour. Damaged stubs shall be replaced in accordance with Architect's instructions at no additional cost.

U. Maintain adequate clearance between conduit and piping.

V. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

W. Cut conduit square using saw or pipe cutter; de-burr cut ends.

X. Bring conduit to shoulder of fittings; fasten securely.

Y. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

Z. Install no more than equivalent of four 90-degree bends between boxes. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.

AA. Provide sealing fittings on all conduit runs which penetrate exterior walls and refrigerated spaces to prevent circulation of air and/or condensation.

BB. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

CC. Provide insulating bushings on all RGS and IMC conduits entering wireways, pullboxes, cabinets, panelboards, etc.

DD. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.

EE. Provide Thomas Jet-Line Polyolefin pull cord, minimum 500 lbs., in each empty conduit except sleeves and nipples.

FF. Use "Push-Pennies" to protect installed conduit against entrance of dirt and moisture.

GG. Ground and bond conduit under provisions of Section 260533.

HH. Identify conduit under provisions of Section 260553.

II. Where connections to free-standing equipment in excess of 18" from structure are required, a vertical, minimum size 3/4", rigid conduit secured to ceiling and floor shall be utilized with wiring into this conduit by means of a rigid connection to a conduit body and wiring from this conduit by means of a conduit body with a flexible conduit connection to equipment.

JJ. Flexible conduit shall not exceed 2'-0" in length unless specified otherwise.

KK. Route conduit through roof openings for piping and ductwork or through "PCA" series roof curb as manufactured by Pate or equal. Pitch pockets are unacceptable. This contractor shall provide curbs where required to roofing contractor for installation and coordination of installed locations.

3.3 INSTALLATION OF SURFACE METAL RACEWAY

A. Use flat-head screws to fasten channel to surfaces. Mount plumb and level.

B. Maintain grounding continuity between raceway components. Provide a code size grounding conductor within raceway.

C. Multi-outlet surface raceway systems shall contain power and communications outlets as shown on drawings. Receptacles shall be duplex devices as specified in Section 262726. All power and communication wiring and devices shall be field installed.

D. All services to and from surface raceways shall be concealed. Exposed routings are unacceptable.

E. Install all device covers, blank covers, connectors, elbows, and end caps as required for a complete system. Use suitable insulating bushings and inserts at connections of surface metal raceway to outlets and corner fittings.

F. Route surface metal raceway in such manner as to provide maximum "concealment". (i.e. Vertical routings shall be made in corners at wall intersections or adjacent structural components. Horizontal routings shall be along top of baseboards.)

3.4 INSTALLATION OF BOXES

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Mounting heights as specified in other sections shall be to the bottom of the outlet.

C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Secure flush mounting box to interior wall. Accurately position to allow for surface finish thickness.

I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

J. Use adjustable steel channel fasteners for hung ceiling outlet box.

K. Do not fasten boxes to ceiling support wires.

L. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

M. Use gang box where more than one line voltage device is mounted together. Do not use sectional box.

N. Use separate boxes for low voltage systems. Do not install line voltage and low voltage devices within same outlet.

O. Use 4-inch square box with plaster ring for single device outlets.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Q. Set floor boxes level.

R. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

S. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes. Orient all outlets in like manner.

T. Coordinate locations of all floor outlets with Architectural furniture lay-outs.

U. Position outlet boxes to locate luminaries as shown on Architectural reflected ceiling plan.

V. Position outlet boxes which serve electric water coolers such that box, device and coverplate will be entirely concealed within equipment cabinet.

W. Position outlet boxes at markerboards in accordance with elevations on Drawings.

X. Adjust floor box flush with finish flooring material.

Y. Adjust flush-mounting outlets to make front flush with finished wall material.

Z. Install knockout closure in unused box opening.

3.5 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches in nominal diameter.
   2. Install backfill as specified in Division 2 Section "Earthwork."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
   4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
   5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
      b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
   6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, placing them 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.6 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
   2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.8 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.9 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Install conduit to preserve fire resistance rating of partitions and other elements in accordance with Section 07841. Seal penetrations with Flame-Safe FS900 series firestop compounds as manufactured by International Protective Coatings Corporation (800-334-8796) or equal by 3M or Hilti. Verification of these requirements shall be the responsibility of this Contractor.

3.10 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260537 - CABLE HOOK SUPPORT SYSTEM

PART 1 - GENERAL

1.1 REFERENCES

A. ASTM B633 - Specification for Electro-deposited Coatings of Zinc on Iron and Steel.

B. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process.

C. ANSI/ TIA/ EIA 568A - Commercial Building Telecommunications Cabling Standard

D. ANSI/ TIA/ EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces

E. NFPA 70, National Electrical Code

1.2 QUALITY ASSURANCE

A. Cable hooks shall be listed and labeled by Underwriters Laboratories (UL).

B. Cable hooks shall have the manufacturers name and part number stamped in the part itself for identification.

1.3 SUBMITTALS

A. Submit product data on cable hook devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, cable hook support systems shall be as manufactured by Cooper B-Line, Inc., Erico, Hubbell, or Walker.

2.2 CABLE HOOK SYSTEMS

A. Cable hooks shall have a flat bottom and provide a minimum of 4-inch cable bearing surface.

B. Cable hooks shall have 90-degree radiused edges to prevent damage while installing cables.

C. Cable hooks shall be designed so the mounting hardware is recessed to prevent cable damage.

D. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.

E. Factory assembled multi-tiered cable hooks shall be used where required to provide separate cabling compartments, or where additional capacity is needed.

F. Cable hooks shall be B-Line series BCH64-2S or engineer approved equal by Erico, Hubbell, or Walker.

2.3 FINISHES

A. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.

PART 3 - EXECUTION

3.1 CABLE HOOK CAPACITY AND LOAD RATING

A. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.

B. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.

C. Follow manufacturer’s recommendations for allowable fill capacity for each size of cable hook.

3.2 INSTALLATION

A. Installation and configuration shall conform to the requirements of the ANSI/ EIA/TIA Standards 568A & 569, NFPA 70 (National Electrical Code), and applicable local codes.

END OF SECTION 260537

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Identification for raceway.
   2. Identification for conductors and communication and control cable.
   3. Underground-line warning tape.
   4. Warning labels and signs.
   5. Instruction signs.
   6. Equipment identification labels.
   7. Miscellaneous identification products.
   8. Panelboard directories.
   9. Equipment backboards color coding.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

E. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner’s final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers, and shall use these numbers wherever required. (For example, room numbers are used in programming of fire alarm systems and intercom system, and shall match the Owner’s final choice.)

PART 2 - PRODUCTS

2.1 RACEWAY IDENTIFICATION MATERIALS

A. Paint conduit striped every ten feet. All junction boxes shall also be painted.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. For building wire and cables in sizes 8 AWG and smaller provide with factory insulation to correspond to color code; in sizes 6 AWG and larger provide 3/4" colored tape bands in lieu of colored insulation.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
   1. Not less than (6 inches) wide by (4 mils) thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR (36 INCHES)."

2.5 INSTRUCTION SIGNS

A. Engraved laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Two Layer Acrylic: Adhesive backed, with black letters on white background.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: (3/16 inch).
   2. Tensile Strength: (50 lb), minimum.
   3. Temperature Range: (Minus 40 to plus 185 deg F).
   4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl tape applied in bands.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:
   1. Fire Alarm System: Red.
   2. Security System: Blue and yellow.
   3. Mechanical and Electrical Supervisory System: Green and blue.
   4. Telecommunication System: Green and yellow.
   5. Intercommunication and Program Clock System: Blue.
   6. Television System: Yellow.

7. Computer System: Green.
8. Video Surveillance System: White

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

E. Conductors to Be Extended in the Future: Attach to conductors and list source and circuit number.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

G. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and optical fiber cable.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
   1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.
   2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

J. Instruction Signs:
   1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
   2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum (3/8-inch-) high letters for emergency instructions at equipment used for power transfer.

K. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with (1/2-inch) high letters on (1-1/2-inch) high label; where 2 lines of text are required, use labels (2 inches) high.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   2. Equipment to Be Labeled:
      a. Panelboards, electrical cabinets, and enclosures.
      b. Access doors and panels for concealed electrical items.

c. Electrical switchgear and switchboards.
d. Transformers.
e. Emergency system boxes and enclosures.
f. Motor-control centers.
g. Disconnect switches.
h. Enclosed circuit breakers.
i. Motor starters.
j. Push-button stations.
k. Power transfer equipment.
l. Contactors.
m. Remote-controlled switches, dimmer modules, and control devices.
n. Power-generating units.
o. Voice and data cable terminal equipment.
p. Master clock and program equipment.
q. Intercommunication and call system master and staff stations.
r. Television/audio components, racks, and controls.
s. Fire-alarm control panel and annunciators.
t. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
u. Monitoring and control equipment.
v. Uninterruptible power supply equipment.
w. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at (50-foot) maximum intervals in straight runs, and at (25-foot) maximum intervals in congested areas.

G. For building wire and cables in sizes 8 AWG and smaller provide with factory insulation to correspond to color code; in sizes 6 AWG and larger provide 3/4" colored tape bands in lieu of colored insulation.
   1. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   2. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of (6 inches) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at (6 to 8 inches) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds (16 inches) overall.

J. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

K. For all panelboards, provide neatly typewritten directory of each device usage including building room numbers (e.g. Convenience Outlets Room A101).

L. Locate directory inside panelboard door. Protect directory with clear plastic.

M. Electrical Equipment Backboards: Medium grey.

N. Telephone and Computer Equipment Backboards: White with medium grey frame.

END OF SECTION 260553

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 260941 - DIGITAL LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. The lighting control system specified in this section shall provide sensor-based and manual lighting control.

B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed)

C. All system devices shall be networked together enabling digital communication and shall be individually addressable.

D. The system architecture shall be capable of enabling stand-alone groups (zones) of devices to function in some default capacity even if network connectivity to the greater system is lost.

E. The system architecture shall facilitate remote operation via a computer connection.

F. The system shall not require any centrally hardwired switching equipment.

G. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

1.2 SUBMITTALS

A. Product Datasheets (general device descriptions, dimensions, wiring details, nomenclature)

B. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices)

C. Other Diagrams – as needed for special operation or interaction with other system(s)

D. Factory Startup/Commissioning Worksheet – must be completed prior to factory start-up.

E. Hardware and Operation Manuals

F. Other operational descriptions as needed.

1.3 QUALITY ASSURANCE

A. All steps in sensor manufacturing process shall occur in the USA, including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.

B. All components and the manufacturing facility where product was manufactured must be ROHS compliant.

C. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40-degree Fahrenheit (and Celsius) operation.

D. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

1.4 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

B. Coordinate lighting controls with BAS either through IP based intercommunication of system or hardwired auxiliary relay outputs.

C. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

1.5 WARRANTY

A. All devices in lighting control system shall have a 5-year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This specification is based on the nLight® Network Control System an Acuity Brands Company. Equals by Wattstopper, Greengate, or Current.

2.2 SYSTEM REQUIREMENTS

A. System shall have an architecture that is based upon two main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones.

B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.

C. System must interface directly with intelligent LED luminaires such that only CAT-5 cabling is required to interconnect luminaires with control components such as sensors and switches.

D. Intelligent lighting control devices shall communicate digitally, require <4 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.

E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher-level network backbone.

F. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.

G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.

H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.

I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.

J. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in a remotely located devices such as panels) to minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.

K. System shall have one or more primary wall mounted network control devices that are capable of accessing and controlling connected system devices.

L. System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.

M. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.

N. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to the utilization of a space. Note operating modes should be utilized only in manners consistent with local energy codes.
   1. Auto-On / Auto-Off (via occupancy/vacancy sensors)
      a. Zones with occupancy/vacancy sensors automatically turn lights on when occupant is detected.
      b. Zones with occupancy/vacancy sensors turn lights off when vacancy is detected.

c. Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic functionality.
d. Coordinate auto on or vacancy setting preference with owner.

O. System shall provide the option of having pre-terminated plenum rated CAT-5 cabling supplied with hardware.

2.3 INDIVIDUAL DEVICE SPECIFICATIONS

A. Networked System Occupancy Sensors
1. "Dual" technology occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions.
3. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants.
4. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
5. Sensors shall be available with two integrated Class 1 switching relays, and up to one 0-10 VDC dimming output. Sensors shall be capable of switching 120 / 277VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, and ¼ HP motor. Relays shall be dry contacts.
6. Sensors shall be available with two occupancy "poles", each of which provides a programmable time delay.
7. Sensors shall be available in multiple lens options which are customized for specific applications.
8. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
9. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
10. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
11. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
12. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
13. Network system shall also have ceiling, recessed, & corner mounted sensors available.
14. Fixture mount sensors shall be capable of powering themselves via a line power feed.
15. Sensors shall have dimming control and low temperature/high humidity operation.
16. Sensors with dimming can control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of Class 2 current (typically 40 or more ballasts).
17. Sensors shall be the following Sensor Switch model numbers, with device options as indicated on the drawings.
a. CM PDT 10 R

B. Networked System Power (Relay) Packs
   1. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay(s), shall have 2nd relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
   2. Power Packs shall accept 120 or 277 VAC, be plenum rated, and provide Class 2 power to the system.
   3. All devices shall have two RJ-45 ports.
   4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
   5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
   6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
   7. Power Packs and Power Supplies shall be available that are WiFi enabled.
   8. Power (Secondary) Packs shall be available that provide up to 16 Amp switching of all lighting load types.
   9. Power (Secondary) Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
   10. Specific Secondary Packs shall be available that provide up to 5 Amps of switching as well as 0-10 VDC dimming of fluorescent ballasts/LED drivers.
   11. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
   12. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
   13. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
   14. Specific Secondary Packs shall be available that provide up to 5 Amps of switching of dual phase (208/240/480 VAC) lighting loads.
   15. Specific Secondary Packs shall be available that require a manual switch signal (via a networked Wall Station) in order to close its relay.
   16. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
   17. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
   18. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
   19. Power (Relay) Packs and Supplies shall be the following Sensor Switch model Series:
      a. nPP16 (Power Pack w/ 16A relay)
      b. nPP16 ER (UL924 Listed Secondary Pack w/ 16A relay for switching emergency power circuits)
      c. nPS 80/150/250 (Auxiliary Bus Power Supply)

C. Networked System Relay & Dimming Panels
   1. Panel shall incorporate up to 4 normally closed latching relays capable of switching 120/277 VAC or up to 2 Dual Phase relays capable of switching 208/240/480 VAC loads.

2. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
3. Panel shall provide one 0-10VDC dimming output paired with each relay.
4. Panel shall power itself from an integrated 120/277 VAC supply.
5. Panel shall be capable of operating as either two networked devices or as one.
6. Panel shall supply current limited low voltage power to other networked devices connected via CAT-5.
7. Panel shall provide auxiliary low voltage device power connected wired directly to a dedicated terminal connection.
8. Power (Relay) Packs and Supplies shall be the following Sensor Switch model numbers:
   a. nPANEL 4 (Panel w/ four 120/277 VAC relays and four 0-10 VDC dimming outputs)

D. Networked Auxiliary Input / Output (I/O) Devices
1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.
2. Devices shall have two RJ-45 ports.
3. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
4. Specific I/O devices shall have a dimming control output that can control 0-10 VDC dimmable ballasts or LED drivers by sinking up to 20 mA of current (typically 40 or more ballasts).
5. Specific I/O devices shall have an input that read a 0-10 VDC signal from an external device.
6. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event, run a local/remote control profile, or raise/lower a dimming output.
7. Auxiliary Input/Output Devices shall be the following Sensor Switch model numbers:
   a. nIO D (I/O device with 0-10 dimming output)

E. Networked System Wall Switches & Dimmers
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
2. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
3. All devices shall have two RJ-45 ports.
4. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
5. Devices shall be Gray in color.
6. Devices with mechanical pushbuttons shall provide tactile and LED user feedback.
7. Devices with mechanical pushbuttons shall be made available with custom button labeling
8. Devices with a single "on" button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.
9. Wall switches & dimmers shall be the following nLight model numbers, with device options as specified:
   a. **nPODM** (single on/off, pushbuttons, LED user feedback)
   b. **nPODM DX** (single on/off, single dimming raise/lower, pushbuttons, LED user feedback)
   c. **nPODM 2P** (dual on/off, pushbuttons, LED user feedback)
   d. **nPODM 2P DX** (dual on/off, dual dimming raise/lower, pushbuttons, LED user feedback)
   e. **nPODM 4P** (quad on/off, pushbuttons, LED user feedback)
   f. **nPODM 4P DX** (quad on/off, quad dimming raise-lower, pushbuttons, LED user feedback)

F. Networked System Scene Controllers
   1. Device shall have two, three, four, or eight buttons for selecting programmable lighting control profiles or acting as on/off switches.
   2. Devices shall be Gray in color.
   3. Device shall recess into single-gang switch box and fit a standard GFI opening.
   4. Devices shall provide LED user feedback.
   5. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
   6. All devices shall have two RJ-45 ports.
   7. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
   8. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
   9. Device shall have LEDs indicating current selection.
   10. Scene Selector device shall be the following nLight model number:
      a. **nPODM 2S** (2 Scene, push-button)
      b. **nPODM 4S** (4 Scene, push-button)
      c. **nPODM 4S** DX (4 Scene, push-button, On/Off/Raise/Lower)
      d. **nPODM 2L** (2 Adjustable Preset Levels, push-button, On/Off)
      e. **nPODM 2L AB** (2 Scene, push-button, On/Off/High/Low)
      f. **nPODM 4L DX** (4 Adjustable Preset Levels, push-button, On/Off/Raise/Lower)

PART 3 - EXECUTION

3.1 START-UP & SUPPORT FEATURES

A. To facilitate start-up, all devices daisy-chained together (using CAT-5) shall automatically be grouped together into a functional lighting control zone.

B. All lighting control zones shall be able to function according to default settings once adequate power is applied.

C. System shall be able to auto-discover all system devices without requiring any commissioning.

D. All system devices shall be capable of being given user defined names.

E. All sensor devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

F. Provide 4-hours of manufacturer certified training and programming for the system, in order to meet the system programming requirements required by the Owner.

END OF SECTION 260941

SECTION 260943 - BUILDING LIGHTING CONTROLS

PART 1 - GENERAL

1.1 INTRODUCTION

A. The intent of this specification is to provide for furnishing, installing, testing and placing into operation, a complete and functional lighting control system with provision for integrated switching and dimming control of the indicated lighting.

1.2 DESCRIPTION OF WORK

A. Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is defined to include lighting control panels, control stations and other user interface devices, wiring, and ancillary programming equipment. Type of lighting control equipment and wiring specified in this section includes the following:
   1. Programmable relay/dimmer panels
   2. Over-ride switch stations
   3. Breaker panels with Programmable relays
   4. Preset dimming control stations

B. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways, electrical boxes and fittings required for installation of the lighting control system, which are not part of this section.

1.3 QUALITY ASSURANCE

A. Independent Testing Laboratory - The control panels shall be tested and listed under the UL 916 Energy Management Equipment standards.

B. Factory Programming – The system shall be turned over to the owner fully programmed and ready for immediate operation. It shall be the responsibility of the contractor to coordinate with the owner and supply the necessary “as-installed” information and desired schedules to the manufacturer in a timely manner.

C. Manufacturer experience - To insure a uniform installation and single responsibility, all switching and dimming equipment described herein shall be supplied by a single manufacturer. Manufacturer shall have a minimum of 10 years experience in lighting control systems.

D. Manufacturer shall be Synergy Lighting Controls, Wattstopper, Hubbell, or Lutron. Basis of design is Synergy Lighting Control System.

1.4 CODES AND STANDARDS

A. Network - ANSI 875.1, ARCNET®

B. Protocol - ASHRAE 135 – 1995, BACnet®

C. IEEE Std 2000.1-1998

D. UL 916 Energy Management Equipment

E. California Energy Commission

1.5 SUBMITTALS

A. Prior to fabrication manufacture shall submit the following materials for approval.

B. Manufacturer’s published catalog data sheets for all equipment and components of the lighting control system.

C. Shop Drawings - Submit detailed drawings and documentation of lighting control system components and interconnection. As a minimum, the shop drawings shall include the following:
   1. One-line schematic diagram with wire type details
   2. Network wiring details
   3. Lighting control panel load schedules
   4. Input and output wiring details

5. Programming worksheets for system configurations
6. A complete BACnet *Protocol Implementation Conformance Statement* (PICS).

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The lighting control system shall provide seamless control and monitoring of all lighting included in the scope of work regardless of whether it is relay switched or dimmed. All relay and dimmer panels, unless otherwise noted, shall be interconnected by a communication bus making possible the sharing of control functions and status system wide. Control inputs shall be transferable over the network to affect lighting control patterns and zones regardless of to which relay or dimmer panel the loads are connected. Overrides for after hour use or cleaning shall be accomplished via pushbutton switch. lighting control panels shall provide a user interface and display permitting local set-up, override, monitoring and diagnostics.

2.2 HARDWARE

A. Enclosures
   1. Shall be NEMA 1 rated, code gage steel cabinet. Enclosure and contents shall be designed to operate in interior spaces with temperatures of 32°-104° F (0°-40° C) and, 0-90% non-condensing humidity. Enclosure shall be available with optional recessed mounting hardware. See drawings for mounting requirements.
   2. Enclosure Dimensions:
      a. Small - 21” (533mm) H X 20” (508mm) W X 6” (152mm) two power modules maximum.
      b. Medium - 34.5” (876mm) H X 20” (508mm) W X 6” (152mm) four power modules maximum.
   3. Multi-tapped Transformer - The enclosure shall be supplied with multi-tapped transformer and shall not require specification of voltage for each control location. Provide a dedicated power feed of 277, 60 Hz, 225 VA. for each enclosure.
   4. Modular Design - The power modules and system controller shall be modular and designed for ease of field service or upgrade.

B. Relay Power Modules
   1. Mechanical - All Relay Power Module components shall be mounted to heavy steel back plane. Module shall install into enclosure with keyed tab and slot hardware, secured in place with heavy duty screws.
   2. Relay Power Module shall provide eight relay outputs designed for the control of lighting circuits. The Power Module shall be operable without the system controller installed for direct operation of lighting loads or with the system controller for programmable input to output mapping. Terminal block shall accept two (2) #8 AWG maximum wire(s).
   3. Relay Certification – Relays shall be Underwriters Lab (UL) and (CUL) listed.
   4. Relay Status Indicators - The system shall provide LED status indicators for all relay outputs.
   5. Relay Ratings - Relays shall be SPST, mechanically latching, individually replaceable with enclosed contacts. Relays shall be rated to at least 18K SCCR, 30 amps at 277 VAC electronic or HID ballast, 15 amps 120VAC tungsten, 20A at 347V. A limited 3-year warranty shall be provided on the individual relays.
   6. Relay Response - Relays shall be individually settable to respond as normally open, normally closed, momentary on, momentary off, Inteliswitch, or for Sweep Switch operation through the System Controller.
   7. Standard Inputs – The Relay Power Module shall provide:
      a. Remote override switch input shall be provided to accept a dry contact closure from a remote-control device such as an A/V system, building automation system, fire alarm panel or other similar device to force all relays on or off. Terminal block shall be removable. Whenever active, the On or Off override condition shall be visually and audibly annunciated via the UIP on the System Controller.

8. Input/Output Expansion Module - The I/O expansion module shall connect directly to the Relay Power Module and provide:
   a. Eight (8), programmable dry contact low voltage switch/occupancy sensor inputs with removable terminal blocks. Momentary or maintained contacts shall be supported as 3-wire momentary, 2-wire momentary, alternate action or 2-wire maintained contact. 24VDC power shall be provided to power occupancy sensors. Inputs shall be dry contact and internally sourced. Inputs shall be linkable to any number of relays for override control.
   b. Two (2) inputs per module shall be capable of monitoring external analog sensing devices such as a photocell. It shall be possible to control the output relays in response to analog input values with 100 steps of analog control resolution. Terminal block shall be removable.
   c. Eight (8), pilot light outputs with removable terminal blocks. Pilot light output voltages shall be jumper selectable for 5V, 20V or 24V.
   d. Eight (8), 0-10vdc analog outputs for dimming control of 0-10vdc dimmable ballasts.
9. Fade Time – The system shall support an adjustable fade rate from 0 to 99 minutes with a 1 sec resolution when changing from a preset level to another preset level.
10. Removable Low Voltage Terminal Blocks – All low voltage terminal blocks shall be removable to provide the capability for the installer to remove the connector from the header when terminating wire. Systems that do not provide removable low voltage terminal blocks shall not be acceptable.
11. BACnet integration – Provide the capability for relays/analog outputs, dry contact low voltage switch inputs, and analog inputs to be accessible from BACnet network when used with a networked System Controller.

C. System Controller
1. Mechanical - The system controller shall be supplied as a modular chassis consisting of the user interface panel, system control electronics, and provision for installation of up to four industry standard half-length ISA accessory boards. The system controller shall plug into the enclosure as an assembly for ease of installation, service, or upgrade. All system controllers shall be installed into the enclosures only after the rough-in phase of installation is complete.
2. User Interface Panel (UIP) - The user interface shall provide a simple means to set-up, program, and monitor the lighting control system. Provide as a minimum the following features:
   a. Multi-lingual operation in English, Spanish or French
   b. Four line, eighty-character LCD display with back light
   c. Four multi-function menu selection keys graphically associated with the LCD display
   d. A twelve key, numeric keypad with Enter and Back functions
   e. A four-key menu navigation and selection keypad with Up, Down, plus (+) and minus (-) function keys
   f. LED status indicators for Network, DMX512 input and Local input/output bus.
3. Capacity - The system controller shall have the capacity to operate up to 12 power modules in two enclosures, permitting up to 96 points of control from each system controller.
4. RS232 Port - Provide a front mounted DB9 serial connector for connection of a personal computer or other external serial device. Provide a second DB9 serial connector within the enclosure for permanent connection of serial devices. Option to add up to an additional 4 more serial ports
5. RS485 ARCNET port – Provide a removable terminal block connection for the network bus wire connection.
6. Ethernet Port – Provide an Ethernet port for connection to a Local Area Network.
7. RS485 Control Station port – Provide a removable terminal block connection for the dimming control station and/or addressable network button station bus.

8. Program Back-up - The user program shall be stored in non-volatile memory. The system shall utilize a memory back-up device that is system integrated, maintenance free and not require batteries for retention of memory.
9. Modem for Remote Access – The System Controller shall be provided with a modem for remote access to program and trouble shoot the system.
    a. Off-line programming - It shall be possible to program the system off-line via personal computer or laptop located at a remote site.
    b. On-line monitoring and control - It shall be possible to monitor and override the status of the system in real time via personal computer located at a remote site. This shall include the current status of individual loads, input status, event log, relay run time/start counters, and graphic screen operation as a minimum.
    c. System programming via email – Provide the capability for emailing as an attachment the owner's system programming database to factory support such that the factory personnel can open the programming database to modify the programming and operating problems and email the corrected database back to the owner for upload into "System" via Configuration Software listed in this section.
    d. Factory support - Provide free remote dial-in factory support capability for the life of the system such that factory personnel can assist the owner with the diagnosis and resolution or programming and operation problems. It shall be possible for the factory to read the software version currently installed at the site and download an updated version to the site if required without interruption of the user program.

D. Network
1. Communication - System controllers shall be capable of panel-to-panel communications over a high-speed 156Kbps, hard-wired data network or Ethernet LAN.
2. Wire - Network wire shall be twisted and shielded pair, installed in a daisy chain configuration, and rated for EIA-485 data communication. Network wire type and installation shall be per the lighting control system manufacturer's requirements without exception. For Ethernet LAN applications, wire shall be Cat 5 cable.
3. Protocol - Network protocol shall be BACnet® over ARCNET® (ANSI 878.1) token passing or BACnet IP. Systems utilizing proprietary networking schemes shall not be acceptable

E. Networked Preset Dimming Control Stations
1. Capacity – Preset control stations shall provide 6 presets, master raise/lower, individual raise/lower, and OFF control for 4, 8, 12, or 16 control channels as indicated from the front of the control station.
2. Finish - Faceplates shall attach to mounting frame without visible screws and, when in place, shall provide a clean architectural appearance. Full-length piano hinge shall allow faceplate to fold down flat against wall when open. Faceplate finish shall be brushed stainless steel or as otherwise directed by the architect.
3. Presets – Control stations shall be capable of storing and recalling a total of 16 presets, each with fade time set-able as 5, 10, 15, 30, 45 seconds or 1, 5, 10, 30, 60 minutes.
4. Level Indication - Each channel shall have an associated 10 segment LED bar graph which shall indicate the intensity of the lighting.
5. Master - Master raise/lower function shall adjust intensity of all control channels simultaneously. Channels set as non-dim shall be excluded from master raise/lower operation.
6. Exclusion from Presets – It shall be possible to individually exclude channels from saved presets.
7. Tamper Proofing – Provide a hidden switch on each control station to disable the preset save function to prevent unauthorized or accidental overwriting of scenes.

F. Networked Override Switch Control Station
   1. Finish – Faceplates shall attach to the mounting frame without visible screws and, when in place, shall provide a clean architectural appearance. Faceplate finish shall be brushed stainless steel or as otherwise directed by the architect.
   2. Buttons – Stations shall support up nine programmable buttons per station with associated status LED indicators. Each button shall be individually programmable for function and load controlled. Stations shall support the following button function types:
      a. ON (for afterhours use)

G. Networked Touch Screen Control Station
   1. 3.5” color screen with configurable color schemes
   2. Resistive touch screen interface is compatible with gloves and prosthetic limbs.
   3. Capacity – Provides up to 16 Presets and 32 channels, with number of presets and channels configurable via the SYSW CONFIG software or SYSC MLS / MLX controller.
   4. Finish – No visible screws. Provides a clean architectural appearance.
   5. Presets – Capable of storing and recalling a maximum of 16 presets, each with fade time set-able as 0, 5, 10, 15, 30 and 45 seconds, or 1, 5, 10, 30 and 60 minutes.
   6. Preset lighting levels can be modified and saved from the SYGS station.
   7. Adjustable channel intensity using raise/lower buttons.
   8. Level Indication - Each channel provides an associated bar graph which indicates the intensity of the lighting in 1% increments.
   9. Master - Master raise/lower function adjusts intensity of all dimmed control channels simultaneously.
   10. User defined alphanumeric labels for all channel and preset buttons. Labels may be edited in the SYSW CONFIG software or on the SYGS station.
   11. Password protection options for multiple levels of access.
   12. Customizable 'logo screen' provides ability for customers to display their own logo or other picture on the station screen when not in use.

H. Control Station LAN Network – Control stations shall be connected to the system via a four-wire digital communication bus network wire. The system shall support one control station LAN for each system controller. Each control station LAN shall support a maximum of sixty stations.

I. Emergency Lighting:
   1. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF/DIMMING control of emergency lighting along with the normal lighting. Upon normal power failure, the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Dimmed circuits shall be driven to 100% output.
   2. Features include:
      a. 120/277 volts, 50/60 Hz., 20-amp ballast rating
      b. 0-10V Dimmer override to 100%
      c. Auxiliary contact for remote test or fire alarm system interface
   3. Hubbell Product Number: UL924BRLN (1)(2). Equals by Functional Devices Inc., LVS Inc.

2.3 FIRMWARE FEATURES

A. Open Protocol Networking - To insure interoperability with other building systems, the lighting control panels shall communicate using the BACnet® (ASHRAE 135- 1995) communication standard. As a minimum, all relays, dimmers, switches, groups and analog inputs shall be represented as standard BACnet objects and shall support read/write services. Systems requiring a gateway device for BACnet communications shall provide at least one BACnet gateway point for each lighting control relay, dimmer, switch input and analog input on the project. It shall be the sole responsibility of the lighting control system supplier to map all proprietary lighting control points through the gateway and supply complete written documentation cross referencing the lighting zones to the BACnet points. This documentation

shall clearly indicate which BACnet properties and services are provided by the gateway and which properties and services are actually supported by the proprietary lighting control devices to which the gateway is connected. All lighting control devices conforming to the BACnet protocol shall have a Protocol Implementation Conformance Statement (PICS) that identifies all of the portions of BACnet that are implemented.

B. Groups - It shall be possible to associate output relays and dimmers into logical control zone groups. Groups shall be assign-able to schedule events, switch inputs, analog inputs, control station channel, presets, DMX output, or telephone override. It shall not be necessary to program functions or schedules individually for each output. Groups shall be network visible to other building systems as standard BACnet objects.

C. Astronomic Clock - The system clock shall of the astronomical type and be capable of calculating the correct time for sunrise and sunset at the installed location. It shall be possible to set control functions to occur at or up to 99 minutes before or after sunrise or sunset.

D. Daylight Savings Time - The system shall automatically adjust for daylight savings time. It shall be possible to disable this function.

E. Schedules - The system shall support up to 99 unique lighting control schedules. The quantity of time schedule events contained in the schedules shall be limited only by the available system memory and shall be dynamically allocated to the schedules such as to not limit the capacity of any single schedule.

F. Schedule Assignment - Unique schedules may be assigned to each day of the week facilitating a rotating Monday through Sunday weekly operating scenario. A unique holiday schedule shall automatically supercede assigned weekday schedules based on a list of holiday dates. Additionally, schedules may be assigned to specific calendar dates. A schedule assigned to a calendar date shall have priority over a schedule assigned to a Monday through Sunday upon which the calendar date occurs such that only one schedule runs on any given day.

G. Overrides - It shall be possible to override schedule operation and force outputs to an ON state for afterhours use. Overrides shall be initiated from digital wall stations.

H. System override shall be available:
   1. Priority Normal - Under normal time clock operation, a group can be overridden ON by any available corridor mounted digital wall station. The system will remain in the overridden condition for two hours. System shall flash lights to warn occupants of upcoming OFF condition. System can be continually overridden in 2-hour increments by using corridor mounted wall stations.

I. Inter-Panel Control - Each system controller input and output shall include provision to annunciate actuation over the network making events available for use by all controllers connected to the network. This function shall be set-able via the UIP on the system controller and not require the use of a personal computer for inter-panel operation over the network.

J. Flash to Find - It shall be possible to set any output to continuously flash on and off to facilitate easy location of undocumented loads. The flash to find function shall automatically cancel after two minutes.

K. Status - Each system controller shall be capable of displaying the current real time status of all inputs and outputs associated with the controller.
   1. Input Status – The current state of each input shall be displayed as ON or OFF for switch inputs or as a value for analog inputs.
   2. Output Status – The current state of each output shall be displayed as ON or OFF for relay outputs or as a percentage value for dimmed outputs.
   3. Network Status – The network status display shall indicate that the system controller is actively communicating on the local input/output bus and the network by displaying network message traffic expressed as a percentage of capacity. This display shall also indicate the currently available system RAM and flash disk memory.

L. Logging - The system controller shall automatically retain a record of system control events and run times and shall make this information available to the user via the UIP on the system controller.
   1. Event Log - The system shall automatically log in memory key actions performed by the system controller. Each log entry shall be time and date stamped. It shall be possible to view or print the event log via the UIP or PC software. A minimum of 2000 system events shall be saved before the system begins to overwrite the oldest data. Logged actions shall include but not be limited to:
      a. Power up
      b. Power down
      c. Input change of state
      d. Output change of state
      e. Manual override
      f. Network event
      g. New script
      h. Alarms
   2. Relay Run Time - A cumulative “ON” time record shall be accumulated for each output. It shall be possible to view and reset the run-time for each output via the UIP or PC software.
   3. Relay Starts - A counter shall track the quantity of starts for each output. It shall be possible to view or reset the number of starts for each output from the UIP or PC software.

M. Script File - All system parameters and user programming shall be stored within the system controller in the form of an editable text file. It shall be possible to upload and download the file between the system controller and a personal computer.

N. Script Logic - The system controller logic shall support the creation of customized logical control scenarios. Scenarios shall be created off line using the optional Windows® based configuration software package. As a minimum, the system shall understand and process “basic” IF, AND, OR, THEN, ELSE, = (equal), < (less than), and > (greater than) logical statements. Commands and operations to be tested and/or acted upon shall include as a minimum: DAY, DATE, TIME, INPUT, OUTPUT, TIMER, INC COUNTER # (increment counter #), DEC COUNTER (decrement counter #), and RESET COUNTER.

O. Room Partition Control – It shall be possible to configure the system to accommodate areas where movable partitions are used to sub-divide a large room into several smaller rooms. The system shall provide for a dimensional array of possible room combination scenarios making possible the re-mapping of the channel to preset relationships in situations where the architectural relationship of the lighting changes with the reconfiguration of the room. It shall be possible to provide a unique set of presets for each possible room combine scenario. Systems that simply overlap the channels of combined rooms in a one to one relationship are not acceptable.
   1. Provide SYA IR Partition photoelectric sensor for partition between spaces.

2.4 CONFIGURATION SOFTWARE

A. Provide PC software for off-line programming and editing of lighting control panel script files. The application shall run on any personal computer using the Windows XP/Vista/Windows 7 32bit operating system and shall support the BACnet file transfer services allowing co-installation and network operation with other BACnet building automation workstations.

B. It shall be possible to upload, edit, and download user program and log data through a direct connection to the lighting control system network or remotely through the use a telephone modem.

C. The configuration software shall have the ability to “learn” the hardware components that are present in the system and automatically configure a script file using default values which may then be edited by the user.

D. The system shall support the simultaneous use of multiple personal computers.

E. The application shall be BACnet compliant and designed to co-reside on a PC workstation running other BACnet building control applications.

F. The configuration software shall utilize a local database to store all system parameters. The programming database shall be capable of being Emailed to the lighting control manufacture for review, editing and technical support, then Emailed back to the customer for upload into the lighting control system.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION AND DOCUMENTATION

A. Installation - The control system shall be installed and connected as shown on the plans and as directed by the manufacturer. The contractor shall complete all electrical connections to all control circuits, network terminations, RS-232 connections, sensors and override wiring.

B. Documentation - The contractor shall provide accurate "as built" drawings to the owner indicating the correct and latest program in each controller. The "as-built drawings" shall clearly indicate the lighting control panel identification, the load controlled by each relay, and the device connected to each input.

C. Operation and Service Manuals – Provide operation and service manuals for all system components as indicated in the General Provisions.

3.2 PRODUCT SUPPORT AND SERVICE

A. System Start-up
   1. Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:
      a. The control system has been fully installed in accordance with manufacturer's installation instructions.
      b. Low voltage wiring for overrides and sensors is completed.
      c. Accurate "as-built" load schedules have been prepared for each lighting control panel.
      d. Proper notification of the impending start-up has been provided to the owner’s representative.
   2. A Start-up Request form must be completed by the contractor and submitted to the Lighting Control Manufacture prior to scheduling a Start-up.

B. Factory Support: Factory telephone support shall be available at no cost to the owner for the life of the system. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll-free number for technical support.

3.3 WARRANTY

A. Manufacturer shall provide a three (3) limited warranty on the lighting control system and software.

END OF SECTION 260943

SECTION 262410 - SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes arrangement with utility company for permanent electric services, underground service entrance and concrete transformer pads.

B. Related Sections include the following:
   1. Section 260519 - Low Voltage Electrical Power Conductors and Cables
   2. Section 260533 - Raceways and Boxes for Electrical Systems

1.2 SYSTEM DESCRIPTION

A. System Voltage Main Building: 120/208 volts, three phase, four wire, 60 Hertz.

PART 2 - PRODUCTS

2.1 METERING EQUIPMENT

A. Metering Equipment: As required by the utility company and as shown on the plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. All costs related to permanent electric service shall be borne by the electrical contractor.

C. Underground: Install service entrances from Utility Company's pad-mounted transformer to building service entrance equipment. Utility Company will connect service lateral conductors to transformer secondaries.

D. Provide concrete pads for transformer installations. Pads shall conform to any and all requirements of the Electric Utility.

E. Provide 1-1/4" conduit to the meter bases as required by utility.

END OF SECTION 262410

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Load centers.
   4. Transient voltage suppression panelboards.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Panelboard Schedules: For installation in panelboards.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Closeout Procedures and Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

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

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
   1. Ambient Temperature: Not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
      a. Eaton Corporation; Cutler-Hammer Products.
      b. General Electric Co.; Electrical Distribution & Protection Div.
      c. Siemens Energy & Automation, Inc.
      d. Square D.
   2. Transient Voltage Suppression Panelboards:
      a. Liebert Corporation.
      b. Advance Protection Technologies (APT)
      c. Emerson

2.2 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints."

B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
   1. Rated for environmental conditions at installed location.
      a. Outdoor Locations: NEMA 250, Type 3R.
      b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
      c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      d. Indoor Locations: NEMA 250, Type 1.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Provide with standard flush door and lock, all keyed alike.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
   4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
   5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

6. Finish: Manufacturer's standard grey enamel finish over corrosion-resistant treatment or primer coat.
7. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:
1. Material: Tin-plated aluminum.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box. Provide in all panelboards.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Provide where 5-wire configuration is indicated.

D. Conductor Connectors: Suitable for use with conductor material.
1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

B. Minimum Integrated Short Circuit Rating: 14,000 amperes rms symmetrical for 480 volt panelboards or 10,000 amperes rms symmetrical for 208 volt panelboards, unless noted otherwise on Drawings.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:
1. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Circuit breakers shall be listed as suitable for use with 75 degrees C conductor.
2. Bolt-on circuit breakers shall be replaceable without disturbing adjacent units.

2.5 TRANSIENT VOLTAGE SUPPRESSION

A. Transient control systems: where noted on drawings, provide Emerson SolaHD SPD200K10YMOD transient control systems Liebert “Hybrid Advantage@ or equal by Transtector. Install adjacent (within 10 feet) to applicable panelboards. Provide conduit and conductors as schedules for interconnection.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
4. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

2.7 CONTROLLERS

A. Controller Disconnect Switches: integrally mounted and interlocked with controller. Provide coil clearing contacts.
   1. Auxiliary Contacts: Integral with disconnect switches to de-energize external control-power source.

B. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held general-purpose controller.
   1. Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
   2. Coil(s) Voltage 120 volts, 60 hertz, from separate source.
   3. Switched Poles: Three (3).
   4. Contact Rating: As scheduled on Drawings.
   5. Contactor shall be furnished where applicable, in factory assembled panelboard enclosures. Provide line-side lugs to receive incoming feeder(s).

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Provide filler plates for unused spaces in panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."

C. Top of Panel Height: Panelboards with box dimensions of 53 inches or less in height shall be installed with top of panel at 6 ft.-6 in. Panels with box dimensions in excess of 53 inches in height shall be installed such that the operating handle of the uppermost device is 72 inches above finished floor.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices and controllers.
   1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

I. Install drip shields on all panels per detail on drawings.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

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

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, and lugs.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Snap switches and wall-box dimmers.
5. 0-10V LED lighting dimmers, controllers, and switches.
6. Occupancy switches.
7. Pendant cord-connector devices.
8. Cord and plug sets.

1.2 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Provide manufacturer’s catalog information showing dimensions, colors and configurations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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

C. Comply with NFPA 70.

1.5 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).

B. The above manufacturers are tentatively approved for the wiring devices. It should be noted that in the list of approvals where a manufacturer has been approved for a certain product, it is understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of his standard product. His product must still comply with all requirements and standards of the specification and not necessarily his standard specifications.

2.2 STRAIGHT BLADE RECEPTACLES

A. Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, Tamper Resistant, NEMA WD 6 configuration 5-20R, and UL 498. Heavy duty specification grade.
   1. Basis of Design: Pass & Seymour; 5361 (single), 5362 (duplex).
   2. Equal products by the following manufacturer's are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton

B. Duplex Convenience Receptacles with USB Charger, 125 V, 20 A: Comply with Fed Spec WC596, configuration 5-20R, and UL 498, UL 1310. Heavy duty specification grade.
   1. Basis of Design: Pass & Seymour; TR5362USB.
   2. Equal products by the following manufacturers are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton

C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Basis of Design: Pass & Seymour; IG5361 (single), IG6300 (duplex).
   2. Equal products by the following manufacturer's are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton
   3. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Hospital grade.
   1. Basis of Design: Pass & Seymour; TR63-H (duplex).
   2. Equal products by the following manufacturers are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton
   3. Description: Labeled to comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Receptacles: Comply with NEMA WD 1, NEMA WD 6, and UL 498. NEMA type as noted on drawings.
   1. Acceptable Manufacturers:
      a. Cooper
      b. Hubbell
      c. Leviton
      d. Pass & Seymour

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking type plug and receptacle body connector; NEMA WD 6 configurations, as noted on drawings, heavy-duty grade.
   1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
   2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.
   3. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.

2.6 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
   2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
   1. Basis of Design: Pass & Seymour; PS20AC.
   2. Equal products by the following manufacturers are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton
   3. Description: Single and three pole switches.

C. Pilot Light Switches: 120/277V, 20A:
   1. Basis of Design: Pass & Seymour; PS20AC-RPL.
   2. Equal products by the following manufacturers are acceptable:
      a. Cooper
      b. Hubbell
      c. Leviton
   3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:
   1. Basis of Design: Pass & Seymour; PS20AC-L.

2. Equal products by the following manufacturers are acceptable:
   a. Cooper
   b. Hubbell
   c. Leviton
3. Description: Single pole and three pole, with factory-supplied key in lieu of switch handle.

2.8 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. LED Dimmers: 120 V.
1. Lutron Nova T-Star Series, 1500 watt, grey plastic full-range slider style dimmer with mating brushed aluminum coverplate. Equals by Lithonia or Lightolier are acceptable.

2.9 WALL PLATES

A. Decorative Cover Plate: Jumbo-oversize, type 302 stainless steel with stain finish, no equal.

B. Exposed Cover Plate: Galvanized steel.

C. Weatherproof Cover Plate: Type 302 stainless steel with spring hinged gasketed device cover, unless noted otherwise.

D. Manufacturer: Mulberry, Leviton, Cooper or Pass and Seymour.

2.10 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.
1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70 or device listing.
2. Isolated-Ground Receptacles: Orange.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:
1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.
5. Verify outlet boxes are installed at proper height.
6. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:
   1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
   5. Connect wiring devices by wrapping solid conductor around screw terminal or by means of integral screw tensioned clamp, where applicable. Under no circumstances is "back wiring" of devices by a spring tensioned means acceptable.
   6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
   7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   8. Tighten unused terminal screws on the device.
   9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
   10. Install devices plumb and level.
   11. Install switches with OFF position down.
   12. Do not cascade convenience receptacles on the "load" side of GFCI devices, unless specifically noted otherwise.
   13. Connect wiring device grounding terminal to equipment grounding conductor.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates:
   1. Install decorative plates on switch, receptacle, and outlets in finished areas.
   2. Install carpet flanges and coverplates on all floor boxes.
   3. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
   4. Install weatherproof plates on outlets exposed to the elements and as noted.

G. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Install 0-10V conductors on controls side of dimmers according to manufacturers' device listing conditions in the written instructions.
   3. Do not install dimmer switches in ganged installations with other devices. Provide separate outlets. Where dimmers are shown in ganged installations, install in accordance with manufacturer's instructions to maintain full rated capacity of each device and cover with one faceplate.
   4. Provide LED lighting controller/power pack for 0-10V dimming.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates. Adjust devices and wall plates to be level.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

J. Interface with Other Products:
   1. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.
   2. Install wall switch 48 inches above finished floor.
   3. Install convenience receptacle 16 inches above finished floor, unless noted otherwise.

4. Install convenience receptacle 6 inches above backsplash of counter.
5. Install dimmer 48 inches above finished floor.

K. All convenience receptacles which are located within 6 feet of a sink, basin, tub, shower, etc. shall be ground fault protected, regardless of indication. Verification of these requirements shall be responsibility of this Contractor.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 20-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
7. Inspect each wiring device for defects.
8. Operate each wall switch with circuit energized and verify proper operation.
9. Verify that each receptacle device is energized.
10. Test each receptacle device for proper polarity.
11. Test each GFCI receptacle for proper operation.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Cartridge fuses rated 600 V and less for use in switches.

1.2 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:
   1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

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

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.6 EXTRA MATERIALS

A. Fuses: Furnish three of each size and type to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussman, Inc.
   2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
   3. Ferraz Shawmut, Inc.
   4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; dual element, current limiting, time delay, 250 or 600 volt fuse as applicable.

B. Interrupting Rating: 200,000 rms amperes.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare fuse cabinet on plywood backboard within buildings main electrical room.

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers.
   4. Motor Controllers.
   5. Enclosures.

1.2 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. HD: Heavy duty.

C. RMS: Root mean square.

D. SPDT: Single pole, double throw.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current rating.
   4. UL listing for series rating of installed devices.
   5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

C. Product Selection for Restricted Space: Drawings for enclosed switches and circuit breakers are not to scale. Contractor is responsible for maintaining code clearances between enclosures, and adjacent surfaces and other items. Installations shall comply with Article 110 of NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Spares: For the following:
      a. Fuses for Fusible Switches: Three (3)
   2. Fuse Puller: Furnish one fuse puller to Owner.
   3. Storage Cabinet: Furnish one fuse storage cabinet (by fuse manufacturer) to Owner.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:
   1. Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Control Division.
   3. Siemens Energy & Automation, Inc.
   4. Square D/Group Schneider.

B. Fusible Switch Assemblies: NEMA KS 1; heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Cover interlock shall be defeatable. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

C. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Cover interlock shall be defeatable. Handle lockable in OFF position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:
   1. Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Control Division.
   3. Moeller Electric Corporation.
   4. Siemens Energy & Automation, Inc.
   5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents. Minimum 25 kAIC.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

C. Molded-Case Circuit-Breaker Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
   4. Handle Lock: Include provisions for padlocking.

2.4 MOTOR-CONTROLLERS

A. Enclosures: NEMA 250, Type 1(indoor “dry” locations), unless otherwise indicated to comply with environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.

B. Controller Disconnecting Means:
   1. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes. Provide auxiliary contact for disconnection of starter control circuit(s).
   2. Combination Motor Starters: Combine motor starters with motor circuit protector disconnect in common enclosure.

C. Across-The-Line Controllers:
   1. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 2-pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit. Provide in NEMA 1 lockable enclosure.
   2. Magnetic Controller: NEMA ICS 2, Class A, full voltage, non-reversing, across the line, for induction motors rated in horsepower.
   3. Control Circuit: 120 V.
   4. Overload Relay: NEMA ICS 2; solid-state electronic overload protection.

D. Multispeed Controller: Match controller to motor type, application, and number of speeds; include the following accessories:
   1. Compelling relay to ensure that motor will start only at low speed.
   2. Accelerating relay to ensure properly timed acceleration through speeds lower than that selected.
   3. Decelerating relay to ensure automatically timed deceleration through each speed.

2.5 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover of all combination starters.
   1. In addition to HAND/OFF/AUTO selector switch, two speed combination starters shall be furnished with a HIGH/LOW selector in front cover.

C. Control Relays: Auxiliary and adjustable time-delay relays.

D. Auxiliary Contacts: NEMA ICS 2; two normally open field convertible contacts in addition to "latching" contact.

E. Indicating lights: NEMA ICS 2; LED pilot device with GREEN "motor run" in front cover.

F. Overload Reset: Externally operable in front cover.

G. Single-Phase Protective Relay: Provide a single-phase protective relay for all poly-phase magnetic motor starters.

2.6 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
   3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated.

C. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible disconnect switches. Fuses shall be installed in such a way that ratings can be clearly read.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:
   1. Inspect mechanical and electrical connections.
   2. Verify switch and relay type and labeling verification.
   3. Verify rating of installed fuses.
   4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.
   5. Inspect visually and perform several mechanical ON-OFF operations on each circuit breaker.
   6. Verify circuit continuity on each pole in closed position.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors. Do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SECTION 263213 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged engine-generator sets for emergency power supply with the following features:
   1. Gas engine.
   2. Unit-mounted cooling system.
   3. Unit-mounted control and monitoring.
   4. Performance requirements for sensitive loads.
   5. Outdoor enclosure.

B. Related Sections include the following:
   1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. LP: Liquid petroleum.

1.3 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
   1. Thermal damage curve for generator.
   2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
   1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
   1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 180 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

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

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Architect's written permission.

B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: Minus 15 to plus 40 deg C.
   2. Relative Humidity: 0 to 95 percent.
   3. Altitude: Sea level to 1000 feet.

1.6 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size and location of roof curbs, equipment supports, and roof penetrations for remote radiators. These items are specified in Division 7 Section "Roof Accessories."

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One (1) year from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
   2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
   3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Caterpillar; Engine Div.
   2. Kohler Co.; Generator Division.
   3. Onan Power Generation; Industrial Business Group.
   4. MTU Onsite Energy.
   5. Generac.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
   1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:
   1. Power Output Ratings: Nominal ratings as indicated.
      a. Minimum Rating: 30kW, 37.5kVA at 0.8 power factor, 208Y/120 volts, 60 Hz.
   2. Output Connections: Three-phase, four wire.
   3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance:
   1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
   2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within two seconds.
   3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
   4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
   5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
   6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
   7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
   8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3 ENGINE

A. Fuel: Natural gas.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:
   1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
   2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
   3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:
   1. Natural Gas (Vapor-Withdrawal) System:
      a. Carburetor.
      b. Secondary Gas Regulators: One.
      c. Fuel-Shutoff Solenoid Valves: One.
      d. Flexible Fuel Connectors: One.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity. 1,000 watts, 120 volts AC.

G. Governor: Adjustable isochronous, with speed sensing.

H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
   1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
   2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
   3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
   4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
   5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
      a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
      b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

I. Muffler/Silencer: Residential type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
   1. Minimum sound attenuation of 18 dB at 500 Hz.
   2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 95 dBA or less.

J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

K. Starting System: 12-V electric, with negative ground.
   1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
   2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
   3. Cranking Cycle: 60 seconds.
   4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
   5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
   6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place. Constructed to contain spillage of electrolyte.
   7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
   8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
      a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
      b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
      c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
      d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
      e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
      f. Enclosure and Mounting: NEMA 250, Type 1. Locate charger within genset housing.

2.4 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 2 system, and the following:
   1. AC voltmeter.
   2. AC ammeter.

3. AC frequency meter (45 – 65 Hz range).
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Generator overload.
16. Lamp test switch.
17. Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:
    a. Frequency Meter: 45-65 Hz range, 3-1/2-inch dial.
    b. AC Output Voltmeter: 3-1/2-inch dial, 2 percent accuracy, with phase selector switch.
    c. AC Output Ammeter: 3-1/2-inch dial, 2 percent accuracy, with phase selector switch.
    d. Output voltage adjustment.
    e. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
    f. Engine start/stop selector switch.
    g. Engine running time meter.
    h. Oil pressure gage.
    i. Water temperature gage.
    j. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.

D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

E. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals.

2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.
1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Mounting: Adjacent to or integrated with control and monitoring panel.

2.6 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Drip proof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
   1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.7 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

2.8 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
   1. Material: Standard neoprene.
   2. Durometer Rating: 50.
   3. Number of Layers: Three.

2.9 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with elastomeric isolator pads having a minimum deflection of 1 inch on 4-inch- high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 16 Section "Electrical Supports and Seismic Restraints."

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

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

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Division 15 Section "Mechanical Identification" and Division 16 Section "Electrical Identification."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
   2. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

C. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

A. Describe loads connected to emergency system.

B. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency power.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes transfer switches rated 600 V and less including the following:
   1. Automatic transfer switches.
   2. Remote annunciation systems.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
   1. Features and operating sequences, both automatic and manual.
   2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches and remote annunciators through one source from a single manufacturer.

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

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:
   1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Architect's written permission.

1.5 COORDINATION

A. Coordinate size and location of switch with other trades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Contactor Transfer Switches:
      a. Caterpillar; Engine Div.
      b. Kohler Power Systems; Generator Division.
      c. Onan/Cummins Power Generation; Industrial Business Group.
      d. MTU On-Site Power.
      e. Generac.

2.2 RATINGS

A. Ratings: NEMA ICS 2; as follows:

B. Voltage: 208/120 volts, three phase, four wire, 60 Hz.

C. Switched Poles: 4.

D. Continuous Ratings: ATS at minimum 150 amperes.

E. Interrupting Capacity: 100 percent of continuous rating.

F. Withstand Current Rating: 25,000 rms symmetrical amperes when used with circuit breakers (480V).

2.3 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
   1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
   1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
   2. Switch Action: Double throw; mechanically held in both directions.
   3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Battery Charger: For generator starting batteries.
   1. Float type rated 10 A.
   2. Ammeter to display charging current.

3. Fused ac inputs and dc outputs.

I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 16 Section "Electrical Identification."
   1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
   2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
   3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

K. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.4 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Automatic Transfer-Switch Features:
   1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
   2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
   3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
   4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained under-voltage of emergency source, provided normal supply has been restored.
   5. Test Switch: Simulate normal-source failure.
   6. Switch-Position Pilot Lights: Indicate source to which load is connected.
   7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
      a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.5 REMOTE ANNUNCIATOR

A. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are flush-mounting type to suit mounting conditions indicated. The following alarm conditions shall be annunciated at a minimum:
    1. Engine high-temperature shutdown.
    2. Lube-oil, low-pressure shutdown.
    3. Overspeed shutdown.
    4. Engine high-temperature pre-alarm.
    5. Lube-oil, low-pressure pre-alarm.
    6. Overcrank shutdown.
    7. Coolant low-temperature alarm.
    8. Control switch not in auto position.
    9. Battery-charger malfunction alarm.
    10. Battery low-voltage alarm

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 16 Section "Electrical Supports and Seismic Restraints."

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Division 16 Section "Electrical Identification."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Verify that surfaces are ready to receive work.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

C. Connect wiring according to Division 26 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Coordinate tests with generator tests and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 1 Section "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior lighting fixtures, lamps, and drivers.
   2. Emergency lighting units.
   3. Exit signs.
   4. Lighting fixture supports.

B. Related Sections include the following: Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.2 DEFINITIONS

A. CRI: Color-rendering index.

B. CU: Coefficient of utilization.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, including driver housing if provided.

E. RCR: Room cavity ratio.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Driver.
   4. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

B. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. Include replacement parts list.

C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.6 WARRANTY

A. Special Warranty for LED fixtures: Manufacturer's standard form in which LED fixture manufacturer agrees to repair or replace fixtures that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for LED Fixtures: Five years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

2. Drivers: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection.

B. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   2. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Plastic Diffusers, Covers, and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
      b. UV stabilized.
   2. Glass: Annealed crystal glass, unless otherwise indicated.

H. Air-Handling Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 23 Section "Diffusers, Registers, and Grilles."
   1. Heat Removal Units: Air path leads through lamp cavity.
   2. Combination Heat Removal and Air Supply Unit: Heat is removed through cavity at both ends of the fixture door with air return accomplished through louvered door assembly.
   3. Dampers: Operable from outside fixture for control of return-air volume.

2.3 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.4 LED LAMPS

A. LED Lamps: Color temperature 4000 K.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Electrical Supports" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, aircraft cable.

C. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

D. Install clips to secure recessed grid-supported luminaires in place.

E. Provide hanger wire from structure to each corner of fixtures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture. Secure to prohibit movement.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
   1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
   3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
   4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
   3. Continuous Rows: Use cord or stem for wiring at one point and distribute wiring through fixtures via manufacturer installed plugs at each end.

D. Air-Handling Lighting Fixtures: Install with dampers open and ready for adjustment.

E. Adjust aimable lighting fixtures to provide required light intensities.

F. Connect wiring according to Division 26 Section "Conductors and Cables."

G. Fixtures in areas defined by the "Lighting Standards for Georgia Public Schools" shall comply with paragraph G.2.b of standard.

H. Install in accordance with manufacturer’s instructions.

I. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.

J. Install recessed luminaires to permit removal from below.

K. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. Verification of these requirements shall be the responsibility of the Contractor.

L. Install wall mounted luminaires, at height as indicated on Drawings.
   1. Fixtures located above mirrors at lavatories shall be installed 6 inches above top edge of mirror. Coordination through General Contractor is required to determine this elevation.

M. Install accessories furnished with each luminaire.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

O. Bond products and metal accessories to branch circuit equipment grounding conductor.

P. Install specified lamps in each luminaire.

Q. Connect grid troffers to branch circuit utilizing "fixture whips" maximum 6 feet in length.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery/generator and retransfer to normal.

3.3 ADJUSTING:

A. Relamp luminaires that have failed lamps prior to Owner's acceptance.

3.4 CLEANING:

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION 265100

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Basic electrical requirements, which are specifically applicable to all Division 27 Sections, in addition to the requirements of Division 1 - General Requirements.

1.2 SUBMITTALS

A. Provide submittals in accordance with Section 01330 - Submittal Procedures.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 271301 - Voice and Data Communication Cabling and Network Equipment
      a. Product data
      b. Shop drawings
      c. Qualification data
      d. Field quality control test reports
      e. Warranty
   2. Section 274133 – Interactive Audio-Visual, IPTV and Video on Demand System
      a. Product data
      b. Shop drawings
      c. Equipment list
      d. Field quality control test reports

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Only manufacturers listed in specifications or addendums will be considered.

K. Review, corrections, or comments made on the submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addendums (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort

contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

L. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the submittal review.
   1. RNE - Reviewed, No Exceptions Noted
      a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
      b. No corrective action required at this time.
   2. FNC - Furnish with Noted Corrections
      a. Indicates the contractor shall insure that all necessary or noted corrections are incorporated into equipment furnished to the project.
      b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
   3. RES - Revise and Resubmit
      a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
      b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
   4. PSD - Provide Submittal Data
      a. Indicates submittal data was not provided for this item or section.
      b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

M. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All sleeves must be precast in concrete or concrete block and accordingly provided to the mason in a timely manner. Accordingly, all items such as these shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractor’s failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.3 REGULATORY REQUIREMENTS

A. All work installed under Division 27 shall conform to the current adopted Edition of Building/Electrical Codes and their appropriate amendments:
   1. NFPA 70 2023 National Electrical Code
   2. Life Safety Code, NFPA 101
   3. Requirements of the State of Georgia Fire Marshall's Office.
   4. GA State Energy Code.
   5. Standard Building Code
   6. Standard Mechanical Code (Georgia Edition)
   7. Standard for Health Care Facilities, NFPA 99
   8. National Fire Alarm Code NFPA 72
   9. Standard for Emergency and Standby Power Systems NFPA110
   10. Standard for Lightning Protection System NFPA 780
   11. City of McDonough and Henry County Codes

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.4 CONTRACTOR GUARANTEE

A. All equipment and materials furnished and all work performed under these specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after Architect's Final Certificate. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.5 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Three bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binders shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

B. Operating and maintenance manuals shall also comply with Division 1 Section “Operation and Maintenance Data.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Drawings, unless prevented by project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

D. Electrical items are shown on drawings in approximate locations unless dimensioned. Install at location required to serve intended purpose. Include installation within ten (10) feet of location shown.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 27 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g. ceiling plenums, mechanical rooms, etc.) are coordinated and installed to insure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than six-week fabrication schedules. See Section 01100 - Summary for additional requirements.

1.8 ACCEPTABLE PRODUCTS

A. Where a manufacturer has been listed as being acceptable in the various specification sections hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of his standard product. His product shall still comply with all of the requirements and standards of this specification and not necessarily his standard specification, to the extent that it might require special manufacture to meet the requirement and standards of this specification.

B. Prior Approval: Substitutions of specified items and prior approvals of other manufacturers will not be considered.

C. Addenda: If the substitution is allowed, such approval will be set forth in an Addendum.

D. Costs: All costs incurred by the acceptance of substitutions shall be borne by the contractor.

1.9 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.10 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match.

C. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.11 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.12 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers and shall use these numbers wherever required. (For example, room numbers are used in programming of fire alarm systems and intercom system, and shall match the Owner's final choice.)

END OF SECTION 270500

SECTION 271301 - VOICE & DATA COMMUNICATION CABLING & NETWORK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following items for wiring systems used as signal pathways for voice and high-speed data transmission and network equipment:
   1. Main Distribution Frame
   2. Intermediate Distribution Frames
   3. Patch Panels
   4. Fiber Optic Cables
   5. Cat 6A Cables
   6. Patch Cords
   7. Outlets and Terminations
   8. Data Network Switches
   9. Voice Gateway Router and IP Telephone sets
   10. Wireless Local Area Network (WLAN) Access Points
   11. Wireless Local Area Network (WLAN) Configuration
   12. Equipment Programming, Licenses, and Configuration

1.2 DEFINITIONS

A. Backbone: A facility (e.g., pathway, cable, or conductors) between telecommunications rooms or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.

B. BICSI: Building Industry Consulting Service International.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal cross-connect.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. RCDD: Registered Communications Distribution Designer.

I. RMC: Rigid metallic conduit.

J. UTP: Unshielded twisted pair.

1.3 SUBMITTALS

A. Product Data: For features, ratings, and performance of each component specified.

B. Shop Drawings:
   1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connections.
   2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
   3. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
   4. Cabling Administration Drawings.
   5. Wiring diagrams to show typical wiring schematics including the following:
      a. Workstation outlets, jacks, and jack assemblies.

b. Patch cords.
c. Patch panels.
d. Fiber-optic boxes.
e. Distribution cabinets.
f. Terminal racks.

C. Proof of Certification: Provide proof of the following current Certifications:
1. Approved cable manufacturer's Certification of Installers.
2. Corning Fiber Optic cable Certification of Installers.
3. Cisco Partner with Wireless LAN Specialization Certification.
4. Cisco Gold Certified Partner with the Master Unified Communications Certifications.

D. Qualification Data: For Installer.

E. Source quality-control test reports.

F. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have on staff personnel RCDD certified by BICSI.
1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Network Equipment Installer Qualifications: Network switches, gateways, routers, and server installer and configuration technicians must have the following certifications:
1. Cisco Partner with Wireless LAN Specialization Certification.
2. Cisco Gold Certified Partner with the Master Unified Communications Certifications.
3. Cisco Certified Design Expert (CCDE) Certifications.

C. Source Limitations: Obtain all products through sources from the approved manufacturers.

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

E. Comply with NFPA 70, "National Electrical Code."

1.5 QUALIFICATIONS

A. Installer shall be Commscope, Panduit, Corning, S2 Access Control, and Avigilon certified as a company, no exceptions. Data cabling and complete S2 and Avigilon installation shall be performed by one contractor only. NetPlanner Systems and Wachter, Inc. are prequalified installers for Henry County Schools. Any proposed vendor other than NetPlanner Systems Inc. or Wachter, Inc. must have prior approval by Owner.

B. Acceptable low voltage Prequalified Installers:
1. NetPlanner Systems – Atlanta, GA
2. Wachter, Inc.- Suwanee, GA

1.6 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local communication service carrier, AT&T.
1. Meet jointly with specified herein telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute to other participants.

3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of Voice and LAN equipment.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Outlet Assemblies: One of each type for every 25 outlets shown on plans, but no fewer than one.
   2. Patch-Panel Units: One of each type.
   3. Connecting Blocks: One of each type.
   4. Device Plates: One of each type.
   5. Multiuser Telecommunications Outlet Assemblies: One of each type.
   6. Patch cords: quantity 25.
   7. Access Points: quantity 5

1.8 WARRANTIES

A. Contractor shall warrant all cabling items including applications, performance, and product for a period of twenty-five years. All cabling items shall be repaired or replaced without cost to Owner as well as restoring building conditions disturbed during the repair.

B. All Cisco switches, controllers, gateways, and devices specified herein shall include Cisco's "SmartNet 8x5xNBD" warranty in the Owner's name.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SYSTEM REQUIREMENTS

A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate five percent future increase in the number of workstations shown on Drawings. This expansion requirement does not apply to horizontal cable from workstation outlet to first terminal board.

C. The project encompasses a fiber optic backbone, and Category 6, Class A unshielded twisted pair (UTP) data cabling system to implement wired and wireless data networks, Voice cabling, data networking switches, VoIP Telephony, wireless LAN networking equipment, controllers, services, and all licensing etc. for this project. The completed network must be capable of supporting up to 250MHz transmission of data over the enterprise. The UTP must be able to support 400MHz for 100 meters (328 ft. including patch/line cords).

D. Cat 6A Performance Requirements:
   1. Highest Test Frequency 650 MHz

E. Input impedance shall be measured per ASTM 4566-94, 43.2 Method 2, Option 2, (Method 3 will not be allowed), input impedance shall be swept out to 650 MHz and meet the following:
   1. 1 MHz to 100 MHz is 100 ohms $\pm$ 15.
   2. 100 MHz to 200 MHz is 100 ohms $\pm$ 22.
   3. 200 MHz to 400 MHz is 100 ohms $\pm$ 32.
   4. Minimum ACR $\geq$10 dB @ 205MHz (100-meter worst pair NEXT) : $\geq$10 dB @ 190 MHz (100 meter power sum NEXT)
   5. Maximum Skew: 25 ns at 100 meters and 30 ns at 100 meters Channel

6. Maximum Attenuation: 43.21 dB/100 meters @ 400 MHz

F. UTP Termination Devices (connectors and patch panels) Performance Requirements:
1. All connectors to be used in a channel shall meet the following minimum requirements:

FREQUENCY	PSNEXT	ATTENUATION
MHz	dB	dB
1	90	.02
4	78	.04
8	72	.06
10	70	.06
16	66	.08
20	64	.09
25	62	.10
31.25	60	.11
62.5	54	.16
100	50	.20
200	44	.28

2. All connectors to be used in a channel shall meet the following minimum return loss requirements:

FREQUENCY	RL
MHz	dB
1 to 31.25	30
62.5	24
100	20
200	14

G. Channel Performance Requirements:
1. In addition to requirements stated above for individual product specifications, the end-to-end interconnected and installed channel shall meet the following requirements:
a. Channel PSELFEXT

FREQUENCY	CAT 6A
MHz	dB
1.0	61
4.0	49
8.0	43
10.0	42
16.0	37
20.0	35
25.0	33
31.25	31
62.5	25
100.0	21
200.0	15

H.

I. Channel Return Loss

FREQUENCY	CAT 6A
MHz	dB
1.0	19
4.0	19
8.0	19
10.0	19
16.0	19
20.0	19
25.0	18
31.25	17
62.5	14
100.0	12
200.0	9

1. Attenuation-to-Crosstalk ratio (Powersum)
   a. 16.0 dB @ 100 MHz

J. The above requirements contain only values at discrete frequencies. The entire swept frequency range must be compliant.

K. Plenum-rated cables shall use 100% FEP for the insulation.

L. Outlet configurations are indicated on the drawings.

M. Contractors shall ensure that cabling routing from above the ceiling to the racks is contained within cable management system.

N. The main distribution frame (MDF) for this building shall be in the MDF designated space of the building. Minimum two (2) floor mounted racks shall be placed within this room to house the termination patch panels and active hardware including uninterruptable power supplies.

O. There is one (1) intermediate distribution frames (IDF's). All IDF’s shall be connected to MDF via a fiber optic backbone. The IDF's shall be installed in minimum 30"D floor mounted racks unless noted otherwise. Wiring routing to the cabinets shall be contained within cable tray and management systems.

P. The contractor shall conduct the installation in accordance with NEC, NFPA and all applicable codes. The contractor shall obtain all permitting as required to conduct the installation. The contractor shall install the system and certify compliance with NEC, NFPA, IEEE 802.3, 100BaseT, EIA/TIA 568B, and all applicable codes.

Q. Access points for wireless networking shall be installed within the building as shown on the drawings and shall be configured as specified in this section.

R. Voice cabling shall be provided and installed within the building as shown on the drawings as specified in this section.

S. IP based video surveillance system specified in Section 282300 shall be part of this data network.

T. Grounding per Section 260525 shall be provided to the MDF, all IDF's, and telephone backboard.

2.3 IP TELEPHONY DESCRIPTION

A. The Internet Protocol Telephony (IPT) shall be implemented by utilizing the existing Cisco Unified Communication’s Manager (Call Manager), the existing Unified Messaging with Cisco Unity Server, and new Cisco Voice Gateway Router and IP Handsets as listed herein. The installer shall provide services of a Network Engineer to plan, design, configure, and install a complete IPT solution which shall be a Unified Communications solution.

B. Provide licensing for Call Manger, Unity Server, and new voice gateway to support the solution.

C. The IP Handsets shall be powered by Cisco's in-line power capable switches. The network switches shall be utilized to power up and connect IP Handsets to the IPT network.

D. The IP Handsets shall be configured and controlled by Cisco Unity Sever which resides in the school system's Data Center.

E. IP Telephony Implementation and Configuration:
   1. Implement the IPT solution into network including installation of equipment; migration to IP Telephony infrastructure; and functionality testing.
   2. The following steps describe the work required to implement a complete IPT solution for this building:
      a. Implementation of specified 4451 Unified Voice Gateway with SRST.
      b. Design traffic flows to comply with available Quality-of-Service metrics within the client Metro-Ethernet network.
      c. Implementation and configuration of all Cisco 8851 IP Handsets and expansion modules.
      d. User and Extension configurations in Call Manager and Unity
      e. Implementation of Cisco 8851 IP Phones and 8800-A-KEM Expansion Module – Attendant Phones.
      f. Auto Attendant configuration
      g. Implementation of ten (10) Cisco ATA port adapters for fax locations.
      h. Interface 4451 Voice Gateway with Analog Contingency lines via FXO ports. Provide eight (8) ports dedicated for Analog Contingency lines.
      i. Configure 4451 Voice Gateway for 911/SRST dialing using Analog Contingency lines
      j. Configure Inward Dialing on Analog Contingency lines to route to Attendant Phone.
      k. Installer shall provide complete configuration of the IPT solution in accordance with Owner's requirements.

F. IP Telephony End User Training:
   1. Provide basic end user training. The following training tasks shall be performed:
      a. Phone Features - Placing Calls; Call and Phone Controls; Transferring Calls; Conference Calls
      b. Hands On Review - Review of the features on end user's phone; Question and answers on the phone features
      c. Voice Mail - Setup; Internal Access; External Access
      d. Unified Active Assistant Demonstration - Call Settings; Message Settings; Personal Settings
      e. View Mail Discussion - Discuss Play Voice Mail Features; Discuss Respond to Voice Mail Features, etc.

G. IP Telephony After Occupancy Adjustments: Provide after occupancy configuration adjustments. The Installer shall include minimum 24 hours of after substantial completion and occupancy IP Telephony programming and configuration adjustments per Owner's request. This service shall be available to the Owner in four (4) hour increments within one year of substantial system installation.

H. Provide all Cisco 8851 IP phones' MAC addresses and room numbers after placing the phones in the Owner identified spaces for addition to the Call Manager.

2.4 WIRELESS NETWORK DESCRIPTION

A. The Wireless Local Area Network (WLAN) shall be implemented by utilizing IEEE 802.11ac and 802.11an standards and Cisco's cloud managed Meraki MR56 series access points. The access points shall be installed in accessible ceiling tiles and on walls throughout the building as shown on the drawings. The access points shall be connected to the associated distribution frame with Green color patch panel punch block and patched in with Green color patch cables to the grouped switch ports (i.e. switch 01, ports 1-15).

B. In order to achieve optimal number of client log-on with maximum available throughput, there shall be one access point assigned to each classroom. The layout of access points shall utilize Meraki MR56's multiple radios. The access points shall be capable of being powered by Cisco's in-line power capable series switches, specified herein. The switches shall be utilized to power up and connect access points to the local area network.

C. The access points shall be configured and managed over cloud.

D. Wireless Access Point Configuration:
   1. The following steps describe the work required to configure access points and to implement a complete WLAN in the building:
      a. Develop a plan indicating each access point's location within the buildings which shall be uploaded into the Cisco Meraki Dashboard by the Wireless Engineer with each access point labeled AP-01, AP-02 with associated room number in the dashboard and required license file uploaded, IP address, transmit power and channel assignments.
      b. Identify and connect each access point's Green Color patch cord from associated labeled patch panel to network switch port within a distribution frame to activate access points. The Wireless Access Points' Green color patch cords shall be grouped in sequential ports, i.e., ports1-10. The Green color patch panel block shall be connected to sequential switch ports within a distribution frame, i.e., ports 1-15.
      c. Configure access points according to the owner defined, included herein, and system usage determined parameters by utilizing Cisco's guidelines.
      d. Test the entire WLAN for client log-on, security parameters, and coverage etc. in accordance with Cisco's published recommendations, and demonstrate the functionality of the WLAN to the owner and his representatives.
      e. All Access Points shall be mounted with the side LED status light facing the room's main entrance door.
   2. Access Point Data Network Configuration Parameters:

PARAMETER	SETTINGS
System Name	Owner will provide to the installer
IP Address Range for Access Points	Owner will provide to the installer
IP Subnet Mask for Access Points	Owner will provide to the installer
Default Gateway	Owner will provide to the installer
SSID (The SSID is case sensitive)	Owner will provide to the installer
Ensure Compatibility With	non-aironet 802.11
SNMP Admin Community	Owner will provide two (2) to the installer
DNS	Enable
Default Domain	Owner will provide to the installer
Domain Name Servers	Owner will provide to the installer
System Location	Owner will provide to the installer

3. User Defined Access Point Configuration Parameters:

PARAMETER	SETTINGS
Allow Broadcast SSID to Associate	No
SNMP Admin 1 Capability Settings	Write, SNMP, Ident, Firmware, and Admin
SNMP Admin 2 Capability Settings	Write, SNMP, Ident, Firmware, and Admin
User Manager	Enable
802.1X protocol version for EAP Authentication	Draft 10
Primary Server Reattempt Period	0
Server Name/IP	Owner will provide to the installer
Server Type	Owner will provide to the installer
Port	Owner will provide to the installer
Shared Secret	Owner will provide to the installer
Retran Int	Owner will provide to the installer
Max Retran	Owner will provide to the installer
Use Server For	EAP Authentication
Use of Data Encryption by Station	No Encryption
Accept Authentication Type	Open
File Transfer Protocol	TFTP
Default FTP File Server	Owner will provide to the installer

2.5 MOUNTING ELEMENTS

A. Backboards: 3/4-inch, interior-grade, fire-retardant-treated plywood.

B. Distribution racks: Freestanding modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
   1. Module Dimension: Width compatible with EIA 310 standard 19-inch panel mounting.
   2. Finish: Baked-polyester Black powder coat.
   3. Manufactured by Chatsworth Products Inc. Provide free standing minimum 84"H x 19"W 6061 T6 aluminum rack. CPI # 55053-703.
      a. Rack-Mount Ground Bar; 19” W; Copper (CPI #10610-019)

C. Cable Management: Metal with integral wire retaining fingers.
   1. Baked-Polyester powder coat Black finish.
   2. Wire management panels, as required for the full height and width of racks. Wire management shall be manufactured by Chatsworth and shall be as follows:
      a. Single Sided Horizontal – Chatsworth #30130-719 (Anixter # 247659), to be installed above and below each network electronic switch.
      b. Vertical - Chatsworth 40098-703, to be installed on both left and right sides of the floor mounted racks.

D. Power Strips: For mounting in the racks, with 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles, number as required, but in no case fewer than 6, and including the following:
   1. LED indicator lights for power and protection status.
   2. LED indicator lights for reverse polarity and open outlet ground.
   3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
   4. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
   5. Rocker-type on-off switch illuminated when in on position.
   6. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
   7. Protection modes shall be line-to-neutral, line-to-ground, and neutral-to-ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.

2.6 UNSHIELDED TWISTED-PAIR CABLING

A. Cable Manufacturers:
   1. Panduit Corp.
   2. Belden Inc.; Electronics Division.
   3. CommScope Properties, LLC.

B. Terminal and Connector Component and Distribution Cabinet Manufacturers:
   1. Panduit Corp.
   2. Systimax.
   3. CommScope Properties, LLC.

C. 100-Ohm UTP: Comply with UL 444.

D. Voice Backbone Copper Cable:
   1. No. 24 AWG, 25 pair.
   2. Comply with ICEA S-80-576 and TIA/EIA-568-B.2, Category 6A.
   3. NFPA 70, type CMR complying with UL 1666.
   4. Cable Jacket Color: Gray.

E. Voice Copper Cable:
   1. No. 24 AWG, 100 ohm, four pair.
   2. Comply with TIA/EIA-568-B.2, Category 6A.
   3. NFPA 70, types CMG and CMP.
   4. Cable Jacket Color: Gray.
   5. Basis of Design: Four pair minimum Cat 6, Class A plenum rated UTP cables with Gray color jacket.

F. Data Horizontal Copper Cable:
   1. No. 24 AWG, 100 ohm, four pair.
   2. Comply with TIA/EIA-568-B.2, Category 6A.
   3. NFPA 70, types CMG and CMP.
   4. Cable Jacket Color: Blue.
   5. Basis of Design: Four pair minimum Cat 6, Class A plenum rated UTP cables with Blue color jacket.
      a. Cable color for video surveillance system data cable shall be Yellow.

G. Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.
   1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
   2. IDC Connecting Hardware: Consistent throughout Project.

H. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.

I. Voice Patch Panel: Punch blocks – 110 type IDC blocks.

J. Data Patch Panel: Comply with TIA/EIA-568-B.2, meeting or exceeding cable performance. Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Number of Jacks per Field: One for each four-pair UTP cable indicated and conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria.
   2. Basis of Design: 72 port modular patch panels, as required, pinned for 568B. Manufactured by Panduit, # CPPKATP72WBLY (Anixter # 264798). Provide all patch panel jacks in black color. Provide black color inserts for all unused ports.

K. Jacks and Jack Assemblies: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals.
   1. Basis of design: 8 pin RJ45 modular blue color jacks.

L. Patch Cords: Factory-made, four-pair cables in required lengths; terminated with RJ-45 plug at each end.
   1. Basis of design: System matched, Panduit TX-6 Plus blue in color for UTP and LC to LC aqua in color, 50/125um Corning # 050502S5120/xxxM, optical fiber patch cords.
   2. The installer shall determine the length of patch cords (3', 5', or 7' cords) in the distribution frames to adequately arrange and connect in workman like manner to electronic equipment specified herein. The length of patch cords from each outlet to IP Telephony handsets at desktop and Owner provided PCs shall be minimum 14 feet. Provide patch cords for IP based intercom system ceiling speakers.
   3. Provide patch cords from patch panel to switch for endpoints in the following colors:
      a. Wireless Access points – Green
      b. Video/IPTV – Orange
      c. IP Security Camera – Yellow
      d. Interactive Display Panel - Purple

2.7 FIBER-OPTIC CABLING

A. Cable, Terminal, and Connector Product Manufacturers:
   1. Corning Cable Systems.

B. Fiber-Optic Cable: 50/125um enhanced multimode, laser optimized fiber optic OFNP or OFNR cables as listed below. Manufactured by Corning Cabling Systems:
   1. Indoor/Outdoor application - Corning FREEDM LST Gel-Free part # 024S8P-31190-D3.
   2. Indoor only application - Corning MIC part # 024T88-33180-D3.

C. Backbone Fiber Cable: 24 fibers.
   1. Comply with TIA/EIA-492AAAA, tight buffer.
   2. NFPA 70, Type OFN complying with UL 1666.
   3. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.25 dB/km at 1300 nm.
   4. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
   5. Cable Jacket Color: Orange.

D. Horizontal Fiber Cable: Two fibers.
   1. Comply with TIA/EIA-492AAAA, tight buffer.
   2. NFPA 70, Types OFN and OFNP.
   3. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.0 dB/km at 1300 nm.
   4. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
   5. Cable Jacket Color: Orange.

E. Cross-Connect and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
   1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.

F. MDF Fiber Optic cabinet Mount Enclosures: 12 LC adapter panel capacity fiber optic cabinet mount enclosure with fiber optic cable routing accessory kit and 6 LC adapter panel with phosphor bronze sleeves. Manufactured by Corning, # CCH-04U (Anixter # 180420) for enclosure and # CCH-CP24-E4 (Anixter # 355883) for adapter panel.

G. IDF Fiber Optic Cabinet Mount Enclosures: 6 LC adapter panel capacity fiber optic cabinet mount enclosure with fiber optic cable routing accessory kit and 6 LC adapter panel with phosphor bronze sleeves. Manufactured by Corning, # CCH-02U (Anixter # 180627) for enclosure and # CCH-CP06-E4 (Anixter # 355883) for adapter panel.

H. Patch Cords: Factory-made, dual fiber cables in required lengths.

I. Cable Connecting Hardware:
   1. Comply with TIA/EIA-568-B.3.
   2. Quick-connect, simplex- and duplex-Type LC couplers. Insertion loss not more than 0.7 dB.

2.8 WORKSTATION OUTLETS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Dual jack-connector assemblies mounted in single or multi-gang faceplate.
   1. Faceplate: Metal, Satin finish.
   2. Mounting: Flush, unless otherwise indicated.
   3. Legend: Machine-printed, adhesive tape label identifying the circuit.
   4. Basis of design: 8 pin RJ45 modular blue color jacks.

C. Outlet Coverplate: Information outlets single gang, Stainless with satin finish, no exceptions.

D. Protective Enclosure for Access Points in Gymnasium and Commons area: Fiberglass molded construction in gray color, hinged cover with scratch resistant Lexan window. Manufactured by Hoffman #D16148CHSCFGWP (Anixter # 360893) with panel.

E. Patch Panel Icons: provide minimum 100 Pieces per Runner, 24 icons per runner.
   1. Access Points: Panduit #CIBWIREGR-V/N icon for access point port identification in patch panels. Provide in green color with white symbol.
   2. Access Control System: Panduit #CIBCABU-V/N icon for access control system port identification in patch panels.
   3. Video Surveillance System NVR: Panduit #CIBDVROR-V/N icon for video surveillance system DVR port identification in patch panels.
   4. Video Surveillance System Cameras: Panduit #CIBCAMERARD-V/N icon for video surveillance system IP camera port identification in patch panels.

2.9 BACKBOARDS

A. A-C, void-free plywood, 84 inches high and 3/4-inch thick, fire rated.

2.10 GROUNDING AND BONDING

A. Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467.

2.11 IDENTIFICATION PRODUCTS

A. Manufacturers:
   1. Brady Worldwide, Inc.
   2. HellermannTyton.
   3. Panduit Corp.

B. Comply with TIA/EIA-606-A and with applicable requirements in Division 16 Section "Electrical Identification."

C. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

D. Computer-based cable management system, with integrated database and graphic capabilities.
   1. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.
   2. Information shall be presented in database view, schematic plans, or technical drawings.
      a. Microsoft Visio Professional or AutoCAD drawing software shall be used as drawing and schematic plans software.
   3. System shall interface with the following testing and recording devices:
      a. Direct upload tests from circuit testing instrument into the PC.
      b. Direct download circuit labeling into labeling printer.

2.12 ELECTRONIC EQUIPMENT

A. Wireless Network Access Points: IEEE 802.11ac standards compliant, wireless LAN (WLAN) access point of modular design with cloud management. Access point shall have four radios with built-in diversity antennas approved for FCC configuration. Provide with flush-mounting kit for tiled ceilings, and accessories to mount in ceilings or walls as applicable. Access point shall be powered via Cisco line-power-enabled switches over Ethernet. Access point shall be manufactured by Cisco, Meraki MR56-HW with LIC-ENT-5YR.

B. Network Switches and Equipment - Provide the following Cisco *Catalyst* network switches and related supporting equipment in applicable distribution frames:

1. MDF Core and Copper Switches: Provide Cisco Catalyst C9300-48U, 48 port UPOE, each with two 10Gbit Ethernet SFP-10G-SR-S transceiver multimode fiber optic type, three GLC-SX-MMD. Each switch shall have dual PWR-C1-1100WAC-P 1100W AC Config 1 Power Supply front to back cooling and licensed with C9300-NW-A-48, C9300 Network Advantage, S9300UK9-1612, low-density license K12, DNA-A-48-3Y, PI-LFAS-AP-T-3Y, and PNP-LIC.
    a. Provide Cisco Catalyst C9300-24S, 24 port Fiber, with 8x10G Ethernet network module, C9300-NM-8X, transceiver multimode fiber optic modules, GLC-SX-MMD, and single mode fiber optic modules. Each switch is to have dual PWR-C1-715WAC-P 750W AC Config 1 Power Supply, Catalyst stack power cable 150CM, and licensed with C9300-NW-A24, C9300 Network Advantage, DNA-A-24-3Y, PI-LFAS-AP-T-3Y, and PNP-LIC.
2. Provide the following to make interconnections:
    a. Gbit SFP's for MDF to each IDF interconnections.
3. IDF Switches: Provide Cisco Meraki C9300X-48HXN-M, each with 4x10Gbit Ethernet module, C9300X-NM-8Y Fiber Module, SX transceiver multimode fiber optic type, MA-SFP-1GB-SX, and 120G Data-Stack cable, MA-CBL-120G-50CM. Each switch is to have MA-PWR-1100WAC power supply and licensed with LIC- C9300X-48HXN -5Y. Provide rack mountable UPS, Liebert #PSI5-3000RT120LIN "3000VA PSI5 LIO with SNMP card, brackets, and support accessories for each IDF.
4. Spare Capacity: Provide minimum twelve (12) spare copper switch ports in each distribution frame.
5. Each switch port shall be capable of providing adequate power to both radios in the specified access points, and IP video surveillance cameras.

C. IP Telephones: Cisco Unified IP telephone #8851 with programmable backlit line/feature buttons and interactive soft keys, speaker phone, built-in headset port, and integrated Ethernet switch. The IP telephone shall have higher-resolution color display. Provide twenty five (25) IP telephone sets with complete programming, configuration, and installation per the Owner's instructions and requirements herein.

2.13 SOURCE QUALITY CONTROL

A. Fiber-Optic Cable: Each cable spool tested at factory before shipping at 850 and 1300 nm.

B. UTP Cable Verification of Performance: Test every cable package or reel at factory to verify that cable complies with TIA/EIA-568-B.2 requirements.

PART 3 - EXECUTION

3.1 INSTALLATION STANDARDS

A. Comply with BICSI TCI, TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3, and TIA/EIA-569-A.

3.2 EXAMINATION

A. Examine pathway elements intended for cables.
   1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements.
   2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
   3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATION OF MEDIA

A. Backbone Cable for Data Service: Use fiber-optic cable for runs between equipment rooms and data closets and for runs between data closets.

B. Horizontal Cable for Data Service: Use UTP Category 6A cable for runs between data closets and workstation outlets.

C. Horizontal Cable for Voice Service: Use UTP Category 6A cable for runs between wiring closets and workstation outlets.

3.4 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install cables in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces. Cable trays are specified in Division 26 Section "Cable Trays." Raceways and boxes are specified in Division 26 Section "Raceways and Boxes."

C. Cable Installation:
   1. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
   2. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
   3. Pulling Cable: Do not exceed manufacturer's written recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
   4. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
   5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   6. Install UTP cables using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6A performance of completed and linked signal paths, end to end.
      a. Do not untwist more than 1/2 inch of Categories 6A cables at connector terminations.

D. Wiring within Wiring Closets and Enclosures:
   1. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.
   2. Mount patch panels, terminal strips, and other connecting hardware on cabinets.
   3. Group connecting hardware for cables into separate logical fields.
   4. Train conductors to terminal points with no excess.
   5. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

E. Separation from EMI Sources: Comply with BICSI TDM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment. Comply with the following minimum separation distances from possible sources of EMI:
   1. Separation between unshielded power lines or electrical equipment in proximity to open cables or cables in nonmetallic raceways is as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: 5 inches.
      b. Electrical Equipment Rating between 2 and 5 kVA: 12 inches.
      c. Electrical Equipment Rating More Than 5 kVA: 24 inches.
   2. Separation between unshielded power lines or electrical equipment in proximity to cables in grounded metallic raceways is as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: 2-1/2 inches.
      b. Electrical Equipment Rating between 2 and 5 kVA: 6 inches.
      c. Electrical Equipment Rating More Than 5 kVA: 12 inches.
   3. Separation between power lines and electrical equipment located in grounded metallic conduits or enclosures in proximity to cables in grounded metallic raceways is as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
      b. Electrical Equipment Rating between 2 and 5 kVA: 3 inches.
      c. Electrical Equipment Rating More Than 5 kVA: 6 inches.
   4. Electrical Motors and Transformers, 5 kVA or HP and Larger: 48 inches.
   5. Fluorescent Fixtures: 5 inches.

F. Conduit:
   1. Use minimum conduit size as follows:
      a. Data – 1".
      b. Voice – 1".
   2. Comply with TIA/EIA-569-A for maximum length of conduit and bends between pull points, and for pull-box sizing.
   3. Use manufactured conduit sweeps and long-radius ells whenever possible.
   4. In telecommunications rooms, position conduit ends adjacent to a corner on backboard (in case of a single piece of plywood) or in the corner of room (where multiple sheets of plywood are installed around perimeter walls of room). Use cable trays to route cables if conduits cannot be located in these positions. Secure conduits to backboard when entering room from overhead. Extend conduits 1 to 3 inches in finished floor.

G. Backboards: Install plywood with 84-inch dimension from floor up toward ceiling. Butt adjacent sheets tightly, and form smooth gap-free corners.

H. All components specified in this section shall be configured in accordance with the detail shown on the drawings.

I. Minimum bend radius for Category 6A cable shall be 12".

J. All cables shall be terminated.

K. Provide pull boxes as required to facilitate installation. No more than 270 degree of bends shall exist between pull boxes. Installation shall conform to the requirements of sections Division 16, and this section.

L. All cables shall be routed using conduit systems as specified to the cable tray systems.

M. Fiber optic cable shall be routed point to point in minimum 11/4" plenum rated innerduct paralleling corridor routings indoors and in minimum 4" rigid conduit outdoors. Fiber optic raceway shall have a minimum of 24" radius bends.

N. Fiber optic cable in the distribution racks shall be properly secured to the fiber tray and dressed neatly. All fibers shall be terminated with appropriate system-matched connectors, and connected to the connector housing panel.

O. All outlets, access points and cables shall be uniquely labeled, no exceptions.

P. WLAN access points shall be installed as shown on drawings. Access points shall be either ceiling or wall mounted, as applicable. Contractor shall provide all mounting hardware as well as data network drop to each access point.

Q. All wall mounted WLAN access points shall be installed in protective enclosures specified herein.

R. WLAN access points shall be mounted, adjusted and positioned to optimize the wireless network coverage within the building.

S. WLAN access points shall be migrated into Meraki Wireless Dashboard.

T. WLAN access points shall be mounted with side LED status light facing room's main entrance.

U. All specified network switches shall be mounted in racks, connected to power outlets, interconnected, and configured by the contractor per the Owner's instructions. Contractor shall provide and connect all patch cords to these switches as specified. Provide a horizontal wire manager below each switch in racks.

V. All specified network switches shall not be powered on until the Owner's technology representative has approved the installation.

W. Provide service loops of minimum six (6) feet in all data cables at access points. Support and secure loops in accordance with EIA/TIA requirements.

X. Provide patch cords from each outlet shown to Owner provided PC's.

Y. All access points and video surveillance cameras (PoE devices) shall be distributed evenly on all the switches in a distribution rack. There shall be twenty-four or less PoE devices per network switch.

Z. Provide Velcro (Panduit #HLS-15R0 type tie wraps for all data cable management and support within distribution frames.

AA. Install specified UPS at the bottom of MDF and IDF racks.

BB. Coordinate with the Owner for exact patching sequence requirements.

CC. All cables shall be arranged in accordance with the Owner's standards in all distribution frames.

DD. Identify wireless access point and video surveillance ports in patch panels with manufacturer's patch panel id tags.

3.5 TESTING AND DOCUMENTATION

A. All fiber optic strands shall be attenuation tested with a power meter set at both 850nm and 1300nm. The fiber optic cable shall also be length and integrity certified with an OTDR at 850nm. Strip charts covering the entire length of the cable segment shall be presented to the Owner at the project substantial completion. Each strip chart shall show the individual cable identifier. Any displayed anomalies shall be reported at the time of testing.

B. All data twisted pair cabling shall be tested for opens, shorts, grounds, and crosses. 100% of the pairs shall be guaranteed to Owner.

C. All twisted pair data cabling shall be additionally tested with a "Microtest Omni Scanner II" or Fluke "DTX" pair scanner for Category 6A compliance. All tests shall be "Permanent Link (TSB-67) tests.

D. The contractor shall be expected to provide electronic and hard copy documentation handbook at the project's completion. This handbook shall be organized in such a manner as to fully document all testing. All cable identifiers shall be used in the documentation for each test as applicable.

E. The contractor shall submit as-built drawings to the Engineer at the completion of the project.

F. The installer shall provide as-built documentation indicating each access point location within the buildings, IP address, transmit power and channel assignments.

G. The installer shall test the entire WLAN for client log-on, security parameters, and coverage, etc. in accordance with Cisco's published recommendations and demonstrate the functionality of the WLAN to the owner and his representatives.

H. The installer shall test the entire IP Telephony solution in accordance with Cisco's published recommendations and demonstrate the functionality of the IP Telephony to the owner and his representatives.

3.6 GROUNDING

A. Comply with Division 16 Section "Grounding and Bonding" and with TIA/EIA 607.

B. Grounding Points:
   1. Locate grounding terminals in each equipment room, wiring closet, rack, and cabinet.
   2. Telecommunications Grounding Busbars: Mount on wall of telecommunications entrance facility, equipment room, and closet, with standoff insulators.

C. Bonding Conductors:
   1. Extend from telecommunications entrance facility to electrical entrance facility and connect to grounding electrode.
   2. Where a panelboard for telecommunications is located in same room or space as a grounding busbar, bond to equipment ground bus of electrical panelboard.
   3. Extend from telecommunications entrance facility to grounding busbars.
   4. Extend from grounding busbars to ground terminals in equipment racks and cabinets.
   5. Extend from grounding busbars to building metal frame within room, or to metal frame external to room but readily accessible.

D. Special Requirements:
   1. Bonding conductors shall be insulated copper, No. 6 AWG minimum.
   2. Install only in nonmetallic conduit, unless specifically required for protection of conductor. Metallic conduit, if used, shall be RMC. For RMC that exceeds 36 inches in length, conductors shall be bonded at each end of conduit.
   3. Bonding conductors shall be installed without splices unless approved by Architect because of special circumstances. Where splices are necessary, they shall be accessible and shall be located in telecommunications spaces. Splices shall be by irreversible compression connectors or by exothermic welding.

3.7 IDENTIFICATION

A. In addition to requirements in this Article, comply with TIA/EIA-606-A and with applicable requirements in Division 16 Section "Electrical Identification."
   1. Administration class for this Project shall be Class 1.
   2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable and asset management software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable, jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement. At completion, cable and asset management software shall reflect as-built conditions.

C. Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors.

D. Cable and Wire Identification:
   1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
   2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   a. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.
5. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. At Workstations: Label cables within outlet boxes and Attach label to device plate.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cable administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

3.8 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

B. Category 6A UTP Cabling Tests:
1. Tests shall include all tests of Category 6A, conducted from 1 to 250 MHz.
2. Channel and permanent link tests shall be performed with a tester that complies with performance requirements in TIA/EIA-568-B.2, Level III. Include tests for longitudinal or transverse conversion loss.
3. Performance shall comply with minimum criteria in TIA/EIA-568-B.2.

C. Fiber-Optic Cable Tests:
1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Link End-to-End Attenuation Tests:
   a. Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
   b. Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 271301

SECTION 274133 - INTERACTIVE AUDIO VISUAL AND IPTV VIDEO ON DEMAND SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interactive Audio-Visual System.
   2. IPTV and Video on Demand System including all distribution head-end equipment, encoders, decoders, control components, media, software, etc.
   3. High Definition (HD) LCD monitors.
   4. Training Room Audio-Visual System.
   5. Interactive Display Panels.

1.2 SCOPE OF WORK

A. Furnishing of all labor, project management, materials, tools, equipment, and resources necessary for the complete installation of MediaMaster Video on Demand, IPTV, Digital Signage, and AV Control System as specified herein. The bidder shall be a factory authorized MediaMaster Integrator with technical expertise in audio visual display and control systems, unicast and multicast video distribution, and Ethernet networks. Dealers shall prove they have installed at least 5 replicate school systems of equal or greater magnitude in Georgia.

B. It is the intent of these specifications that the Manufacturer and or its' Authorized System Integrator expeditiously furnishes and installs a system complete in every respect and ready to operate. All miscellaneous items and accessories required for such installation, whether or not each such item or accessory as shown on the plans or mentioned in these specifications, shall be furnished and installed.

C. The Video on Demand, IPTV, Digital Signage, and AV Control System must provide the following features:
   1. HD Digital Video On Demand, IPTV Video Distribution, Digital Signage, & AV Control Headend.
   2. HD 1080p 60fps solid state encoders for sources with perpetual licenses.
   3. HD 1080p 60fps solid state decoders, perpetual licenses, HDMI, Component, Composite, VGA outputs.
   4. Networked AV Control System, providing Web based computer control plus administrative control of OLED, DVLED, LCD, and laser flat panel displays and projectors via Ethernet, RS232, with real time status verification & error correction.
   5. Network Certified Interactive Displays, flat panel display, and institutional grade mounting brackets.
   6. Two HD 1080p digital signage creation and multicast systems with remote status & management for administrators.
   7. An 8 channel HD DirecTV on Demand IPTV Multicast System, providing Web based computer control and dynamic channel selection by teachers.
   8. A 6 channel HD CATV on Demand IPTV Multicast System, providing Web based computer control and dynamic channel selection by teachers.
   9. Portable Rolling Tripod, 1080p Camera, and Multicast Encoder System
   10. Web Controlled Central Headend located in the MDF or designated space.
   11. Backboxes and conduits shall be provided by the electrical contractor. Coordinate exact location of all equipment with the Architect prior to installation of conduits and boxes.

D. A highly detailed CAD schematic shall be submitted by the IPTV, VOD, and AV Control Integrator or Manufacturer showing the headend, mini-headend, classroom, and TV ports required. A detailed spreadsheet shall also be submitted listing: every room receiving a IPTV, VOD, and AV component, TV make & model, projector make & model, port speed required, proposed static IP or DHCP, proposed Netmask, proposed Gateway, proposed multicast or unicast address.

E. Data ports configured for unicast and multicast video distribution shall be provided by the District. The ports and their requirements shall meet the requirements detailed via the IPTV, VOD, and AV Control Integrator's and or Manufacturer's submittal.

1.3 CONTRACTOR QUALIFICATIONS

A. Furnishing of all labor, project management, materials, tools, equipment, and resources necessary for the complete installation and modification of the instructional technology network as specified herein. The bidder shall demonstrate The Contractor shall show proof of a contractual relationship with the manufacturer, that they are the trained and certified agent of the product. Submit the original manufacturer's certification.

B. The Contractor shall currently maintain a locally run business for a minimum of five years and shall be an authorized distributor of the supplied equipment with full warranty privileges.

C. The Contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the equipment manufacturer to maintain and service the equipment being supplied.

D. All cabling, termination hardware, and connecting cords shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.

E. The Contractor will accept complete responsibility for the design, installation, certification, and support of the cabling system. The Contractor must show proof that Contractor has the certifying manufacturer's support on all of these issues.

F. All work shall be performed and supervised by AV vendors who are qualified to install AV systems and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.

G. The AV vendor employed shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed. Evidence that the Contractor is a current certified installer of the manufacturer must be provided in writing prior to work commencing on the structured cabling for the building.

H. Vendors providing equipment installation services shall use adequate numbers of skilled workmen who are certified by the component manufacturer, thoroughly trained and experienced with the necessary technology and systems, and completely familiar with the specified requirements and methods needed for proper performance of work. The system head-end installation, start-up and commissioning shall be by the manufacturer certified vendor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Submit in brochure from manufacturer’s latest product literature, specifications, installation instruction and other data required to demonstrate compliance of following products and systems with specified requirements:
   2. CATV amplifiers
   3. Multi-Taps
   4. MPEG Encoding Stations
   5. MPEG Encoder and Decoders
   6. Ethernet to Infrared Controllers
   7. DirecTV on Demand components
   8. Ethernet Controlled LCD Displays with decoders, Sound System and Mount
   9. Head-end equipment, including amplifiers, encoders, combiners, receivers, IR source control modules, equipment cabinets, shelves, UPS, etc.
   10. Extensive CATV & DirecTV channel lineup
   11. Finely detailed CAD headend schematic and cabinet configuration
   12. Finely detailed CAD mini-headend schematic and cabinet configuration

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. One Line Drawing: A one line drawing of the entire system including head-end configuration shall be included in the submittal
   3. Dimensioned plan and elevations of headend equipment.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

D. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.
   2. Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements.

1.5 QUALITY ASSURANCE

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

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. As a minimum standard of quality, these specifications are based on MediaMaster manufactured and supported by Educational Technology Resources Inc 631.589.4300 as distributed and supported by Cana Communications.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: System components shall be equipped and rated for the environments where installed.

1.7 COORDINATION

A. Coordinate size and location of raceway system, and provisions for electrical power to equipment of this Section.

B. Coordinate Work of this Section with requirements of cable and satellite television service provider.

C. Coordinate installation of curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 36 months' full maintenance by skilled employees of IPTV system Installer. Include quarterly adjusting as required for optimum system performance.

B. Service Calls: Provide 24 hours of service calls on system for each school after final acceptance to make any adjustments necessary to keep system at peak operating condition. Service calls performed as requested by Owner. Warranty work is not included in the service call time.

C. Service Contract – Equipment Supplier: Accredited by proposed equipment manufacturers and prepared to offer service contract for system maintenance on completion of guarantee period and provide names, locations, and size of 3 recent successful installations in area; 24 hours per day service, with 24 hour non-emergency service response time provided, and including 1 hour remote emergency call response time and 8 hour on site emergency call response time on 365-day-per-year, 24 hours per day basis.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide no fewer than one of each item listed below. Deliver extra materials to Owner.
   1. Display Decoder: Provide three; each type and rating.
   2. TV Monitor Decoder: Provide three; each type and rating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Specification: Media Master
   1. Approved equal by Educational Technology Resource and ETR.

2.2 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Provide a full time, on-line UPS system providing sine wave correction, voltage regulation, spike suppression, and a minimum of 20 minutes backup power. Standby UPS systems are not acceptable. The UPS shall provide full time protection for the MediaServer, Digital Video Server, Bulletin Board PC, DirecTV Receivers, CATV Receivers at a minimum.

B. The UPS must be capable of interfacing to the MediaServer, Digital Video Server, and Bulletin Board PC with an alarm function to enable an orderly shutdown prior to complete loss of power.

C. Provide rack mounted Lithium Ion UPS system as manufactured by APC or Liebert for Video system intelligent equipment.

2.3 MEDIA MENU CHANNEL

A. The independent Media Menu channel shall be continuously broadcast District wide via the video distribution system to provide teachers and students accurate information about video broadcasts. The scrolling menu channel is a NTSC representation of the most current video schedule.

B. The graphically based Media Menu channel shall be automatically produced by the MediaServer and shall not require human intervention.

C. The graphically based Media Menu channel shall be automatically produced by the MediaServer and shall not require human intervention.

D. A Media Menu channel icon shall appear on every client copy of MediaController Browser software. When the teacher selects the menu, channel bitmap the encoder switches to the appropriate stream.

E. The automatically produced menu channel shall be the factory installed MediaMaster MM-1020 MenuChannel software and hardware product as supplied by ETR, or pre-approved equal.

2.4 ADDRESSABLE MEDIA CONTROL MODULE (ACM) & MYCHANNEL

A. The ACM allows global control of multiple video playback source sites in an individual school, or as a district wide WAN Video-on-Demand system without adding or maintaining multiple servers. The ACM shall consist of, but not be limited to the following:
   1. The ACM shall have (8) eight Infrared output ports for controlling video playback devices such as VCRs, DVDs, LDPs, CATV STBs, DirecTV receivers, etc.

2. The ACM shall control infrared players and receivers via infrared emitter cables. Emitter cables shall be 10' long with 3.5mm mini jacks. Each emitter shall be affixed over each player's or receiver's IR receiver via self-adhesive tape, then covered with the included IR mask for additional protection and adhesion.
3. The ACM shall be locatable anywhere on the WAN/LAN. The ACM shall function as an Ethernet Network Interface Card (NIC) allowing local and remote control of infrared video playback sources. Each ACM shall have a unique IP address for identity on the network.
4. The communication protocol between the ACM and Video on Demand Server shall be TCP/IP.
5. The ACM shall have a standard 10BaseT connector for connectivity to the LAN/WAN. The 10BaseT connector shall have a Link status light and a Transmit Data light.
6. Each ACM shall have the inherent ability to learn IR control commands or accept downloaded command sets. Devices or systems that require a separate or master IR learner box or similar device are unacceptable.
7. The ACM shall have an RS-232 port which can be used for local control, local diagnostics, local IR learning, and local monitoring.
8. The ACM shall include graphical Windows based configuration and diagnostic utility software. Systems, which use character based configuration utilities, will be unacceptable.
9. The ACM microprocessor, real time clock and battery shall be self-contained on a 72 pin SIMM for quick and simple field servicing.
10. The ACM TCP/IP protocol stack shall support standard network diagnostic functions such as PING.
11. The ACM IP address shall be assigned from the MediaServer. Systems which use a dedicated device name, as an addressing scheme shall be unacceptable.

2.5 PORTABLE LOCAL ORIGINATION MULTICAST CART SYSTEMS

A. Interactive distance learning is a required teaching tool and an integral part of a curriculum. The ability to globally multicast media from any room in the district to all classrooms or selected groups of classrooms is equitable and required.

B. Multicasting from permanent and or temporary locations is essential. Broadcast components must be plug and play to allow "on the fly" multicasts. The ability for students to quickly configure a zone of TVs and or projectors to receive the broadcast is mandatory. All software and hardware shall be extremely user friendly to maximize broadcast opportunities.

C. The Owner also desires broadcasts to be viewed on every PC in the district. Thus, IPTV multicasting is deemed the most efficient and effective method of school wide or district wide distribution. The system Manufacturer and its Certified System Integrator shall coordinate installation of an MPEG capable media player on every PC the district wants to equip for viewing multicasts. Additionally, IGMP Snooping must be enabled on every Layer 2 or better network switch to permit multicasting without conflict to other data traffic.

D. Provide one local origination broadcast system as follows: camcorders with 37X optical zoom, integral microphone, external mic jack, quick release mount, fluid head, professional lightweight tripod, rolling dolly, mounting plate system with MPEG-2 encoder, 120V duplex receptacle, power supplies, 25' permanently attached power and data cables, and AV cables. System shall allow School to quickly "broadcast" any event as a DVD quality MPEG-2 multicast stream. Video frame rates from 1.5 to 7.5 Mbits/s shall stream from the encoder's Ethernet port to any data port in the district. The encoder shall be globally manageable via Web interface or locally via RS232 port and a laptop.

E. Each encoder stream shall be assigned a unique channel logo or bitmap from the database in MMAdministrator/Channels/New Channel. These stream bitmaps shall work in concert with MyChannel.

F. MMAdministrator/Zones shall allow broadcast personnel to quickly configure an All Page Zone or Specific Page Zones to receive broadcasts, by simply selecting TVs and projectors via checkboxes.

G. MediaController shall be used to view IPTV multicasts on PCs or MACs equipped with MPEG-2 players. Selecting the broadcast icon will trigger the player to open and decode the multicast stream.

H. Activation of a Video Page shall automatically disrupt all TV and projectors with tuner/decoders from current activities, deliver the broadcast, then restore the system to its original configuration following the Video Page.

I. Activation of a Video All-Page Broadcast shall initiate a Power On command to any TV or projector that is Powered Off, all video sources in use will Pause, and all TVs and projectors monitors will tune to the School's local origination broadcast channel automatically.

J. Upon completion (deactivation) of the Video All-Page, all TVs and projectors will resume their previous status and sources will stay in pause mode until the teacher or student is ready to resume its use.

K. All local origination broadcast equipment shall include all cables and appurtenances required for a turn key system.

L. The MPEG-2 standard definition portable camera cart systems shall be the MediaMaster MM-1581 Single Stream MPEG-2 Standard Definition Camera Cart as supplied by ETR, or pre-approved equal.

M. The video page zone configurator and TV/projector controller shall be the MediaMaster MM-1185 MM Administrator as supplied by ETR, or pre-approved equal.

N. The IPTV controller for PCs shall be the MediaMaster MM-1150 MediaController product as supplied by ETR, or pre-approved equal.

2.6 MY CHANNEL ON DEMAND SYSTEM FOR CATV

A. Manufacturer and or it's Certified Integrator shall be the District's liaison to coordinate free CATV service with a flat, unsloped, strong +25dB signal strength @ CH2 and +25 dB signal strength @ CH70. Maintain, extend, modify, and connect School's CATV system to serve the new IPTV & VOD headend. Provide shelves and mounting components in the headend cabinets, on the wall, and throughout the building as required. The IPTV & VOD headend is the preferred CATV demarcation location.

B. The local CATV service provider is to supply School a free concentration of educational channels in analog and digital formats and various frequency ranges. Manufacturer and the Owner will request 4 integrated receiver/decoders to allow 4 unique and simultaneous on demand CATV streams. Provide shelves and mounting components in the headend cabinets.

C. Provide MediaMaster one MM-1210 Addressable Control Module and four MediaMaster MM-1202 Infrared Emitters. The emitters shall be affixed to the IR receiver on the integrated receiver/decoders for on demand network control.

D. Provide all work, materials, grounding, and manner of placement in strict accordance with requirements of latest edition of National Electrical Code.

E. Provide all materials listed as complying with available standards of Underwriter's laboratories or other similarly established standards and carry their label. Apply all materials in strict accordance with Underwriter's laboratories listing.

F. CATV streaming may be expanded at any time by adding receivers, shelves, splitters, cabling, encoders, etc. Systems that require additional licenses or software fees for this expansion are not acceptable.

G. is enabled it shall be available at every TV & projector via decoder/display controller, and every computer with MPEG Player.

H. Channels must be streamed via SD or HD encoders on the LAN/WAN. Bit rate shall be selectable from 1.5 Bbps to 7.5Mbps. Manufacturer and or Integrator shall initially set encoders @ 4 Mbps. Streaming via the Web is not acceptable. Channel streams shall be viewable on computers with MPEG Players, and on projectors & TV with decoders.

I. System shall allow channels to be “pushed” to any or all TVs & projectors manually via MediaAdministrator/Zone Page, or automatically via prescheduled Playlist. When pushed TVs & Projectors shall Power On, switch input, adjust volume, decode and display required channel.

J. The complete CATV on demand system and all peripherals shall be the MediaMaster MyChannel CATV on Demand System product as supplied by ETR, or pre-approved equal.

2.7 ULTRA HIGH DEFINITION 4K LED BACKLIT LCD FLAT PANEL DISPLAYS

A. Supply and install 4K UHD flat panel displays, in locations shown on the plans and as directed by the Construction Manager. 4K Flat panel display sizes are as listed in the specs or as shown on the plans and shall include advanced features that include but are not limited to: 4K resolution, 50:000 dynamic contrast ratio, 178 degree viewing, RGB/PC input, NTSC & Clear QAM tuner, 3 x 4K HDMI inputs with HDCP Digital Content Protection System, high definition (HD) component video inputs, composite inputs, front firing speakers, built-in audio amplifiers, external speaker outputs, side mounted AV input panel, automatic signal enhancement, firmware modified for front panel lockout, 60,000 hour life expectancy, one year warranty, Energy Star Compliant, MediaMaster Network Certified for RS232 control and status.

B. Provide and install tilting wall bracket and mounting hardware by Peerless. Bracket shall feature security hardware to prevent TV removal without the use of proprietary tools. Supply 2 security hardware tools to School at the close of the project.

C. For every 4K UHD flat panel display provide and install one HD IPTV decoder/display controller, Ethernet to RS232 network control converter, bi-directional control & polling port, RJ45 to DB9 RS232 control cable, CAT6 patch cable, and mounting brackets.

D. The MediaServer shall lock out all front panel controls on TVs installed in public spaces and classrooms to avoid building occupants selecting streams or media other than what the Administration wants viewed. Systems and components without this lockout feature are not acceptable.

E. TVs in public spaces shall not allow local control, they shall strictly perform as directed by Media Playlist to achieve automated broadcasting results such as Bulletin Board messaging.

F. TV1: The 50” UHD 4K flat panel LED backlit LCD displays shall be the MediaMaster Network Certified LCDTV product as supplied by ETR, or equal by Sony, Samsung, or LG.
   1. The tilting wall bracket for the 50” LCDTV shall be the MediaMaster TWB Tilting Wall Bracket product as supplied by ETR, or Peerless equal.

G. TV2: The 75” UHD 4K flat panel LED backlit LCD displays shall be the MediaMaster Network Certified LCDTV product as supplied by ETR, or equal by Sony, Samsung, or LG. Install in Lobby, Cafeteria, and main Corridor areas.
   1. The tilting wall bracket for the 70” LCDTV shall be the MediaMaster TWB Tilting Wall Bracket product as supplied by ETR, or pre-approved equal.

H. The HD IPTV stream decoder/display controller shall be the MM-1276 HD Decoder/Display Controller product as supplied by ETR, or pre-approved equal.

I. The low voltage cabling contractor shall provide one CAT6A Ethernet cable per TV/computer monitor location to serve the networking requirements of each TV/computer monitor. The electrical contractor shall provide 500 watts of filtered 120V power and a duplex receptacle to serve each TV/computer monitor power cord, and IPTV decoder power supply.

J. Provide and install MediaMaster Series MediaCable system to extend the rear input panel of the LCD display monitor to a wall jack adjacent to the front of room teacher workstation. The wall jack panel shall include a HDMI connector and USB connector. The cable system shall include a trunk cable and HDMI adapters. Provide MediaMaster MM-1400 Series MediaCable system as supplied by ETR, or pre-approved equal.

2.8 INTERACTIVE DISPLAY PANELS

A. Provide Interactive Display Panel in all Conference Rooms.

B. Interactive Display Panel and associated components, mounts, and accessories shall be as follows:
   1. Interactive Display Panel (75”, 6000K): Cleartouch CTI-6075K+UH20 with extended total five (5) year warranty, CTI-EXWTY-6075-2Y.
   2. PC Module: Intel i5 6-Core, 8GB DDR4, 256GB SSD, Ultra HD, Windows 11 OS with all licensing, Cleartouch CTI-PCMOD-PC55-ST.
   3. Web Camera: High Definition 2.07 MP / USB 2.0 / 83 deg. FOV, Cleartouch CTS-WC110-UHHD.
   4. Wireless Keyboard and Mouse for PC Module: Cleartouch wireless keyboard and mouse.
   5. Fixed Mobile Stand: Curve-Shaped Open Base with manual height adjustment & cable management, Cleartouch CTI-STAND-FIXM-V3. Provide for all instructional units. Interactive Display Panels in Conference Rooms shall be wall mounted.

C. Provide, assemble, and mount one fixed mobile stand per Interactive Display Panel. Fixed mobile stand shall include all mounting brackets for the Interactive Display Panel, computer, and MM-1275TT IPTV tuner/decoder, and security hardware.

D. For every Interactive Display Panel provide and install one HD IPTV decoder/display controller, Ethernet to RS232 network control converter, bi-directional control & polling port, RJ45 to DB9 RS232 control cable, CAT6e patch cable, and mounting brackets.

E. Provide and install MediaMaster MM-1400 Series MediaCable system to extend the rear input panel of the Interactive Display Panel to a wall jack adjacent to the front of room teacher workstation. The wall jack panel shall include USB-C femail, and a HDMI connector. The cable system shall include a DIN14 trunk cable and HD15/3.5mm & HDMI adapters. Provide MediaMaster MM-1400 Series MediaCable system as supplied by ETR, or equal by Rapid Run.

F. Provide Bogen self-amplified drop-in ceiling speakers (Bogen ACD2X2) in White finish with power supply or equal by JBL, Quam, Atlas, and Extron audio ceiling speakers, cabling, Audio Gear or equal by Extron audio amplification as detailed on the Contract Drawing detail “Typical Classroom Multimedia Equipment and Installation Diagram.” Provide Extron MPA 152 audio amplifier with priority page controller. The audio ceiling speakers shall be rated for the coverage in the area shown.

G. The dual amplified ceiling speaker system shall be the ACD2X2 with PRS2403 power supply products by Bogen Communications Inc, or equal by JBL and Quam.

H. The high-definition multicast decoder/projector controller shall be the MediaMaster MM-1276 High Definition IPTV Decoder product as supplied by ETR.

I. The low voltage cabling contractor shall provide one CAT6A Ethernet cable per location to serve the networking requirements.

J. Coordinate all work and locations of all outlets with the Owner and Architect. In addition, the Contractor under this specification section shall provide all floor, fire partition, ceiling, or other rated structure penetrations, sized as required, and including all fire proofing of such penetrations to maintain structure rated integrity and all conduit required. Comply with the requirements of Division 07.

2.9 VIDEO PRODUCTS

A. Video Projector in Training Room area: Provide minimum 10,000 lumen large venue projector to project on a 200” diagonal screen. The projector shall be by Epson, EB-PU2010W WUXGA 3LCD, Laser Projector with 4K Enhancement and with appropriate lens. Equals by Panasonic and Sony are acceptable.

2.10 IN-WALL AUDIO VISUAL CONTROLLER

A. Provide and install in-wall audio visual controller by Extron, model MLC 104 IP Plus in white color. The controller shall have Ethernet monitoring and control, bidirectional RS-232 port, three digital I/O ports, dedicated IR port, and support for Infrared Control Modules.

B. The buttons shall be labeled to identify the sources.

C. Provide connectivity and power cabling with programming per the Owner's instructions.

2.11 MULTIMEDIA PRODUCTS

A. CAT-5 to USB Extenders
   1. Extension over Category 5 UTP cable to up to 50'
   2. Provide USB to Cat 5 extender at both ends and all associated cables and connectivity.
   3. USB extender in the wall shall be wall plate device type.

2.12 MULTIMEDIA PRODUCTS

A. CAT-5 to USB Extenders
   1. Extension over Category 5 UTP cable to up to 50'
   2. Provide USB to Cat 5 extender at both ends and all associated cables and connectivity.
   3. USB extender in the wall shall be wall plate device type.

2.13 TRAINING ROOM AUDIO-VISUAL SYSTEM

A. Training Room Video Switcher / Control System
   1. The switcher shall support 4K signals.
   2. The switcher shall support EDID capture, HDC, and pass 3D signals.
   3. The switches shall serve as the control system for the room.
   4. There shall be an adequate number of HDBaseT (DM) type transports for longer I/O runs.
   5. Acceptable manufacturer:
      a. Crestron (P/O DMPS3-4K-350C)
      b. AMX
      c. Extron

B. Audio Speakers- Ceiling Mount
   1. Ceiling speakers to be flush mount and have plenum back-cans.
   2. Speakers to be 70V with easy access to wattage tap selector switch.
   3. Speakers to have nominal pattern coverage of 110°.
   4. Speaker shall have continuous program power rating of 75W.
   5. Acceptable manufacturers:
      a. Atlas (FAP62T)
      b. JBL (Control 16C-VA)
      c. Tannoy

C. Audio Power Amplifiers
   1. Amplifiers shall have either a barrier strip or XLR connector for their balanced input connections.
   2. Amplifier to have 70V output
   3. Amplifier shall have minimum of 100W
   4. Shall have no greater than 1% THD at 1 KHz at maximum power
   5. Acceptable manufacturers:
      a. Crestron
      b. Extron

D. Control System – Processors
   1. The control processor shall include the necessary power supply.
   2. The processor shall have Ethernet LAN connections as well as an Ethernet Control Subnet connections.
   3. The control processor shall have these available I/O options:
      a. (8) Relay contact closures
      b. (8) Digital I/O connections
      c. (8) IR / Serial outputs
      d. (1) RS-232/422 bi-directional output

e. (2) RS-232 Bi-directional
f. (1) USB connection
g. (1) Cresnet connection

3. Acceptable manufacturer
   a. Crestron
   b. AMX

E. Wired Touch Panels
1. Refer to drawings to verify the location, size, and type of touch panel. Provide minimum one touch panel in each Meeting Room space.
2. Display type shall be a TFT active matrix color LCD, 5-point multi-touch
3. Provide necessary mounting hardware/box for wall mounted touch panels.
4. Provide a PoE connection for power for wall mounted touch panels
5. Acceptable manufacturers:
   a. Crestron (TSW-560 or latest model)
   b. AMX

F. Miscellaneous Control System Devices
1. Provide remote sensor at moveable wall to activate control system for 2 rooms or 1 large 1 room.
   a. Acceptable model
      1) Crestron GLS-PART-CN
2. Provide 5 port PoE network switch.
   a. Acceptable manufacturer
      1) Crestron
      2) Meraki
      3) CISCO (SG300 or latest model)

G. Equipment Racks
1. Refer to drawings for location of equipment racks. Provide an equipment rack for each space as shown.
2. Provide rack panel blanks and vents to best fill in unused rack spaces.
3. Freestanding and Wall racks shall provide standard l9”W space to mount equipment.
4. The number of rack units shall be enough to house all equipment based on the system design. Population of rack to be 75%-80% with the remainder open for future growth.
5. Where rear access is not possible to rack, provide a sliding and swiveling rack instead.
6. Acceptable Manufacturers:
   a. Middle Atlantic CWR-26-17PD with Lowell Power Sequencer RPC-4
   b. Lowell Manufacturing
   c. Atlas
   d. Chatsworth Products (CPI)

2.14 MISCELLANEOUS PRODUCTS

A. Provide and install Audio Visual wall mounted metal device plate in satin finish.

B. Provide and install all Audio-Visual runner cables.

C. Audio Visual Flying Lead

D. Line Level Audio and Microphone Cable, Plenum Rated: Plenum rated line and microphone level audio cable.
1. Type: Shielded, twisted pair.
2. Conductors: Minimum 22 AWG, stranded conductors and 24 AWG drain wire with overall jacket.
3. NEC Rating: CMP.
4. Acceptable: Extron cable, or West Penn 25291 or comparable by Belden.

E. Speaker Cable, Distributed, Plenum Rated: Plenum speaker cable for Classroom Ceiling Speakers.
   1. Type: Unshielded, twisted pair.
   2. Conductors: 16A WG stranded conductors.
   3. NEC Rating: CMP.
   4. Acceptable: West Penn 25225 or comparable by Belden or Extron.

F. Control Cable, Plenum Rated: For use in control system wiring applications requiring a plenum rating.
   1. For Serial Communication:
      a. Type: One (serial or RS-232), two (RS-422) or three (where handshaking is required) twisted pairs with overall shield and jacket.
      b. Conductors: Minimum 24A WG stranded conductors and 26A WG stranded drain wire.
      c. NEC Rating: CMP.
      d. Acceptable: Extron, West Penn or comparable by Belden.

G. DC Power Cable, Plenum Rated: For DC power wiring requiring plenum rating.
   1. Type: Unshielded, twisted pair.
   2. Conductors: Minimum 8 AWG stranded conductors.
   3. NEC Rating: CMP.

H. Acceptable: West Penn Wire 25224 or comparable by Belden or Gepco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Notify local cable service provider regarding project requirements and schedule. Ensure that cable service provider completes their portion of Work in timely manner to not interfere with project schedule or other trades. A flat signal of +25dB @ CH2 through +25dB @ CH70 shall be requested.

B. All cables originating from outside building grounded at nearest point of entry per NEC.

C. Extend or relocate incoming CATV service to connect to head end rack.

D. Seal all penetrations per electrical wiring methods specified for this Project.

E. All vertical cable runs installed in concealed conduit/raceways.

F. Install all horizontal cable runs above finished ceiling. Install cables with not more than 2-inches sag between supports. Support all cables and tie at maximum of 6 ft. centers within metal bridle rings, metal cable tie mounts or within bar joist.

G. Make any bends in cable in 90-degree increments while maintaining less than minimum cable bend radius. All cable routes parallel or perpendicular to building lines and installed to prevent any cable from crossing or wrapping around bundle. Service loops or excessive slack not allowed. Provide for neat tangle-free cable route.

H. Equipment cabinet(s) anchored to wall or floor utilizing an approved method.

I. All head-end equipment securely installed within equipment cabinet(s) by screws, bolts, nuts, etc. or by method approved by Engineer. All holes intended for equipment mounting used for securing equipment to rack. Provide all exposed hardware in same color and type, preferably matching cabinet finish (i.e. black cabinet-black rack screws).

J. All cabling entering video equipment cabinet(s) installed in conduit or raceway. All cabling within cabinet neatly bundled and secured with tie wraps to cabinet. Avoid cable strain on connectors/terminations. Do not use point of connection to serve as support for cable bundle.

K. All rack ground bars grounded to equipment ground bus, in nearest power panel, utilizing 6 AWG THHN. Ground wire concealed in metallic conduit containing no other power conductors. Ground rack-to-rack ground bar by NEC approved method.

L. After installation of wiring and equipment has been completed, test all cabling to ensure continuity, freedom from grounds (except "made" grounds and those required for protection), and insulation resistance, in accordance with "underwriter's requirements and electrical regulations. Furnish and use suitable instruments such as ammeters, voltmeters, meggers, etc.

M. Prior to final acceptance, provide accurate documentation listing all equipment installed under this Section, including following information: equipment description, equipment part number, equipment serial number, manufacturer's warranty period, suggested retail cost and location of equipment. Any information found to be inaccurate during one-year warranty period requires Contractor to physically re-verify all equipment information at no additional cost to Owner. Complete re-verifications within 1 week after notification of any discrepancy. Submit copy of all documentation.

N. For every piece of equipment installed under this Section, deliver, in one delivery, associated manufacturer's manuals in addition to maintenance manuals specified in other Sections of Project Manual. Obtain signed receipt from Owner's representative and submit two copies to Engineer.

O. Test every outlet in system as specified below.

P. Provide installation and startup of all systems under direct supervision of local agency regularly engaged on installation, repair, and maintenance of such systems.

3.2 FIELD QUALITY CONTROL

A. Testing by Prime Contractor:
   1. Test every television and projector for signal level, clear picture and remote origination/control (as applicable).
   2. Test all head-end equipment for proper frequency, audio/video carrier levels, and RF level outputs. Adjust all levels per manufacturer's recommendations.
   3. Perform all testing required for each building during same day.
   4. Perform tests to all systems under direct supervision of manufacturer's representatives or accredited agencies for all specified equipment and services.
   5. Submit all test results in tabular format with reference to or backed up by equipment/riser diagram that accurately represents installed system.
   6. Submit written test report from authorized representative of equipment manufacturer stating that system has been tested and is in working order prior to final inspection by Engineer.
   7. Engineer and/or Owner's representative reserves right to observe testing.

3.3 TRAINING

A. Owner's Training: Provide minimum 24 hours of training for Owner's personnel per building (48 total hours) used at Owner's sole discretion and scheduled by Owner to fit Owner's needs.

B. Training scheduled by Owner in blocks of 4-8 hours.

C. Begin training after Engineer deems system physically complete and fully operation. Service time not deemed as training.

D. Include following minimum content in training:
   1. General systems overview describing sub-systems and their relationships with each other.
   2. Specifics on sub-systems and how to maintain them to ensure reliable operations.
   3. Operation of equipment to perform intended tasks, including (but not limited to) remote origination, camera operation, television operation, cable patching, fuse replacement and so forth.
   4. Provide written documentation for all training attendees to supplement training (i.e. diagrams, training outlines/highlights, etc.). Revise number of training hours in paragraph below to suit Project. Coordinate with Division 1 Sections.

END OF SECTION 274133

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Basic electrical requirements, which are specifically applicable to all Division 28 Sections, in addition to the requirements of Division 1 - General Requirements.

1.2 SUBMITTALS

A. Provide submittals in accordance with Section 01330 - Submittal Procedures.

B. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

C. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

D. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

E. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

F. Data not submitted shall have a statement explaining why the data was not submitted.

G. Submittals not conforming to any of the above requirements shall be rejected.

H. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:
   1. Section 281300 – Security Access
      a. Product Data
      b. Shop Drawings
      c. Equipment List
      d. Field Quality Control Test Reports
      e. Warranty
   2. Section 282300 - Video Surveillance
      a. Product Data
      b. Shop Drawings
      c. Equipment List
      d. Field Quality Control Test Reports
      e. Warranty
   3. Section 283110 - Fire Alarm System
      a. Product Data
      b. Shop Drawings
      c. Qualification Data
      d. Field Quality Control Test Reports
      e. Submittals to Authority having jurisdiction.
      f. Documentation

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Only manufacturers listed in specifications or addendums will be considered.

K. Review, corrections, or comments made on the submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addendums (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

L. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the submittal review.
   1. RNE - Reviewed, No Exceptions Noted
      a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
      b. No corrective action required at this time.
   2. FNC - Furnish with Noted Corrections
      a. Indicates the contractor shall insure that all necessary or noted corrections are incorporated into equipment furnished to the project.
      b. Contractor shall incorporate items requested in review comments, but re-submittal not required.
   3. RES - Revise and Resubmit
      a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
      b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.
   4. PSD - Provide Submittal Data
      a. Indicates submittal data was not provided for this item or section.
      b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

M. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All sleeves must be precast in concrete or concrete block and accordingly provided to the mason in a timely manner. Accordingly, all items such as these shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractor’s failure to submit or order such materials sufficiently in advance of the work. See Architectural specification section for additional requirements for submittals.

1.3 REGULATORY REQUIREMENTS

A. All work installed under Division 28 shall conform to the current adopted Edition of Building/Electrical Codes and their appropriate amendments:
   1. NFPA 70 2023 National Electrical Code
   2. Life Safety Code, NFPA 101
   3. Requirements of the State of Georgia Fire Marshall's Office.
   4. GA State Energy Code.
   5. Standard Building Code
   6. Standard Mechanical Code (Georgia Edition)
   7. Standard for Health Care Facilities, NFPA 99

8. National Fire Alarm Code NFPA 72
9. Standard for Emergency and Standby Power Systems NFPA110
10. Standard for Lightning Protection System NFPA 780
11. City of McDonough and Henry County Codes

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein.

D. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.4 CONTRACTOR GUARANTEE

A. All equipment and materials furnished and all work performed under these specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after Architect's Final Certificate. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.5 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Three bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binders shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

B. Operating and maintenance manuals shall also comply with Division 1 Section “Operation and Maintenance Data.

1.6 PROJECT/SITE CONDITIONS

A. Install work in locations shown on Drawings, unless prevented by project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

D. Electrical items are shown on drawings in approximate locations unless dimensioned. Install at location required to serve intended purpose. Include installation within ten (10) feet of location shown.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 28 Contractor shall have coordination meetings with all other Contractors to ensure that all systems installed in "share areas" (e.g. ceiling plenums, mechanical rooms, etc.) are coordinated and installed to insure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than six-week fabrication schedules. See other sections for additional requirements.

1.8 ACCEPTABLE PRODUCTS

A. Where a manufacturer has been listed as being acceptable in the various specification sections hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of his standard product. His product shall still comply with all of the requirements and standards of this specification and not necessarily his standard specification, to the extent that it might require special manufacture to meet the requirement and standards of this specification.

B. Prior Approval: Substitutions of specified items and prior approvals of other manufacturers will not be considered.

C. Addenda: If the substitution is allowed, such approval will be set forth in an Addendum.

D. Costs: All costs incurred by the acceptance of substitutions shall be borne by the contractor.

1.9 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.10 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match.

C. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.11 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.12 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers, and shall use these numbers wherever required. (For example, room numbers are used in programming of fire alarm systems and intercom system, and shall match the Owner's final choice.)

END OF SECTION 280500

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 281300 - SECURITY ACCESS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes a security access system consisting of a Central Network Station, one networked workstation computer, operating system and application software, and field-installed Controllers connected by a high-speed electronic data transmission network. The security access system shall have the following:

1. Access Control:
   a. Regulating access through doors.
   b. Visitor assignment.
   c. Time and attendance.
   d. Surge and tamper protection.
   e. Secondary alarm annunciator.
   f. Credential cards and readers.
   g. Push-button switches.
   h. Credential creation and credential holder database and management.
   i. Monitoring of field-installed devices.
   j. Reporting.
2. Security:
   a. Video and camera control.
   b. Interface with Video Surveillance system.

1.2 DEFINITIONS

A. ABA Track: Magnetic stripe that is encoded on track 2, at 75-bpi density in binary-coded decimal format; for example, 5-bit, 16-character set.

B. CCTV: Closed-circuit television.

C. Central Monitoring Station: A PC with software designated as the main controlling PC of the security access system and Video Surveillance system. Where this term is presented with initial capital letters, this definition applies.

D. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.

E. CPU: Central processing unit.

F. Credential: Data assigned to an entity and used to identify that entity.

G. dpi: Dots per inch.

H. File Server: A PC in a network that stores the programs and data files shared by users.

I. GFI: Ground fault interrupter.

J. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

K. I/O: Input/Output.

L. LAN: Local area network.

M. LED: Light-emitting diode.

N. PC: Personal computer. This acronym applies to the Central Station, workstations, and file servers.

O. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.

P. RF: Radio frequency.

Q. ROM: Read-only memory. ROM data are maintained through losses of power.

R. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

S. TWAIN: (Technology without an Interesting Name.) A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

T. UPS: Uninterruptible power supply.

U. WAN: Wide area network.

V. WAV: The digital audio format used in Microsoft Windows.

W. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

X. Windows: Operating system by Microsoft Corporation.

Y. Workstation: A PC with software that is configured for specific limited security system functions.

Z. WYSIWYG: (What You See Is What You Get.) Text and graphics appear on the screen the same as they will print.

1.3 SYSTEM DESCRIPTION

A. The S2 NetBox™ / Enterprise Security Management System shall be implemented through network appliance architecture with a three-tiered modular hardware hierarchy and embedded three-tier software architecture.

1. The network appliance shall be capable of running on an TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.
2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.
3. Security of the data communicated over the network to and from the browser, Network Controller, and nodes shall be protected by encryption (SSL 128-bit) and authentication (SHA-1).
4. The top hardware tier shall be the Network Controller. Embedded on the Network Controller shall be an operating system, a web server, security application software, and the database of personnel and system activity.
5. The middle hardware tier shall be the Network Node. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application blades connected to the system’s inputs, outputs, and readers. This modular design shall make it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs shall be automatically re-integrated.
6. The bottom hardware tier is the Application Blades. Four unique Application blades shall be available:
    a. Access Control Blade: shall support two readers, four supervised inputs, and four relay outputs.
    b. Alarm Input Blade: shall support eight supervised inputs.
    c. Relay Output Blade: shall support eight relay outputs.
    d. Temperature Blade: shall support eight analog temperature sensor inputs.

B. The S2 system shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.
   1. The database tier shall use PostgreSQL. This shall provide a small footprint, low administration, and high reliability relational database that is embedded without requiring the use of a separate PC server.
   2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.
   3. The web browser shall provide UL 1076 compliant browser-based monitoring and incorporate asynchronous Javascript™ and XML technology (AJAX) for a faster user experience.
   4. The security application software tier shall contain the business logic. This application shall also be embedded on the network device and requires no additional memory or processing power.
   5. This three-tiered embedded software design shall run within an embedded Linux operating system and shall require no client-side software other than a web browser.

C. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

D. All S2 systems and components shall have been thoroughly tested and proven in actual use.

1.4 OVERALL SYSTEM CAPABILITY

A. The S2 Security Management System shall meet the requirements of educational facility access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring, communications loss monitoring, and temperature monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

B. Widget Desktop: The S2 system shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop. Each widget shall provide easy access to a frequently used function—allowing users to, for example, view an activity log, a camera view, or real-time web content. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which widgets are available in a layout and the extent to which users can customize the layout.

C. The S2 system shall provide the following Access Control capabilities:
   1. Integrated photo ID creation capability with video verification.
   2. User interface secured access under encrypted password control.
   3. Region occupancy counting and control.
   4. "First-in-unlock" rule enforcement.
   5. Multiple access levels and cards per person.
   6. 128-bit card support for Weigand card readers.
   7. Detailed time specifications.
   8. Simultaneous support for multiple card data formats.
   9. Elevator control.
   10. Access privileges variable by threat level.
   11. Scheduled portal unlock by time and threat level.
   12. Card format decoder quickly discovers unknown card formats.
   13. Card enrollment by reader or keyboard.

14. Compatibility with various input devices, including biometric readers.
15. Activation/expiration date/time by person with one minute resolution.
16. Access level disable for immediate lockdown.
17. Use of Threat Levels to alter security system behavior globally.
18. Multiple holiday schedules.
19. Timed unlock schedules.
20. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.
21. Card enrollment reader support.
22. Counted-use access control.
23. Dual-reader portal support.
24. Wiegand Reader support.
25. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.
26. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
27. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.
28. Integration with supported alarm panels.
29. Optional storage and recall of ID photos and personal/emergency data.
30. Up to 60,000 person records.

D. The S2 system shall provide the following Monitoring capabilities:
1. Common alarm panel integration for disarm on access, and arm on egress.
2. Integrated alarm monitoring and event management with alarm panels.
3. Support for the direct viewing of IP cameras.
4. Integrated real-time IP, and NVR systems with stored video replay for events.
5. Provides alarms on video loss, video motion detection, and video restore events.
6. Virtual inputs for video loss and building-occupancy-limits-exceeded.
7. Provides alarms on communication loss and temperature variation.
8. Support for the creation of custom sets of alarm event actions.
9. Provides the ability to record video and link to video for alarm events.
10. Available video control and playback through the S2 System user interface.
11. Provides the ability to assign threat levels to various alarms according to severity.
12. Provides the ability to select up to 20 levels of priority for event actions.
13. Support for electronic supervision of alarm inputs.
14. Support for the use of output relays for enabling circuits under alarm event control.
15. A monitoring desktop that integrates video, system activity logs, floor plans, ID photos, and alarm notifications.
16. Support for the creation of unlimited customized monitoring layouts through the use of widgets.
17. Graphic floor plans with active icons of security system resources.
18. System user permissions to grant whole or partial access to system resources, commands, and personal data.
19. Secure access to the user interface under encrypted password control
20. Delivery of alerts via browsers, email, and text messages.

E. The S2 system shall provide the following Video Management capabilities:
1. Real-time video monitoring displays, including unlimited cameras simultaneously.
2. Playback of event-related video.
3. Video switching and video widget pop-ups based on access activity or event activation.
4. Integrated alarm inputs from the video management system.
5. Digital playback of video events.
6. Linking of video and events based on triggers provided by the S2 system or video system.
7. Support for multiple NVR systems.
8. Multiple pre-programmed supported cameras.
9. Recall of photo ID and real-time image for comparison.

10. Monitoring and control through a web browser interface.
11. System user permissions to grant whole or partial access to system cameras and video resources.

F. The S2 system shall provide the following Security Database capabilities:
1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
2. Built-in Open Database Connectivity (ODBC) compliant database for personal data.
3. LDAP integration for single-user logon authentication.
4. Up to 60,000 person records.
5. Network-secure API for external application integration.
6. Extensive and easy to use custom report generator.
7. User-defined data fields in personnel records.
8. Record recall by vehicle tag, name, or card.
9. ODBC compliant Database.
10. An API for adding to, deleting from, and modifying the database.
11. Storage of system user passwords and permissions.
12. Storage and recall of ID photos and emergency personal information.
13. Pre-defined reports on system configuration, system activity history, and people.
14. English-based query language for instant custom reports.
15. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third-party software (such as Crystal Reports) shall be necessary.
16. Periodic backup to on-board flash ROM and optional network attached storage (NAS), including FTP servers.
17. Periodic archive creation for historical custom reporting and improved on-board database performance.
18. Email and text messaging (SMS) alert notifications.

1.5 HARDWARE REQUIREMENTS

A. The S2 Security Management System shall employ a modular hardware concept that enables simple system expansion and utilizes a three-tiered hardware hierarchy:
1. At the top tier is the Network Controller, which shall contain the database engine, web server, application software, and configuration data. It is at this level that System Users, through a browser interface, shall interact with the S2 system, set configurations, monitor activities, run reports, and manage alarms.
2. At the second tier is the Network Node, an intelligent device with native TCP/IP support, which shall make and manage access control decisions.
3. At the third tier are the application extension blades. Each of these blades shall connect to and manage a set of inputs, outputs, readers, cameras, or temperature monitoring points.
4. The network device shall run on building’s TCP/IP networks and shall be configurable for access from separate subnets, through gateways and routers, and from the Internet. A MicroNode shall also be available that combines an Access Control blade and Network Node.

B. The Network Node shall contain the operating system, database engine, web server, application software, and configuration data.

C. A solid-state Network Node shall consist of a blade-style, circuit card that also combines a Network Node on the card. The Network Controller portion of the card shall contain a processor, flash memory, and a network switch. The Network Node shall be supplied with 12V DC at a minimum of 3 amps. Internal battery backup shall supply sufficient power to provide for an orderly shutdown of the system in case of loss of external power. External battery backup shall be used to provide uninterrupted operation in the event of external power loss. The Network Node portion shall contain a serial port for communication with the Application blades and a network interface port.

D. The S2 NetBox™ Extreme Network Controller shall be rack-mount enclosure. It shall contain a motherboard with an Intel® Atom™ processor and solid-state disk drive. An Ethernet connector shall be provided for network connection.

E. The S2 Enterprise Ultra Network Controller shall consist of a rack-mounted controller with additional processing power and memory, RAID-1 disk drive array, serial port and network connections.

F. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application blades connected to the system's inputs, outputs, and readers. The Node shall be supplied with 12V DC at a minimum of 3 amps. The Node blade shall supply all Application blades in the node with power. The Network Node shall be available in three configurations: a combined Network Controller/Network Node blade; a standalone Network Node blade, and a MicroNode with included Access Control blade. Each Network Node shall support up to seven Application blades except for the MicroNodes. Communications between the node and Network Controller shall be encrypted and authenticated (SHA-1).

G. The Application blades shall interface with the Network Node. The Application blades shall be blade-style circuit cards. There shall be four types of Application blades:
   1. Access Control blade: shall support 2 readers (input devices such as keypads, RFID devices or Biometric readers), 4 supervised inputs and 4 relay outputs.
   2. Supervised Input blade: shall support 8 supervised inputs. Supervised input connectors are 2-pin. The system shall support a wide variety of input supervision types including normally-open circuit and normally-closed circuits, and zero, one or two resistor configurations.
   3. Relay Output blade: shall support 8 relay outputs. Relay output connectors are 3-pin. Both normally-open circuit and normally-closed circuit output devices are supported. The relay outputs shall support any output devices that operate on the following maximum electrical ratings: 30 Volts DC or AC, 2.5 Amps inductive or 5.0 Amps non-inductive.
   4. Temperature blade: shall support 8 analog temperature sensor inputs. Temperature range shall be 32° to 158° F (0° to 70° C). Temperature precision within that range shall be ±1.0° F (±0.5° C).

H. The MicroNode shall combine a Network Node and an Application blade capability in one enclosure. The Access Control blade portion of the MicroNode shall support two readers, one temperature input, four supervised inputs and four relay outputs. A MicroNode shall utilize Power over Ethernet (PoE) at the 802.3AF standard and be capable of supplying direct power to 2 readers, 2 motion REXs, and 2 door strikes.

1.6 HARDWARE PACKAGING REQUIREMENTS

A. The S2 NetBox™ /Enterprise Security Management System shall have various hardware enclosures and configurations available to support different installation requirements.

B. The S2 4U Rack-Mount enclosure shall support one standalone Network Node blade and seven Application blades.

C. The S2 MicroNode enclosure shall support a solid-state Node, its Access Control blade, and one temperature point.
   1. It shall be a wall-mount enclosure with dimensions of 7" (178 mm) H x 7" (178 mm) W x 3.5" (89 mm) D.
   2. It shall be possible to power the MicroNode with a PoE that conforms to the IEEE 802.3af standard. This provides nominal 48VDC at a maximum of 400mA.
   3. Provide power supply rated for 120V AC at 60Hz input with each MicroNode.

D. The solid-state Network Node shall be powered by 100-240V AC at 50-60 Hz. Power must come from a separate circuit with an isolated earth ground. Provide backup power supply to the S2 system with an Uninterruptible Power Supply (UPS).

1.7 VIDEO MANAGEMENT INTEGRATION

A. General: The S2 NetBox™ Security Management System shall support the integration of Digital Video Recorders (DVR) supporting analog video cameras and Network Video Recorders (NVR). This integration shall allow the viewing of live streaming video in the browser interface and recorded video playback. Viewing live streaming video shall require the Java™ 2 Runtime Environment version 1.4.2 or version 5.0.
   1. Events in the alarm subsystem can initiate video recording. Video motion detection, camera up and camera down messages from the VMS can initiate alarms.
   2. It shall be possible to monitor NVR cameras in the same views as IP cameras. VMS events shall be logged in the system activity log. It shall be possible to view recorded video of events from the Activity Log.

1.8 API INTEGRATION

A. An application programming interface (API) is provided for the S2 NetBox™ Security Management system. The API provides programmatic access to the network-connected components managed by the S2 system.
   1. Communication between the S2 system and another application takes place through the TCP/IP networking protocol. The API is invoked by POSTing an HTTP message to the web server on the S2 Network Controller.
   2. The S2 database includes a table of “people” whose records act as container objects for attributes attached to people in real life. People are mapped to access levels, which specify access privileges—and to access cards, whose credentials are used for access control.
   3. Access levels are entered into the system using the normal web user interface for the S2 system. People and credentials may be entered into the system either through the web user interface or through the API.
   4. The API supports commands for:
      a. Adding, modifying, removing, and retrieving data about a person, and retrieving information about one or more people based on various search criteria.
      b. Adding, modifying, and removing credentials, and retrieving a list of the names of defined card formats.
      c. Adding, modifying, and deleting access levels, and retrieving a list of the valid access levels in the system.
      d. Pinging the S2 system to determine its health, and retrieving the current version of the API from the server.
      e. Retrieving a history of access activity, either for all users or for a particular access card.
      f. Adding, modifying, and removing threat levels and threat level groups, and setting the threat level in the system.
      g. Retrieving a list of portals and associated card readers defined for the S2 system.
      h. Adding, modifying, deleting, and retrieving time specifications and time specification groups.

i. Adding, modifying, and deleting holidays, and returning a list of holiday keys or a specific holiday.
j. Adding, modifying, deleting readers and reader groups, and returning a list of reader group keys or information for a specific reader group.
k. Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.

1.9 COORDINATION

A. Door Hardware Interface: Coordinate with Division 8 Sections that specify door hardware required to be monitored or controlled by the security access system. The Controllers in this Section shall have electrical characteristics that match the signal and power requirements of door hardware. Integrate door hardware specified in Division 8 Sections to function with the controls, software and hardware in this Section.

1.10 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories. Reference each product to a location on Drawings.

B. Shop Drawings:
1. Wiring Diagrams. Show typical wiring schematics including the following:
a. Workstation outlets, jacks, and jack assemblies.
b. Patch cords.
c. Patch panels.
2. Cable Administration Drawings: As specified in Part 3 "Identification" Article.
3. Battery and charger calculations for Central Station, workstations, and Controllers.

C. Project planning documents as specified in Part 3.

D. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals.
1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
2. System installation and setup guides, with data forms to plan and record options and setup decisions.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be S2 Access Control certified as a company, no exceptions.

B. Acceptable Prequalified Installers:
1. AdaptToSolve Inc., LaGrange, GA.
2. NetPlanner Systems, Atlanta, GA.
3. Wachter, Inc., Suwanee, GA.
4. Place Service Inc., Canton, GA.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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

E. Comply with NFPA 70, "National Electrical Code."

F. Comply with SIA DC-03.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Controllers:
1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.
2. Open each container; verify contents against packing list, and file copy of packing list, complete with container identification for inclusion in operation and maintenance data.
3. Mark packing list with designations that have been assigned to materials and equipment for recording in the system labeling schedules that are generated by cable and asset management system specified in Part 2.
4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.13 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Access Control Blades: Quantity one (1).
2. Relay Output Blades: Quantity one (1).
3. Card Readers: Quantity three (3).
4. Door Status Monitoring Contacts: Quantity three (3).
5. Request-to-Exit Devices: Quantity three (3).
6. S2 Netdoor MicroNode in enclosure: Quantity three (3).
7. Push-Button Switches: Quantity three (3).

1.14 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosure.
3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned interior environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 3R enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph. NEMA 250, Type 3R enclosures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SECURITY ACCESS SYSTEM

A. Manufacturer: S2 Security.

2.3 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

2.4 ACCESS CONTROL SYSTEM (ACS) HARDWARE

A. S2 Enterprise Ultra Network Controller: Provide rack mountable Enterprise Ultra Network Controller with Intel® Core 2 Quad 3.2 GHz processor, solid state drive in RAID-1 configuration minimum. The controller shall be mounted in a 19” equipment rack in the school system’s data center.

B. S2 NetBox Network Nodes: Provide rack mountable Network Nodes, S2-NN-E14R-RM, with 64 GB SSD storage option. The quantity of Network Nodes shall be determined by the number of card readers shown on the drawings plus three card reader spare capacity for each building. The Network Nodes shall be mounted in a 19” equipment rack.
   1. Provide wall mountable Network Nodes, S2-NN-E14R-WM, with 64 GB SSD storage option for intermediate Network nodes located in remote areas of the building in data closets.

C. UPS: Self-contained static Uninterruptible Power Supply (UPS).
   1. Provide rack mountable Lithium-ion Smart UPS, APC # SMTL2200RM2UCNC.
   2. Size: Provide a minimum of 1 hour of operation of the controller equipment.
   3. Batteries: Sealed, Lithium-ion.
   4. Accessories:
      a. Transient voltage suppression.
      b. Input-harmonics reduction.
      c. Rectifier/charger.
      d. Battery disconnect device.
      e. Static bypass transfer switch.
      f. Internal maintenance bypass/isolation switch.
      g. External maintenance bypass/isolation switch.
      h. Output isolation transformer.
      i. Remote UPS monitoring.
      j. Battery monitoring.
      k. Remote battery monitoring.
      l. Network card.

2.5 SECURITY SYSTEM AND VIDEO SURVEILLANCE MONITORING STATION

A. Workstation shall consist of a standard unmodified PC, with accessories and peripherals that configure the workstation for a specific duty.

B. Workstation Computer: Standard unmodified PC by DELL of modular design, OptiPlex 7090 Minitower or equal. The CPU shall be at least 10th Generation Intel® Core i7.
   1. Memory: 16 GB of usable installed memory.
   2. Power Supply: Minimum capacity of 250 W.
   3. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
   4. Color Monitor: Not less than 17 inches LCD UHD monitor.
   5. Keyboard: With a minimum of 64 characters, standard ASCII character set based on ANSI X3.154.
   6. Mouse: Standard, cordless, compatible with the installed software.
   7. Disk storage shall include the following, each with appropriate controller:
      a. Minimum PCIe NVMe Class 35 Solid State Drive.

2.6 MICRONODE

A. Provide S2 Netdoor MicroNode in enclosure. The MicroNode shall operate with a power supply.

2.7 CARD READERS

A. Power: Card reader shall be powered from its associated Controller, including its standby power source.

B. Enclosure: Suitable for recessed, semi flush mounting as shown on the drawings. Mounting types shall additionally be suitable for installation in the following locations:
   1. Indoors, controlled environment.
   2. Indoors, uncontrolled environment.
   3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

C. Read Only Contactless Smart Card reader:
   1. Contactless smart card reader shall securely read access control data from 13.56 MHz contactless smart cards. The contactless smart card reader shall be optimally designed for use in access control applications by providing:
      a. Secure access control data exchange between the smart card and the reader utilizing key diversification and mutual authentication routines.
      b. Universal compatibility with most access control systems.
      c. Guaranteed compatibility to read all HID data formats ensuring card-to-reader interoperability in multi-location installations and multi-card/reader populations when used with Genuine HID products.
      d. Ease of installation through identical wiring methods as legacy 125 KHz proximity readers.
      e. The ability to read expanded data format lengths up to 144 bits.
      f. Backwards compatibility with legacy 125 KHz proximity access control formats (e.g., 26-bit, 32, 35-bit, 37-bit, 56-bit, and HID Corporate 1000 formats).
      g. Optimal read range and read speed for increased access control throughput.
      h. A full product line of compatible products including readers, readers with integral keypads and LCD displays, long range readers, biometric readers, read/write readers, card programmers, and cards.
      i. Global, off-the-shelf availability.
      j. Built in compatibility across the product line without the need of special programming.
      k. Product construction suitable for both indoor and outdoor applications.
      l. Customizable behavior for indicator lights and audible tones.
   2. Contactless smart card reader shall be configurable to read data simultaneously from the following card:
      a. HID iCLASS Access Control Sector/Application data.
   3. Contactless smart card reader shall be HID Global iCLASS Model R40, base P/N 6120 (Wiegand)

2.8 ACCESS CARDS

A. Manufacturer: HID, an Assa Abloy Group

B. Access Cards:
   1. Access cards shall store uniquely coded data used by card readers as an Identifier.
      a. Wiegand Wire Effect Cards: Ferromagnetic wires laminated into the credential card using binary digits specified for Wiegand readers to generate a unique credential card identification code.
      b. Proximity Cards: Use proximity detection without physical contact with the proximity reader for proper operation.
   2. Access cards shall be HID 2100 iClass/Prox Embeddable 13.56 MHz read/write contactless smart technology cards.

3. Quantity: Provide two hundred (200) cards per building with clear vertical format card holders and navy-blue break-away lanyards.
    a. The cards and card holders shall be configured for vertical format badge.

2.9 REQUEST TO EXIT DETECTORS

A. Manufacturer: Bosch.

B. Request-to-Exit Detector:
1. Provide universal mounting high performance door monitor with sounder alert and sequential Logic Input (SLI).
2. The detector shall have wraparound coverage pattern with precise pattern control and up to 64 second adjustable latch time.

C. Request-to-Exit detector shall be Bosch DS160 Series High Performance in Gray color and with matching trim plate.

2.10 DOOR STATUS MONITOR

A. Manufacturer: Bosch.

B. Door status monitors shall be 19mm terminal connection contacts.

C. Provide Bosch ISN-CTC75-B terminal connection contacts in door matching color.

2.11 MASTER INTERCOM STATION

A. Manufacturer: Aiphone.

B. Master intercom station shall be provided for communication between the main entrance door and the general office area. The station shall be desk mountable.

C. Provide Aiphone JP-4MED Master station with wide and zoom & pan/tilt color monitor & built-in picture memory. Include MCW-S/A desk stand and power supply.

D. Provide master intercom stations for general office area.

2.12 DOOR INTERCOM STATION

A. Manufacturer: Aiphone.

B. Door intercom station shall be provided for communication between the main entrance door and the general office area master intercom station. The station shall be recessed mountable in wall in a single gang box.

C. Provide Aiphone JP-DVF Flush mount door station weather and vandal resistant stainless steel door station with mechanical call button.

2.13 PUSH-BUTTON SWITCHES

A. Manufacturers: Securitron Magnalock Corporation; an ASSA ABLOY Group Company.

B. Push-Button Switches: Momentary-contact back-lighted push buttons, with stainless-steel switch enclosures.
1. Electrical Ratings:
    a. Minimum continuous current rating of 10 A at 120 V ac.
    b. Contacts that will make 720 VA at 60 A and that will break at 720 VA at 10 A.
2. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.
3. Enclosures shall additionally be suitable for installation in the following locations:
    a. Indoors, controlled environment.
    b. Indoors, uncontrolled environment.
    c. Outdoors.

C. Power: Push-button switches shall be powered from their associated Controller, using dc control.

2.14 DOOR HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm. Exit device and alarm contacts are specified in Division 8 Section "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Division 8 Section "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power line supervision. Signal switches shall transmit data to Controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and shall report a forced entry. Power and signal shall be from the Controller. Electric strikes and electrified door hardware are specified in Division 8 "Door Hardware."

D. Door Ajar Alarm: Monitored door left ajar for longer than two (2) minutes shall generate an audible and graphic alarm at the main monitoring station in the front office. Program all S2 access control systems to have this functionality.

2.15 CABLES

A. Manufacturers:
   1. Anixter, Inc.
   2. Belden Inc.; Electronics Division.
   3. West Penn Wire/CDT; a division of Cable Design Technologies.

B. Multiconductor access control banana peel composite cable. The composite cable shall consist of the following conductors in plenum rated jacket:
   1. Card Reader – 6 conductor 22 AWG BC overall shield with drain wire.
   2. Door Contact - 4 conductor 22 AWG BC unshielded.
   3. Request-to-Exit - 4 conductor 22 AWG BC unshielded.
   4. Electric Door Strike (Lock/Power) - 4 conductor 18 AWG BC unshielded.

C. Provide Belden 658GMS Composite access control cable.

D. Intercom Cable: 22 AWG two (2) wires, non-twisted and non-polarized, shielded, plenum rated.
   1. Provide larger gauge cable for long distance cable run. The cable shall be sized for the distance and pathway shown on the drawings.

E. LAN Cabling: Comply with Division 27 Section "Data Cabling System"
   1. NFPA 262.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.
   1. Record setup data for control station and workstations.

2. For each Location, record setup of Controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each Controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options, design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset management system details, input data from construction documents. Include system schematics and Visio Technical Drawings.

D. In meetings with Architect, Engineer, and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Contracting."

B. Install cables and wiring according to requirements in Division 27 Section "Voice and Data Cabling."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

E. Install LAN cables using techniques, practices, and methods that are consistent with Category 6E rating of components and that ensure Category 6E performance of completed and linked signal paths, end to end.

F. Install cables without damaging conductors, shield, or jacket.

G. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

H. Install end-of-line resistors at the field device location and not at the Controller or panel location.

3.4 CABLE APPLICATION

A. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. Card Readers and Keypads:
   1. Install number of conductor pairs recommended by manufacturer for the functions specified.
   2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire.
   3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the Controller.

D. Install minimum No. 18 AWG cable, bundled as specified, from Controller to electrically powered locks. Do not exceed 500 feet**.**

3.5 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:
   1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
   2. Bus: Mount on wall of main equipment room with standoff insulators.
   3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 INSTALLATION

A. Network Nodes: Install Access Control Panel (ACP) Network Nodes in CCTV, Video Surveillance, NVR, designated spaces.
   1. Install intermediate Network Nodes in data closets in data racks or on wall, as applicable.

B. Provide 120V/20A power outlets at wall mounted node locations. Provide 120V circuit for each power outlet.

C. Provide two data outlets at wall mounted node locations. Connect to the closest data rack.

D. Push Buttons: Where multiple push buttons are housed within a single switch enclosure, they shall be stacked vertically with each push-button switch labeled with 1/4-inch- high text and symbols as required. Push-button switches shall be connected to the Controller associated with the portal to which they are applied, and shall operate the appropriate electric strike, electric bolt, or other facility release device.

E. Install card readers.

F. Install master intercom, push buttons, and door station to unlock door hardware.

3.7 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and with TIA/EIA-606.

B. Using cable and asset management software, develop Cable Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.8 SYSTEM SOFTWARE AND LISENCES

A. Develop, install, and test software and databases for the complete and proper operation of systems involved. Assign software license to Owner.

B. Join all new access control system components with the S2 enterprise system including all licensing.

C. Provide licenses for all the locations.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 6 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-568-1, "Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA-568-B.
   2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
   3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Remove and replace malfunctioning devices and circuits and retest as specified above.

3.10 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks according to approved procedures that were developed in “Preparation” Article and with manufacturer's written instructions.
   1. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.11 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured, with an activated burglar alarm and access-control system reporting to a Central Station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. Refer to Division 1 Section "Closeout Procedures."

B. Develop separate training modules for the following:
   1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
   2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.

3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

C. Individually train minimum five (5) staff members at each building to prepare and input credentials to man the control station and workstations and to enroll personnel.

END OF SECTION 282300

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 282300 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. This system shall provide all digital IP video surveillance, using cameras at the locations shown on the plans, from a central and remote monitoring stations.

B. The central monitoring station shall include recorders, monitors, system power supplies and other related items as specified or required.

C. The system shall be capable of recording minimum twenty (20) pictures per second per camera in twenty-four (24) hour mode and shall be adjusted initially for the twenty-four (24) hour mode.

1.2 DEFINITIONS

A. AGC: Automatic gain control.

B. CCD: Charge-coupled device.

C. UPS: Uninterruptible power supply.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
   1. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
   2. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
   3. Wiring Diagrams: Power, signal, and control wiring, and grounding.
   4. Certifications: Provide letters of certification indicating that the equipment supplier is a factory authorized representative and the personnel involved in installation have undergone factory-required training.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

D. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, network video recorders, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.
   2. Service Centers: Provide list of authorized service centers where spare parts and repair services may be obtained. Include name, address and telephone number of nearest service representative responsible for warranty service.
   3. Certifications: Provide letter from manufacturer's authorized representative certifying that the installation was reviewed and has been installed and is functioning in accordance with these specifications, manufacturer's instructions and applicable codes.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. The installer shall be an Avigilon certified company.

2. A company with minimum of five years of experience in installing video surveillance systems in educational buildings.
3. The company shall be located within one hundred miles of the project site.

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

C. Comply with NECA 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, non-condensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 3R enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. NEMA 250, Type 3R enclosures.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fixed Dome Cameras: Quantity three (3).
2. 270 Degree Cameras: Quantity three (3).
3. 360 Degree Cameras: Quantity three (3).

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
1. Warranty Period: One year from date of Substantial Completion.
2. Contractor shall provide routine maintenance, adjustments and repairs during the one year warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide equipment manufactured by Avigilon. Each major component of this system, i.e. head end equipment, cameras, monitors, video recorders, shall be of a single manufacturer. Multiple manufacturers of a major component shall not be permitted.

2.2 SYSTEM REQUIREMENTS

A. All electrical items shall be UL listed and installed in accordance with its listing and manufacturer's recommendations.

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
   1. Minimum Protection for Power Connections 120 V and More.
   2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections.

C. All equipment shall be provided by an authorized manufacturer's representative who shall be capable of providing maintenance and service on all equipment provided.

2.3 FIXED DOME CAMERAS

A. The semi-flush-mounted vandal resistant cameras shall be an Avigilon model 6.0C-H6A-DC1, 6.0C-H6A-DP1, or 6.0C-H6A-DO1 as shown with minimum 4GB SD card. The camera shall incorporate a 1/3" interline transfer Super Dynamic III Progressive Scan CCD. The cameras shall have a sensitivity of 0.5 lux (with DNR on) with a clear dome.

B. The camera shall use a Dual Streaming Codec with JPEG and H.264 Video Compression. Camera shall be capable of streaming up to 30ips.

C. The camera's imager and lens assembly shall rotate on a three-axis hinge for optimal camera positioning. The camera shall be able to be semi-flush mounted on a wall or ceiling using a standard double-gang electrical box. The camera shall feature a rugged weatherproof exterior housing with an advanced dehumidification device, base and body as independent structures, and that meets IP66rating. The vandal resistant camera shall feature a local monitor output jack for picture and positioning adjustments.

D. The camera's Super Dynamic III CCD shall be charged with long and short charges, creating both standard shutter speeds and fast shutter speeds simultaneously, on a single image field. The Super Dynamic III CCD shall automatically apply each exposure pattern to bright and dark areas. The Super Dynamic III CCD shall feature images with a dynamic range of up to128 times.

E. The camera shall feature a body-based vandal automatic back focus mechanism for automatic and remote back focus adjustment. The automatic back focus adjustment (ABF) shall engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night Mode and on manual activation at the camera or remote from the camera using a System Controller.

F. The camera shall incorporate a CS-mount, 1/3", automatic iris, 2X variable focal lens with a focal length of 3.8-8mm (2.1X). The lens shall be suitable for use in areas where there is a varying light source. The lens shall have a maximum aperture ratio of 1:1.4 (wide), 1:1.8(telephoto). The unit shall have an angular field-of-view of 35 degrees telephoto and 73 degrees wide(horizontal), and 26 degrees telephoto and 53degrees wide (vertical). The camera shall also accept specific 1/3", vari-focal, auto iris lenses with varying focal lengths while continuing to allow the vandal automatic back focus mechanism to engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night mode, and on manual activation at the camera or remote from the camera using a system controller.

G. The power source shall be PoE (IEEE802.3af), which includes the operation of optional heater unit for exterior cameras.

2.4 270-DEGREE DOME CAMERAS

A. The semi-flush-mounted vandal resistant mini dome cameras shall be an Avigilon model 15C-H5A-3MH with 4K resolution, and minimum 4GB SD card. The camera shall incorporate a 1/3" interline transfer CCD. The cameras shall have a sensitivity of 0.5 lux (with DNR on) with a clear dome.

B. The camera shall use a Dual Streaming Codec with JPEG and H.264 Video Compression. Camera shall be capable of streaming up to 30ips.

C. The camera's imager and lens assembly shall rotate on a three-axis hinge for optimal camera positioning. The camera shall be able to be semi-flush mounted on a wall or ceiling using a standard double-gang electrical box. The camera shall feature a rugged weatherproof exterior housing with an advanced dehumidification device, base and body as independent structures, and that meets IP66rating. The vandal resistant camera shall feature a local monitor output jack for picture and positioning adjustments.

D. The camera shall feature a body-based vandal automatic back focus mechanism for automatic and remote back focus adjustment. The automatic back focus adjustment (ABF) shall engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night Mode and on manual activation at the camera or remote from the camera using a System Controller.

E. The camera shall incorporate a CS-mount, 1/3", automatic iris, 2X variable focal lens with a focal length of 3.8-8mm (2.1X). The lens shall be suitable for use in areas where there is a varying light source. The lens shall have a maximum aperture ratio of 1:1.4 (wide), 1:1.8(telephoto). The unit shall have an angular field-of-view of 35 degrees telephoto and 73 degrees wide(horizontal), and 26 degrees telephoto and 53degrees wide (vertical). The camera shall also accept specific 1/3", vari-focal, auto iris lenses with varying focal lengths while continuing to allow the vandal automatic back focus mechanism to engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night mode, and on manual activation at the camera or remote from the camera using a system controller.

F. The power source shall be PoE+ (IEEE802.3af).

G. Provide POE60U-1BTE-R power injector with each 270-Degree dome camera.

2.5 360-DEGREE DOME CAMERAS

A. The semi-flush-mounted vandal resistant Full HD mini dome color CCD cameras shall be an Avigilon model 8.0C-H5A-FE-DO1-IR with 4K resolution, and minimum 4GB SD card. The camera shall incorporate a 1/3" interline transfer CCD. The cameras shall have a sensitivity of 0.5 lux (with DNR on) with a clear dome.

B. The camera shall use a Dual Streaming Codec with JPEG and H.264 Video Compression. Camera shall be capable of streaming up to 30ips.

C. The camera's imager and lens assembly shall rotate on a three-axis hinge for optimal camera positioning. The camera shall be able to be semi-flush mounted on a wall or ceiling using a standard double-gang electrical box. The camera shall feature a rugged weatherproof exterior housing with an advanced dehumidification device, base and body as independent structures, and that meets IP66rating. The vandal resistant camera shall feature a local monitor output jack for picture and positioning adjustments.

D. The camera shall feature a body-based vandal automatic back focus mechanism for automatic and remote back focus adjustment. The automatic back focus adjustment (ABF) shall engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night Mode and on manual activation at the camera or remote from the camera using a System Controller.

E. The camera shall incorporate a CS-mount, 1/3", automatic iris, 2X variable focal lens with a focal length of 3.8-8mm (2.1X). The lens shall be suitable for use in areas where there is a varying light source. The lens shall have a maximum aperture ratio of 1:1.4 (wide), 1:1.8(telephoto). The unit shall have an angular field-of-view of 35 degrees telephoto and 73 degrees wide(horizontal), and 26 degrees telephoto and 53degrees wide (vertical). The camera shall also accept specific 1/3", vari-focal, auto iris lenses with varying focal lengths while continuing to allow the vandal automatic back focus mechanism to engage and reposition the imaging assembly for optimal focus position on automatic or manual switchover from Day to Night mode, and on manual activation at the camera or remote from the camera using a system controller.

F. The power source shall be PoE+ (IEEE802.3af).

G. Provide POE60U-1BTE-R power injector with each 360-Degree dome camera.

2.6 CAMERA ACCESSORIES

A. All indoor ceiling mounted cameras shall be provided with embedded ceiling mount bracket.

B. All exterior mounted cameras shall have heater unit.

C. All exterior corner mounted cameras shall be mounted with vandal-resistant corner mount bracket.

2.7 NETWORK VIDEO RECORDERS

A. The Avigilon recorders shall be capable of connecting to up to 64 network cameras each without extra license fees and their images can be recorded simultaneously. Provide multiple recorders to accommodate all the cameras shown on the drawings plus ten (10) spare cameras.

B. The recorders shall be equipped with minimum 94TB HDDs.

C. They shall allow up to 94TB HDD storage to be installed in the main units.

D. The total system shall have minimum 94TB HDD storage capacity.
   1. The HDD storage capacity shall allow minimum thirty-five days of record time for all the cameras connected to each recorder at an optimal rate of 20 frames per second with continuous 24/7 recording setting.
   2. The recording schedule shall be set for continuous 24/7 recording for all the cameras.

E. The recorder shall be the equipment with an embedded real-time operating system and shall not be based on a Microsoft Windows OS. The OS must reside completely in the hardware and not be installed on the hard disk drives. Installed disk drives must be dedicated to recording videos.

F. The recorders shall support H.264 and JPEG multi format.

G. The recorders shall provide Various Recording Mode: Manual, Schedule, Event (Pre/Post), Emergency, and External Timer. It shall have the capabilities to control: Pan/Tilt, Zoom, Focus, Brightness and Preset Positions. It shall be able to search using Time & Date, Event Type and Camera number.

H. The recorders shall have up to 8 recording programs including individual recording mode for each camera, and 6-time schedules per day.

I. The recorders shall have up to 64 audio capabilities and can be recorded and played back at G.726 (ADPCM) 32 kbps.

J. The recorders shall have 2x built-in Gigabit network interfaces (10Base-T / 100Base-TX / 1000Base-T) for camera recording and client access.

K. The recorders shall have the quick discovery and IP setup function for network cameras.

L. The recorders shall have the capabilities to transfer recorded images to FTP server upon alarm and/or live image periodically. Images recorded in the SD memory card in the i-Pro network cameras can be transferred to the recorder automatically even when the recorder is in recording status.

M. The recorders shall have User/Host authentication, 4 programmable user levels, 16 user priorities and User-Camera View/Control partitioning setup for sophisticated user management. It shall be capable of up to 32 user registrations.

N. The recorders shall have Alteration detection and recorded data encryption for data security.

O. The recorders shall be viewable from any properly connected PC using Google Chrome and Fire Fox.

P. The recorders shall provide user authentication and support different user privileges based on logon ID. From the client the user should (with proper authentication) be able to do the following:
   1. Setup cameras
   2. Define live viewing, recording rates and quality settings.
   3. Define recording programs and schedules.
   4. View live video in either single or quad views.
   5. Search and playback recorded video.
   6. Download selected recorded video.
   7. Control connected PTZ cameras.

Q. Supported protocols: TCP/IP, UDP/IP, HTTP, FTP, SMTP, DHCP, DNS, DDNS, NTP, SNMP

R. The power source shall be 120VAC, 60Hz at approx. 170W.

S. Unit shall be mounted (EIA 19@ standard) either with mounting brackets or rack shelf.

2.8 HIGH-DEFINITION VIDEO MONITORS

A. Provide a minimum 20" high-definition LCD video monitor with rack mountable accessories in a standard 19" rack panel for each network video recorder.

B. The monitor shall have a 20" diagonal flat square screen with 1,600 x1,200 resolution. The monitor shall feature a control panel that can be locked to prevent unauthorized altering of the settings. The monitor shall feature on-screen display for adjustment of sharpness, brightness, picture, color, tint and volume.

C. The monitor shall feature built-in speakers. Three audio and video inputs, DVI, HDMI, and S-video loop through (Mini-DIN 4-pin), and selectable 1/2/3/S-Video terminals shall be located on the rear of the monitor. The power source shall be 120VAC, 60HZ. The monitor shall be UL listed. Provide Avigilon monitors with rack mounting brackets.

2.9 CONTROL STATIONS

A. Heavy-duty, freestanding, modular metal furniture units arranged to house standard mounting electronic equipment. Coordinate video surveillance component arrangement and wiring with components and wiring of other systems. The station shall include integrated work surface, pull out shelves for system keyboard and mouse. Basis of design is a minimum 7 feet high unit by Chatsworth Product Inc (CPI).

B. Equipment Mounting: Standard 19-inch rack complying with EIA 310.

C. Provide an AC outlet power strip containing a minimum of six outlets mounted vertically near the rear of the cabinet. Power strip shall be provided with a six-foot power cord rated for 20 amps at 120 volts. The strip shall be fused or have a circuit breaker as over-current protection. The power strip shall be MOV protected in three modes: L-N, N-G, L-G with a 300V clamping level. Each outlet shall be rated for 15 amps.

D. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.
   1. UPS: Self-contained static Uninterruptible Power Supply (UPS). Provide rack mountable UPS, APC #AMER PWR SMTL2000RM2UCNC with rack mounting and network monitoring accessories.

E. Provide a standard unmodified PC with accessories and peripherals that configure the control station for a specific duty.
   1. Control Station Computer: Standard unmodified PC by DELL of modular design, OptiPlex Minitower or equal. The CPU operating speed shall be at least 3.0 GHz.
   2. Memory: 8 GB of usable installed memory.
   3. Power Supply: Minimum capacity of 250 W.
   4. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
   5. Keyboard: With a minimum of 64 characters, standard ASCII character set based on ANSI X3.154.
   6. Mouse: Standard, cordless, compatible with the installed software.
   7. Disk storage shall include the following, each with appropriate controller:
      a. Minimum 1 TB SATA hard disks, maximum average access time of 3.0 Gb/s

2.10 RECORDING MANAGEMENT SOFTWARE

A. Provide Avigilon software management and live monitoring software for the facilities department computer.

B. The software shall be installed, configured, and all recorders connected on the facilities department dedicated computer per the Owner’s instructions.

2.11 CABLES AND CONNECTORS

A. All cables and connectors shall be in compliance with Section 271301 “Data Network.”

B. All cables shall be plenum rated.

C. All cables shall be in conduit to and from cable tray or J-hook system.

D. Provide weatherproof cables or weatherproof sleeving or conduit in exterior locations.

PART 3 - EXECUTION

3.1 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras level and plumb.

B. Install cameras with 84-inch-minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations, unless otherwise indicated.

E. Avoid ground loops by making ground connections at only the control station.

F. Identify system components, wiring, cabling, and terminals according to Division 16 Section “Electrical Identification.”

G. Provide device identification label on each camera. The label shall be printed on laminated label tape.

H. Cameras shall be grouped for display on video surveillance system monitors in accordance with the Owner's direction on each individual monitor.

I. Provide 10 feet of extra cable at each camera, coiled above ceiling.

J. Provide corner mount brackets for all exterior cameras shown to be corner mounted.

K. Contractor shall relocate cameras up to 10 feet after original installation per Owner's request at no increase in contract price.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

C. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video surveillance equipment for acceptance and operational testing as follows:
   1. Prepare equipment list described in Part 1 "Submittals" Article.
   2. Verify operation of auto-iris lenses.
   3. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
   4. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
   5. Set and name all preset positions; consult Owner's personnel.
   6. Set sensitivity of motion detection.
   7. Connect and verify responses to alarms.
   8. Verify operation of control-station equipment.

D. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

E. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. Remove and replace malfunctioning items and retest as specified above.

G. Record test results for each piece of equipment.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

I. Upon completion of installation of all components and at substantial completion, repair or replace all damaged items. Surface scratches in painted enclosures shall be painted over. Deep scratches in metal enclosures or damage or defects in other items shall be replaced.

3.3 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Tasks shall include, but are not limited to, the following:
   1. Check cable connections.
   2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
   3. Adjust all preset positions; consult Owner's personnel.

4. Recommend changes to cameras, lenses, and associated equipment to improve Owner' utilization of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.4 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to provide up to eight hours to train Owner's maintenance personnel to adjust, operate, and maintain video surveillance equipment.
   1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
   2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
   3. Review equipment list and data in maintenance manuals. Refer to Division 1 Section “Operation and Maintenance Data."
   4. The contractor shall coordinate the date of the training with the owner, in writing, a minimum of 15 days prior to substantial completion.
   5. At the end of the one-year warranty period, the manufacturer's representative shall, within 30 days of the expiration of the warranty period, provide up to eight hours of instruction in the operation and maintenance of the system to the owner's personnel.
   6. The owner shall be permitted to make a video and/or audio tape of the training sessions.

B. Contractor and installer shall provide a letter certifying that the installation meets the applicable codes, plans and specification and was installed in accordance with manufacturer's instructions.

END OF SECTION 282300

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 283110 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fire alarm systems.

B. Related Sections include the following:
   1. Division Section "Door Hardware" for door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system.

1.2 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.3 SYSTEM DESCRIPTION

A. Intelligent analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

1.4 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72.

B. Fire alarm signal initiation shall be by one or more of the following devices:
   1. Manual stations.
   2. Heat detectors.
   3. Smoke detectors.
   4. Automatic sprinkler system water flow.
   5. Fire extinguishing system operation.
   6. Monitor module.

C. Fire alarm signal shall initiate the following actions:
   1. Alarm notification appliances shall operate continuously.
   2. Identify alarm at the FACP and remote annunciator.
   3. De-energize electromagnetic door holders.
   4. Activate voice/alarm communication system.
   5. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
   6. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
   7. Record events in the system memory.
   8. Call local fire department or others as directed by Owner.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:
   1. Operation of a fire-protection system valve tamper.

E. System trouble signal initiation shall be by one or more of the following devices or actions:
   1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
   2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
   3. Loss of primary power at the FACP.
   4. Ground or a single break in FACP internal circuits.
   5. Abnormal ac voltage at the FACP.
   6. A break in standby battery circuitry.
   7. Failure of battery charging.

8. Abnormal position of any switch at the FACP or annunciator.

F. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
   1. Visual and audible trouble alarm at control panel and at remote annunciator panel.
   2. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
   3. Lamp Test: Manual LAMP TEST function causes alarm indication at fire alarm control panel and at annunciator panel.

G. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to:
   1. Sound local fire alarm signaling devices and initiate voice evacuation without sending signal to Municipal Fire Department.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
   1. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire alarm system design.
   2. Device Address List: Coordinate with final system programming.
   3. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
   4. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
   5. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   6. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

D. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

E. Submit manufacturer's certificate that system meets or exceeds specified requirements.

F. Submit a schedule of values in accordance with Section 01290 - Payment Procedures for the following fire alarm devices fully installed, programmed and displayed on graphic annunciator: smoke detector, heat detector, duct mounted smoke detector, door holder (magnetic), monitor module, interlock relay, sprinkler flow and tamper device connection, horn, horn/strobe, speaker/strobe, indicating strobe, manual pull station and emergency telephone handset (fire fighter).

G. Submit shop drawings to the local authority having jurisdiction for the project records and permitting. Pay all associated fees and charges.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

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

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Duct Mounted Detectors: Quantity five (5).
   2. Indicating Strobes: Quantity five (5).
   3. Smoke and Heat Detectors: Quantity five (5) each.
   4. Speaker Strobes: Quantity five (5).

1.8 QUALIFICATIONS

A. Installer: Company specializing in smoke detection and fire alarm systems with five years of experience. Installer shall be the manufacturer's factory authorized full-line distributor, no exceptions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. FACP and Equipment:
      a. Edwards Systems Technology Inc. (EST4)
   2. Wire and Cable:
      a. Comtran Corporation.
      b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
      c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
      d. West Penn Wire/CDT; a division of Cable Design Technologies.
   3. Audible and Visual Signals:
      a. Amseco; a division of Kobishi America, Inc.
      b. Commercial Products Group.
      c. Gentex Corporation.
      d. System Sensor; a GE-Honeywell Company.

2.2 FACP

A. Control Panel: Microprocessor controlled, addressable point analog fire alarm panel of modular construction with surface wall-mounted enclosure. Field programming shall be possible through an integral 80 character supervised alpha/numeric display and keypad.

B. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, relays, alarm signaling devices and voice evacuation system. Include battery-operated emergency power supply with capacity for operating complete system in standby mode for 24 hours followed by alarm mode for 5 minutes.

C. Circuits:
   1. Detection Circuits: Supervised with alarm and trouble indication.
   2. Signal Circuits: Supervised signal module, sufficient for signal devices connected to system.
   3. Actuation of alarm notification appliances, emergency voice communications, annunciation, shall occur within 10 seconds after the activation of an initiating device.
   4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

D. Notification-Appliance Circuit: Operation shall sound in a 60 beats per minute, march-time pattern.

E. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, relays, alarm signaling devices and voice evacuation system. Include battery-operated emergency power supply with capacity for operating complete system in standby mode for 24 hours followed by alarm mode for 5 minutes.

F. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciator, after initiating devices are restored to normal.
   1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
   2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
   3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

G. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

I. Voice/Alarm Signaling Service: A central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the Fire Command Center.
   1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones, or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall be UL 1711 listed.
      a. Allow the application of and evacuation signal to indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
      b. Programmable tone and message sequence selection.
      c. Standard digitally recorded messages for "Evacuation" and "All Clear."
      d. Generate tones to be sequenced with audio messages of the type recommended by NFPA 72 and that are compatible with tone patterns of the notification-appliance circuits of the FACP.
   2. Notification-Appliance Circuits: NFPA 72, Class A or B.
   3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

J. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.
   1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, and trouble signal shall be powered by the 24-V dc source.
   1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
   2. Power supply shall have a dedicated breaker for this connection at the service entrance equipment. Paint the breaker red and identify it with "FIRE ALARM SYSTEM POWER."

L. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
   1. Batteries: Sealed lead calcium.
   2. Battery and Charger Capacity: Comply with NFPA 72.

M. Surge Protection:
   1. Install surge protection on normal ac power for the FACP and its accessories.
   2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
   1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP. The force to activate the device shall be no greater than five (5) lbf.
   2. Station Reset: Key- or wrench-operated switch.

2.4 SYSTEM SMOKE DETECTORS

A. General Description:
   1. UL 268 listed, operating at 24-V dc, nominal.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
   4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   5. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:
   1. Sensor: LED or infrared light source with matching silicon-cell receiver.
   2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:
   1. Ionization Smoke Detectors:
      a. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
      b. Detector Sensitivity: Between 0.5 and 1.7 percent/foot smoke obscuration when tested according to UL 268A.
   2. UL 268A listed, operating at 24-V dc, nominal.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
    a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
5. Provide with auxiliary DPDT relay contact key-operated NORMA-RESET-TEST switch.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where indicated.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
8. Each sensor shall have multiple levels of detection sensitivity.
9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
10. Auxiliary contacts shall be rated minimum 4A at 28 VDC, 7.5A at 115 VAC.
11. Two-wire detector with common power supply and signal circuits.

2.5 MONITOR MODULE

A. The monitor module shall be used to connect a supervised zone of conventional initiating devices (any N.O. dry contact device) to the system loop. The monitor module shall be addressable. An integral LED shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

2.6 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.
    1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
    2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.7 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
    1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn not to exceed 120 dB maximum. Provide integral strobe lamp and flasher (minimum 1 Hz, maximum 3 Hz) with clear or nominal white lens with RED letter head FIRE on lens.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
    1. Rated Light Output: 75 candela.
    2. Strobe Leads: Factory connected to screw terminals.
    3. Minimum 1 Hz, maximum 3 Hz

D. Voice/Tone Speakers:
    1. UL 1480 listed. (90 dBA at ten feet)
    2. Compatible with both 70V and 25V audio distribution systems.
    3. Speakers shall operate over frequency range of 400 – 4000 Hz.
    4. Mounting: Flush, semi recessed, surface mounted.

5. Matching Transformers: Tap range matched to the acoustical environment of the speaker location. Have separate terminals for ¼, ½, 1 or 2 watt operation. Set tap at ½ watt.
6. Provide integral strobe lamp and flasher (minimum 1 Hz, maximum 3 Hz) with RED lettered FIRE on white lens where indicated. Finishes shall be RED enamel.

E. Remote Annunciator: Provide a supervised remote 80 character, back-lit display annunciator including audible and visual indication of fire alarm by device or zone; and audible and visual indication of system trouble. Key enabled control switches shall permit ACKNOWLEDGE, SILENCE and RESET functions.

2.8 VOICE EVACUATION SYSTEM:

A. Voice evacuation system shall provide an evacuation alarm signal and voice transmission over the fire alarm speaker and speaker-strobe devices. Unit shall be UL listed. The system shall be integrated within the 24 VDC fire alarm panel. Speaker lines shall be 25 V RMS and supervised for open or short circuit. Further the unit shall have the following features.

B. Amplifiers, signal generator, power supply, output transformer and speaker lines shall be continuously supervised for normal operation, open or short circuit.

C. Amplifiers shall be capable of withstanding a continuous output short circuit with alarm tone sounding without failure, fusing or shutdown.

D. System shall be operable for non-emergency public address announcements without an alarm condition.

E. Two-way telephone communication circuits shall be arranged so as to allow communication between the fire command center and up to seven (7) remote telephone locations simultaneously.

F. Speaker line output shall include provision for class A or class B supervised speaker wiring.

G. Amplifier shall be specifically designed for high-intelligibility speech reproduction and fire evacuation signaling.

H. A prerecorded voice module shall be used to store tones and/or messages and transmit them over speaker circuits automatically upon alarm actuation. The voice module shall have no moving parts.

I. Protection circuitry shall be included to prevent failure due to overloading, overheating, speaker line short circuit, over-voltage, and polarity reversal. Automatic current limiting shall keep circuitry within safe operating limits, without shutdown.

J. Fixed Emergency Telephone Handset
1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets on line (off hook) without degradation of the signal.

2.9 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also, duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing. Unit shall be supervised 80 characters, back-lit display with audible and visual indication of system trouble.
1. Mounting: Flush cabinet, (NEMA 250, Class 1) with keyed access.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled according to UL 632.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by manufacturer of the device.
   2. Finish: Paint of color to match the protected device.

2.12 WIRE AND CABLE

A. Fire alarm system initiating loop and signal circuit cables shall be UL listed NEC type FPL, power-limited cabling in accordance with this specification and NEC 760-55 through 58.

B. Initiating and Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.

2.13 AUXILIARY DEVICES:

A. Interlock Relays: Industrial duty, long life, encapsulated coil; 8A - 120 VAC, SPDT, silver power contacts; in NEMA 1 enclosure. Relay shall be U.L. listed. Install such that no high voltage wiring will be in the same conduit with the fire alarm system wiring.

B. Sprinkler Water Flow Alarm Switches: The Sprinkler Water flow alarm and tamper switches shall be provided by others.

C. City Fire Department Connection: Two telephone connections shall be utilized between this facility and the local Fire Department or as directed by Owner. Provide and install a dual line Digital Communicator/Transmitter within the control panel.

D. Strobe Synchronization Modules: The strobe synchronization modules shall be provided to enable all strobes within a field of view to flash synchronously.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Installation shall be in strict compliance with manufacturer's recommendations. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing conduits and pulling wire.

B. Smoke or Heat Detector Spacing:
   1. Smooth ceiling spacing shall not exceed 30 feet.

C. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Install manual station and emergency telephone 48" above floor.

G. Install audio-visual and visual only signal devices 80" above floor.

H. Device Location-Indicating Lights: In accordance with Georgia Accessibility Code visual signal appliances shall be installed in each of the following areas.
   1. Restrooms and any other general usage areas (e.g., classrooms, meeting rooms)
   2. Hallways, lobbies and any other area of common use.

I. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.

J. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

K. All Equipment shall be held firmly in place. Fastening and supports shall be adequate to support the loads with a reasonable safety factor.

L. All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal will be activated until the system is restored to normal.

M. Make conduit and wiring connections to sprinkler flow switches, sprinkler valve tamper switches, HVAC shut-down relay, smoke damper relays, master intercom interface relay, etc.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:
   1. NECA 1.
   2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes."
   1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Electrical Identification."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

D. Identify conduit in as specified in Section 260533.

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
   2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
      a. Include the existing system in tests and inspections.
   3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
   4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
      a. Detectors that are outside their marked sensitivity range shall be replaced.
   5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section "Closeout Procedures."

3.8 WARRANTY:

A. Guarantee on-site response to a trouble call within twenty-four (24) hours after receipt of such call.

B. Make available to the owner an authorized and trained service representative who will provide maintenance during normal working hours at no cost to the Owner for a period of twelve (12) months from the date of acceptance.

END OF SECTION 283110

SECTION 311111 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants and grass to remain.
2. Removing existing trees, shrubs, groundcovers, plants and grass that interfere with work to be done or are noted to be removed.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing and removing site utilities.
7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:

1. Specification Section "Earthwork" for soil materials, excavating, backfilling, site grading, furnishing and placing of topsoil on lawn and landscape areas.
2. Specification Section "Finish Grading of Lawn and Landscape Areas" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

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

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site and

disposed of in a legal and lawful manner. Stripped topsoil shall only be taken off site with the Owner's express written consent and only after all site needs are met.

1.5 SUBMITTALS

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

B. Record drawings identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Contractor shall verify that all site clearing occurs within the boundary/property lines, particularly in areas where clearing approaches adjacent common property lines or noted buffers. Limit clearing to areas noted on the plans and to areas required for the installation of utilities.

B. Regulatory Requirements: Comply with governing EPD (Georgia Environmental Protection Division) notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Submit copy of notification to Architect.

1.7 PROJECT CONDITIONS

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

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
3. Provide trained flagmen and install traffic control devices. Operate warning lights in accordance with authorities having jurisdiction and to warn motorists of construction activity.

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

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Georgia "Call Before You Dig" Utilities Protection Center: 811.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place. Those measures that cannot be installed prior to site clearing must be installed concurrent with site clearing such that all cleared areas are fully contained at the end of each day's activities.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Specification Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor shall be responsible for all construction layout work.

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

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

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

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

E. Provide surface water control during construction operations to direct runoff water to sediment ponds and barriers and to prevent damage to adjacent properties.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control Drawings, and in response to intermediate construction conditions.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established. Coordinate inspections with Owner’s Testing Agency in accordance with NPDES Permit No. GAR 100001. Maintain erosion controls on a daily basis.

C. Contractor shall remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.

2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ an arborist, licensed in Georgia, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.
2. Coordinate with proper utility provider for any utility line requiring removal or relocation.

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

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

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

D. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

E. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Use only hand methods for grubbing within tree protection zone.
4. Dispose of all vegetation removed in a legal and lawful manner.
5. Grind all trees and limbs and spread wood chips around perimeter of site for additional erosion control measures. Place wood chips between double rows of silt fence.

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

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

2. After fill placement, grade surface to meet adjacent contours and to provide surface drainage.

3.6 TOPSOIL STRIPPING

A. Remove sod, grass, brush, roots, wood, glass, stones, broken concrete, brick, concrete block, etc. before stripping topsoil.

B. Strip topsoil, root zones, and cultivated material to whatever depths are encountered, from building pad and pavement areas and from all other cut and fill areas.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile stripped topsoil, root zone and cultivated materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover or grass to prevent windblown dust.

1. Do not stockpile topsoil within tree protection zones.
2. Spread and dispose of excess topsoil as specified in Specification Section - Earthwork, and under items 'D' and 'E' below.

D. Allow testing company to review topsoil and cultivated material stripping and stockpiling. Stockpile cleanest topsoil for respreading on lawn and slope areas.

E. At completion of grading operations, minimum topsoil depth shall be 4 inches on all landscape areas including: ditches, grass swales, landscape areas and slopes. Contractor shall stockpile

sufficient topsoil to provide the specified minimum depth or provide topsoil from off-site sources if sufficient topsoil is not available from disturbed areas onsite.

3.7 SITE IMPROVEMENTS

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

B. Sawcut and remove all slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

C. Use of explosives will not be permitted.

3.8 DISPOSAL

A. Disposal: Remove obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property. Burning or burial of debris on-site shall not be allowed.

END OF SECTION 311111

SECTION 312300 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, parking areas, driveways, lawns and grasses, and exterior plants.
2. Undercutting and handling of unsuitable materials.
3. Furnishing suitable borrow material from off-site.
4. Predensification and proofrolling.
5. Spreading and finish grading of topsoil on all site areas including lawn and landscape areas.
6. Excavating and backfilling for buildings and structures.
7. Floor slab base material for slabs-on-grade.
8. Excavating and backfilling for utility trenches.
9. Excavating and backfilling pits for buried utility structures.
10. Removing sediment from temporary storage areas.

B. Related Sections include the following:

1. "Allowances" for quantity allowance provisions related to sitework.
2. Specification Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Specification Section "Finishing of Lawn and Landscape Areas" for finish grading, including preparing and placing topsoil and planting soil for lawns.
4. Specification Section “Rock Removal.”
5. Specification Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill. Offsite borrow areas shall be approved by the Geotechnical firm prior to use.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for such items.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation (Mass Rock) or ¾ cu. yd. for footing, trench, and pit excavation (Trench Rock) that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits (Trench Rock): Late-model, track-mounted hydraulic excavator; equipped with a 36 inch wide, maximum, short-tip-radius rock bucket; with bucket-curling force of not less than 40,000 lbf; measured according to SAE J-1179.

2. Bulk Excavation (Mass Rock): Late-model, track-mounted dozer pulling a single tooth ripper with a drawbar pull of not less than 80,000 pounds; measured according to SAE J-732.
3. Any material that may be classified as rock shall be evaluated by the Geotechnical Engineer or his representative prior to excavation. No claims for payment of rock excavation will be paid for unless the excavation is witnessed and verified by a representative of the Geotechnical Testing Company.

G. Soil Materials: Defined under Part 2 "Products", if not defined here.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.

J. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt and clay particles; friable, pervious and black or a darker shade of brown, grey or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel and other objects greater than one inch in diameter; and free of subsoil and weeds, roots, toxic materials or other nonsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for on-site soil material proposed for fill and backfill.

B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.5 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code."

B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. Soil tests, field density tests, and testing of footing subgrades, observation and report of predensification shall be made by a Geotechnical Testing Agency (Geotechnical Engineer) approved by the OWNER and paid for in accordance with requirements set forth in the Specification Section “Quality Requirements.”

C. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1. Protect structures, utilities, sidewalks, pavement and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

D. Barricade open excavations occurring as part of this work and post with warning lights.
1. Operate warning lights as recommended by authorities having jurisdiction.

1.6 PROJECT CONDITIONS

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

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS (Excludes soil backfill for Modular Concrete Block Retaining Walls)

A. Satisfactory Suitable Soils for project requirements excluding reinforced backfill for modular concrete block retaining walls are limited to soils classified in accordance with ASTM D 2487 Soil Classification Groups GC, SC, CL, GW, GP, GM, SW, SP, SM and ML or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension and contain no more than 15 percent larger than 2.5 inches. Satisfactory fill shall be free of debris, waste, frozen materials, vegetation, and other deleterious matter and shall have a liquid limit less than 50, plastic index less than 30 and a Standard Proctor maximum dry density (ASTM D-698) greater than 95 pcf.

B. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

C. Unsuitable soil/materials are soils or materials defined as Soil Classification Groups OL, GH, MH, OH and PT and/or that are not suitable or appropriate for their intended use as determined by the Testing Agency or the Engineer of Record.

D. Base Course: Graded, crushed aggregate base conforming to Georgia Department of Transportation specifications.

E. Backfill and Fill Materials: Satisfactory soil materials as defined above.

F. Floor Slab Base Material: Floor slab base material shall be #89 aggregate meeting the Georgia Department of Transportation specifications for Road and Bridge Construction Section 800 (latest edition).

G. Granular Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1 ½ inch sieve and not more than 5 percent passing a number 4 sieve.

2.2 ACCESSORIES

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

B. Locator Wire: 12 gauge insulated copper wire, continuously installed above water lines and looped up inside valve boxes and looped around base of hydrants, P.I.V.s and other water main accessories.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Specification Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Specification Section "Site Clearing," during earthwork operations.

3.2 SHORING AND BRACING

A. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

B. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.

D. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

E. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated utility trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

C. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Construct temporary drainage ditches to divert groundwater and subsurface water away from building and paving areas. Do not use footing excavations as temporary drainage ditches. Do not permit construction drainage onto adjacent property.

3.4 EXPLOSIVES

A. Explosives: Obtain written permission from authorities having jurisdiction and Architect before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.5. EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth, unsuitable materials and rock. Do not excavate unsuitable materials or rock until they have been classified by Geotechnical Engineer and cross sectioned by the Surveyor. The Contract Sum will be adjusted for rock and unsuitable soil excavation according to Contract provisions for such items.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as unsuitable materials, rock or unauthorized excavation.

    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Unsuitable soil excavation includes the excavation and disposal of materials classified as unsuitable by the Geotechnical Engineer. Suitable materials above the unsuitable fill layers shall be removed and placed as onsite fill material.

    a. Excavated unsuitable materials may be utilized onsite in non-structural areas as directed by the Engineer or disposed of offsite.
    b. Measurement of excavated unsuitable material and haul-in borrow materials will be performed in accordance with specifications.

3. Rock excavation includes removal and disposal of rock onsite or offsite as directed by the Engineer. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction. Rock will be measured in accordance with Specification Specification “Rock Removal.”

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 feet. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.8 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe at elevations indicated or below frost line, whichever is deeper.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated or required for safety purposes.

1. Clearance: 12 inches each side of pipe or conduit unless pipe is in rock, in which case excavation shall be 6 inches clear on each side of pipe.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Allow for bedding courses as required for each item.

3.9 SUBGRADE INSPECTION, PREDENSIFICATION, AND PROOFROLLING

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. The entire stripped subgrade for building, sidewalks, and paving areas shall be scarified and compacted and then proof-rolled as recommended by the Geotechnical Engineer. The compaction efforts shall be sufficient to densify the subgrade of areas to receive fill to a minimum density of 98% in accordance with ASTM-D-698 for a depth of 12 inches. All at grade areas and cut surfaces shall be scarified to a depth of 12 inches and compacted to at least 98% of the same criteria.

D. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 20 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or as directed.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line or trees to remain.

3.12 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, ice, vegetation, or other deleterious matter.

3.13 UTILITY TRENCH BACKFILL

A. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the Engineer or authorities having jurisdiction.

B. Place backfill on subgrades free of mud, frost, snow or ice.

C. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Backfill voids with satisfactory soils while installing and removing shoring and bracing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 5 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use satisfactory soil material.
4. Under building slabs, use satisfactory soil material, to floor slab base material.
5. Under footings and foundations, use satisfactory soil material.

C. Place soil fill on subgrades free of mud, frost, snow, ice, vegetation or deleterious matter.

3.15 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure to prevent wedging.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049 for soils which will not exhibit a well-defined moisture-density relationship.

1. Subgrades for Footings, Utility Trenches, Structures, Building Slabs, Steps and Pavements: Compact to at least 95 percent of the Standard Proctor Maximum Dry Density to within 12 inches of finished subgrade. The top 12 inches shall be compacted to at least 98 percent of the same criteria.
2. Lawn and Landscape Areas: Compact each layer of backfill or fill soil material to 95%.
3. Base Course for Paving – Compact base course in accordance with Paragraph 3.19.

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated, allowing for minimum depth of topsoil. Compact with uniform levels or slopes between points where elevations are shown or between such points and existing grades.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Curbs, Walks, Lawns, and Unpaved Areas: Plus or minus 1/2 inch. Backfill against curbs and pavement edges flush to provide smooth finish in areas to grassed. Grade areas to receive sod to allow for 1-1/2 inch thickness.
2. Pavements: Plus or minus 1/2 inch.

C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 GRADING OF ALL LAWN AND LANDSCAPE AREAS (UNDER SPECIFICATION "EARTHWORK")

A. General: Uniformly grade areas including adjacent transition areas. Smooth finish surfaces within specified work areas and adjacent transition areas to within plus or minus 0.10' between points where elevations are shown or between such points and existing grades. Grade areas adjacent pavement to slope as indicated on the drawings and to prevent ponding of water.

B. Topsoil Placement:
1. All lawn and landscape areas shall have a 4" uniform layer of topsoil spread prior to final grading. Smooth and compact finished surface with uniform levels between points where elevations are shown or between such points and existing grades.
2. Grade elevation of topsoil relative to walks, curbs, paved surfaces, and drainage structures, manhole tops, valve boxes, etc. to conform to the following criteria.

    a. Seeded Lawn Areas - One-half inch below finish grade.
    b. Sodded Lawn Areas - One and one-half inches below finish grade.
    c. Shrub and Ground Cover Areas - One inch below finish grade.

C. Temporary and Permanent Grassing shall be performed in accordance with Specification Section "Landscape Work."

3.19 BASE COURSE

A. Proofroll: Proofroll subgrades immediately prior to placing base material. Proofroll shall be in accordance with Paragraph 3.9 of this Section. Rework or undercut areas that pump or rut and replace with suitable materials prior to placing base materials. Place base course on subgrades free of mud, frost, snow, ice, vegetation or deleterious matter.

B. On prepared subgrade, place base course under pavements and walks as follows:

1. Place base course material over subgrade course under hot-mix asphalt pavement.
2. Shape base course to required crown elevations and cross-slope grades.
3. Place base course 8 inches or less in compacted thickness in a single layer, unless mandated otherwise by Authorities having jurisdiction.
4. Where indicated on the Drawings, place base course that exceeds 8 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

5. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 100 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 100 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed. An experienced geotechnical engineer shall observe the pre-densification of the building and parking areas. One copy of results of all Compaction Test and observations of pre-densification shall be submitted to Owner, Architect and Engineer.

1. Testing company shall perform field density tests in accordance with ASTM D 2937 (drive cylinder method), ASTM D 2167 (rubber balloon method), as applicable, or nuclear method ASTM D 2922.
2. Pavement Subgrade Areas and Building Slab Subgrade: Make at least one field density test for each one foot lift for every 2,500 sq. ft. of building subgrade area and 5,000 sq. ft. in pavement subgrade areas but in no case fewer than two tests per lift.
3. Utility Trench Backfill: Make at least one field density test for each 12 inch layer of compacted backfill for every 75 lineal feet of trench construction and at least one test per structure.
4. Topsoil Thickness: Test topsoil thickness one test per 5,000 sq. ft. of lawn area but in no case fewer than three tests.

B. Footing Subgrades: All footing subgrades shall be examined by an experienced geotechnical engineer or his representative immediately prior to placement of reinforcing steel. Auger and penetrometer testing, augmented by hand probing, shall be performed on all footings in accordance with the following:

1. Auger and penetrometer testing: One test for each 25 lineal feet of footing subgrade.
2. Probe rod testing: One test for each spread footing and one test for each 10 lineal feet of continuous footing.

C. If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction to meet the requirements specified herein. Re-testing of areas shall be at the Contractor's expense.

3.21 PROTECTION

A. Protect Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth required; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove waste material, trash, and debris, and legally dispose of it off Owner's property.

3.23 INSUFFICIENT FILL MATERIAL

A. If the quantity of grading material is insufficient to provide finished grade and subgrade elevations shown on the drawings, the Contractor shall obtain the required material from approved offsite borrow sources. No additional compensation will be made to balance the earthwork.

3.24 EXCESS CUT MATERIAL

A. If the quantity of grading material is in excess of the quantities necessary to provide subgrade and finish grade elevations indicated on the drawings, the excess material shall be disposed of offsite. No additional compensation will be made to balance the earthwork.

END OF SECTION 312300

SECTION 312315 – ROCK REMOVAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specifications, apply to this section.

B. Specification Section - "Earthwork"

1.2 SCOPE OF WORK

A. Removal of all rock materials discovered during excavation for the purpose of construction. Removal shall include drilling and/or blasting incidental thereto and disposal of excavated materials.

B. When necessary for prosecution of the Work, the use of explosives to assist rock removal may be exercised by Contractor provided this use is in compliance with all local, State, Federal and other Governmental regulations applying to transportation, storage, use and control of explosives.

C. Blasting as a method for rock removal shall be employed only with the approval of Owner and only after Contractor has exhausted alternate methods for removing rock such as ram-hammering, etc.

1.3 RELATED WORK

A. Specification Section - "Earthwork"

1.4 REFERENCES

A. NFPA 495 – Code for the manufacture, Transportation, Storage, and Use of Explosive Materials.

B. OSHA 2207 – Construction Industry Standards, Subpart T – Demolition.

1.5 QUALITY ASSURANCE

A. Geotechnical Firm – Geotechnical Engineer paid for in accordance with the requirements set forth in Specification Section “Quality Requirements” shall observe the testing of rock for compliance with definitions in Specification Section - "Earthwork." Geotechnical firm shall make report of all measurements of rock excavated in a written report format prior to submittal for payment by the Contractor.

B. Explosives Firm – Company specializing in explosives for disintegration of subsurface rock with documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for explosive disintegration of rock.
B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. All explosives shall be stored securely in compliance with all laws and ordinances, and all such storage places shall be clearly marked DANGEROUS EXPLOSIVES. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents. Locked storage shall be provided satisfactory to the Engineer, never closer than 1,000 feet from any road, building, or camping area.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Rock (Definition) – Rock is defined in Specification Section - "Earthwork."

B. Explosives – Shall be suitable for intended purposes at the Contractor's option subject to review by Owner and Engineer.

C. Delay Devices – Type recommended by explosives firm to be used as accessory to explosives. Subject to review by Engineer.

D. Blasting Mat – When the use of explosives is necessitated during prosecution of the Work, Contractor shall incorporate the use of blasting mats of type recommended by explosives firm to lessen the danger of projectiles occasionally resultant from blasting of rock.

PART 3 – EXECUTION

3.1 GENERAL

A. Rock excavation near existing utility lines and mains or other structures shall be conducted with utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of owner and by Contractor at his own expense.

B. Rock excavation for all structures and adjacent trenches under this contract and any other rock excavation directed by Owner shall be completed before construction of any structure is started in the vicinity.

C. Unless otherwise directed by Architect, excavated rock material shall be deposited onsite in non-structural areas and choked-in with soil and compacted. A minimum of 2' of compacted soil shall be spread over top of rocks.

D. Contractor shall correct unauthorized rock removal by backfill to grade with compacted crushed stone.

3.2 INSPECTION

A. Contractor shall coordinate potential rock removal and blasting with Owner to allow Owner to review site conditions prior to materials being classified as rock.

B. Contractor shall verify site conditions and note irregularities affecting work of this Section prior to performing any operations involving explosives.

C. Beginning work of this Section means acceptance of existing condition.

D. Rock shall be excavated 6 inches beyond the horizontal limits of excavation and 6 inches below footing grades or trench depths.

E. Space below grade for pipe shall then be backfilled with crushed rock or gravel or other approved materials and tamped to proper grade.

3.3 ROCK REMOVAL – MECHANICAL METHOD

A. Excavate for and remove rock by the mechanical method using equipment that has the draw bar pulling power or bucket curling force greater than that outlined in Specification Section - "Earthwork."

3.4 ROCK REMOVAL – EXPLOSIVES METHODS

A. If rock is uncovered requiring the explosives method for rock disintegration and removal, the Engineer shall be notified immediately so that the surface can be examined. (All materials removed shall be considered common excavation).

B. The Contractor shall notify any owners of adjacent buildings or structures, and any public utility owners having structures or other installations above or below ground, in writing prior to use of explosives.

C. Rock excavation by use of explosives shall be conducted with due regard for safety of persons and property in the vicinity and in strict conformance with requirements of local, State and Federal ordinance, laws and regulations governing the use of explosives.

D. Blasting shall be conducted so as not to endanger persons or property, and the blast shall be covered with mats or otherwise satisfactorily confined. The contractor shall be held responsible for and shall make good any damage caused by blasting or accidental explosions.

E. The Contractor shall permit only authorized and qualified persons to handle and use explosives.

F. Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.

G. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

H. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The Contractor shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

I. No explosives or blasting agents shall be abandoned.

J. Contractor’s employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals. Flags, or barricades, to ensure safety.

K. It shall be contractor’s responsibility to incorporate the use of seismic monitoring during rock

excavation, by use of explosives. Contractor shall maintain all seismic records and blasting logs to be furnished to Engineer upon request.

L. Disintegrate rock and remove from excavation.

M. Cut away rock at excavation bottom to form level bearing.

N. Remove shaled layers to provide sound and unshattered base for pipe and footing foundations.

O. Unless otherwise directed by Architect, excavated rock material shall be deposited onsite in non-structural areas and choked-in with soil and compacted. A minimum of 2’ of compacted soil shall be spread over top of rocks.

P. Contractor shall correct unauthorized rock removal or overbreak in accordance with backfilling and compaction requirements at his own expense.

3.5 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces and cavities formed by removed rock for inspection by Architect or his representative prior to new construction.

3.6 MEASUREMENT OF ROCK REMOVAL

A. All measurements for rock removal shall be made by the Geotechnical Engineer and reported to the Owner, Architect, and Engineer in written daily field reports submitted on a daily basis.

B. Measurements for trench rock excavation for piping installation will be made to the width of the pipe plus six inches (6”) on both sides of the pipe, but in no case shall the trench width be less than three feet (3’-00”). Vertical measurement of the excavated rock shall include only the area directly above the trench width to the top of the rock to include six inches below the invert of the pipe. No measurement for laying back sides of excavations or for additional excavation at concrete structures, junction boxes, manholes, inlets, etc. will be made. This excavation will be considered incidental to the installation.

C. Elsewhere excavate rock to a depth of 8” below proposed concrete slabs and pavements, 24” outside of concrete work for which forms are required, 12” outside of perimeter footing, and 12” below finished grade in areas to receive landscaping and seeding. All measurements shall be based on these dimensions.

D. Quantities shall be verified by the Architect and Engineer.

3.7 SUBMITTAL FOR PAYMENT FOR ROCK REMOVAL

A. All submittals for payment for rock removal shall be made in the same month’s or the next month’s pay application. Application for payment for rock removal which exceeds the second pay application is subject to denial by Architect and Owner.

END OF SECTION 312315

SECTION 312500 - EROSION, SILTATION AND DUST CONTROL

1.1 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specification Sections, apply to this section.

1.2 SCOPE

A. This work shall consist of control measures during construction until final acceptance to control water run off, erosion, siltation, and unreasonable amounts of dust. Permanent measures, which will remain in place after completion, are shown on plans. Temporary measures are also shown on plans or required by notes on plans or project specifications. Measures to adequately control erosion and siltation throughout project construction, at different stages of construction, are required whether or not shown on the plans. This control shall be accomplished through the use of berms, dikes, sediment basins, sediment barriers, sediment traps, slope drains, grasses, and other devices.

1.3 GENERAL

A. Comply with all applicable federal, state (GA Erosion & Sedimentation Control Act) & local ordinances.

B. In general, the work required to accomplish the planned facilities will be performed in a way which will minimize even temporary increase in suspended matter or pollutants in local streams or storm drains.

C. Clearing and grubbing operations shall be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages, as described in Specification Section "Site Clearing."

D. During construction the Contractor shall maintain careful scheduling and performance to ensure that land stripped of its natural ground cover is exposed only in small quantities and for durations not exceeding 14 days. Areas left exposed for periods greater than 14 days shall be seeded with temporary grass and/or mulched.

E. The erosion control measures described herein shall be continued until the permanent drainage facilities have been constructed and until grass on planted slopes is sufficiently established to be an effective erosion deterrent.

F. The Contractor shall be responsible for maintenance of erosion control measures until final stabilization of the site, and the Contractor shall remove and dispose of erosion control devices after maintenance responsibilities are concluded.

1.4 SEDIMENT BARRIERS

A. Temporary sediment barriers shall be installed where shown on the plans or directed by the Engineer. Sediment barriers shall be fabric fence. Sediment shall be removed periodically during construction to ensure continued satisfactory performance as intended.

1.5 TEMPORARY GRASSING AND MULCHING

A. Where staged construction or other conditions prohibit the completion of the project in a continuous manner the Contractor shall temporary grass and/or temporary mulch all areas disturbed.

B. Temporary grass shall consist of sowing a quick growing species of grass suitable to the area and season. Seeding shall be done in accordance with the Landscape Work Section and the Drawings.

C. Temporary mulch shall be applied to deter surface erosion. The mulched areas may be placed on slopes as steep as 2:1 using a tractor to imbed the mulch into the slope.

1.6 RUN OFF, EROSION AND SEDIMENTATION CONTROLS

A. During construction, route run off through sedimentation barriers, check dams and sediment basins.

B. The Contractor shall maintain sedimentation devices in functional condition. Temporary sediment storage areas, sediment barriers, sediment traps, and check dams shall be cleaned out when these devices are at last 50 percent of their capacity. Defective materials shall be replaced.

C. Silts and deposits removed from control barriers shall be placed in eroded areas, compacted and stabilized with vegetation.

D. The Contractor shall establish sediment barriers at the toe of slopes under construction. These barriers may be relocated and reused after permanent slope stabilization becomes established. As they are relocated, any defective material in the barrier shall be replaced. In addition, all debris and silt at the previous location shall be removed.

1.7 DUST CONTROL

A. Dust shall be controlled by keeping dry areas damp by sprinkling with water, or other means.

1.8 EROSION CONTROL BLANKETS

A. 4:1 – 3:1 Slopes: Use straw fiber blankets sewn between two biodegradable, jute/scrim nets. Blankets shall be BioNet S150BN as manufactured by North American Green, Curlex II FibreNet as manufactured by American Excelsior Company, or Biodegradable Landlok S2 as manufactured by SI Geosolutions.

B. 2½:1 and Steeper Slopes: Use erosion control fabric intended for permanent installation on slopes. Fabric shall have (2) U.V. stable nets. Top net shall be 5 lb. black and bottom net shall be 3 lb. black. Nets shall be stitched on 1½" centers. Fabric shall be P300P as manufactured by North American Green or pre-approved equal.

C. Waterways and Swales: Use blankets of curled wood or coconut fiber matrix sewn between two heavy-wieght, UV stabilized nets. Blankets shall be C125 as manufactured by North American Green, Curlex III as manufactured by American Excelsior Company, or Landlok C2 as manufactured by SI Geosolutions.

1.9 FILTER FABRIC

A. All filter fabric to be placed under rip-rap aprons shall be Georgia Department of Transportation Class 'C' fabric. Fabric shall be 180-N as manufactured by Mirati, 4552 as manufactured by Amoco, N07 as manufactured by Geolon or FX-7OS as manufactured by Carthage. Fabric shall be secured to ground per manufacturer's recommendations.

1.10 RIP-RAP STONE

A. All rip-rap stone shall meet Georgia Department of Transportation Specifications.

END OF SECTION 312500

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 with termiticide.

B. Related Sections:
   1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of termite control product.
   1. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For termite control products, from manufacturer.

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.

D. Warranties: Sample of special warranties.

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.

B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products from single source from single manufacturer.

1.6 PROJECT CONDITIONS

A. 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.

B. 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. 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 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Corporation, Agricultural Products; Termidor.
   b. ENVU: Premise 75.
   c. FMC Corporation, Agricultural Products Group; Talstar.
   d. Syngenta; Demon.
2. 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 requirements, 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: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers and piers; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Masonry: Treat voids.
4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

This page intentionally left blank

B. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of joint devices.

C. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

E. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimum specified. Machine placement must product curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.4 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

C. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints at 15 feet on center. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
2. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

D. Construction Joints: Place construction joints at end of placements and at locations when placement operations are stopped for a period of more than 1/2-hour, and at every third contraction joint.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

E. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

3.5 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architects.

E. All horizontal surfaces shall be given a broom finish as described in this Project Manual.

F. All vertical surfaces and non-walking surfaces shall be given a rubbed finish as described in Specification Section "Cast-in-Place Concrete."

3.6 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Allow testing company to drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Sweep concrete curb and gutter and pressure wash sidewalks to remove stains, discolorations, dirt and other foreign material just prior to final inspection. Remove exposed fiber mesh from concrete after concrete has cured.

END OF SECTION 321313

SECTION 321313 - CONCRETE PAVING, SIDEWALKS & CURB AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specifications, apply to this section.

1.2 DESCRIPTION OF WORK

A. Extent of concrete curb and gutters and concrete paving is shown on the drawings.

B. Prepared subgrade is specified in Specification Section "Earthwork."

C. Concrete and related materials are specified herein.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C94 requirements for production facilities.

1.4 SUBMITTALS

A. Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete.

1.5 JOB CONDITIONS

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

B. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

B. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

C. Expansion Joint Materials: Recycled rubber one-half inch in thickness.

2.2 CONCRETE MIX, DESIGN AND TESTING

A. Design mix to produce normal-weight concrete consisting or Portland cement, aggregate, air-entraining admixture and water to produce the following properties:

1. Compressive Strength:
   a. Pedestrian sidewalks, plazas, courtyards and curb and gutter: 3000 psi
   b. Vehicular driveways: 4000 psi
2. Compressive strength shown above is required minimum at 28 days, unless otherwise noted.
3. Slump Range: 3” to 5”.
4. Air Content: 5% to 8%.
5. Fiber Mesh: 1.5 pounds polypropylene fiber per cubic yard of concrete for paving and sidewalks.
6. NO WATER SHALL BE ADDED ON-SITE.
7. Curing compound shall be used on all concrete paving, sidewalks and curb and gutter. Curing compound shall be 1100-Clear as manufactured by W.R. Meadows or equal.

2.3 REINFORCEMENT

A. Shall be as indicated on the drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and area ready to receive paving.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines with gutter pitched to drain in locations indicated by the grades shown on the plans. Rigidly brace and secure all forms. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 CONCRETE PLACEMENT

A. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

B. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of joint devices.

C. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

E. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimum specified. Machine placement must product curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.4 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

C. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints at 15 feet on center. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
2. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

D. Construction Joints: Place construction joints at end of placements and at locations when placement operations are stopped for a period of more than 1/2-hour, and at every third contraction joint.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

E. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

3.5 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architects.

E. All horizontal surfaces shall be given a broom finish as described in this Project Manual.

F. All vertical surfaces and non-walking surfaces shall be given a rubbed finish as described in Specification Section "Cast-in-Place Concrete."

3.6 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Allow testing company to drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Sweep concrete curb and gutter and pressure wash sidewalks to remove stains, discolorations, dirt and other foreign material just prior to final inspection. Remove exposed fiber mesh from concrete after concrete has cured.

END OF SECTION 321313

SECTION 321316 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specification Sections, apply to this section.

B. Georgia Department of Transportation Specifications, latest edition.

1.2 RELATED SECTIONS

A. Specification Section "Earthwork" for subgrade and aggregate base courses.

1.3 DESCRIPTION OF WORK

A. Extent of asphalt concrete paving work is shown on the drawings. This work shall include the base and asphaltic concrete paving of the thicknesses and types shown on the drawings for all areas noted on the plans to be paved.

1.4 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.5 JOB CONDITIONS

A. Base course may be placed when air temperature is above 30 F (-1 C) and rising.

B. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations. All materials shall meet Georgia Department of Transportation Specifications.

B. Base Course: Crushed aggregate base conforming to the Georgia Department of Transportation Specifications.

C. Asphalt Cement: AASHTO M 226 (ASTM D 3381) for viscosity-graded material and AASHTO M 20 (ASTM D 946) for penetration-graded material.

D. Prime Coat and Tack Coat: Tack coat shall conform to the Georgia Department of Transportation Specifications.

E. On Site Parking Stall Marking Paint:

1. Modified acrylic latex emulsion. Federal Specification No. TT-P-1952B.

F. Crosswalks, stop bars and arrows and all striping on public roadway shall be thermoplastic markings per Georgia D.O.T. Specification Section 653.

2.2 ASPHALT-AGGREGATE MIXTURE

A. Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with Georgia Department of Transportation Standard Specification Section 400 and the Drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Compact base course to 100 percent of its maximum dry density as determined by the Modified Proctor ASTM D 1557.

B. Proof roll prepared base surface to check for unstable areas and areas requiring additional compaction immediately prior to paving.

C. Notify Engineer of unsatisfactory conditions. Do not begin paving work until deficient base areas have been corrected and are ready to receive paving.

D. Prime Coat and Tack Coat: Apply in accordance with Ga. Department of Transportation Specification Sections 412 and 413.

3.2 PLACING MIX

A. Base Course: Place base course on a prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness, maintain optimum moisture content for compacting base material during placement operations.

B. Asphaltic Concrete: Place asphalt concrete mixture on prepared surface, spread and strike-off. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness. Placement and compaction shall meet Georgia Department of Transportation Specification Section 402.

C. Paver Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course.

3.3 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. The layers shall be rolled in accordance with Georgia Department of Transportation Specification Section 400.

C. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

D. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

E. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

F. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

G. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

H. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

I. Erect barricades: to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 TRAFFIC AND LANE MARKINGS

A. Cleaning: Sweep and clean surface to eliminate material and dust.

B. Pavement Striping within Parking Area Excluding Crosswalks, Stop Bars and Arrows: Use traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding (Fed. Spec. No. TT-P-1952B). Striping lanes shall be 4-inches in width.

C. Color: On-Site Parking & Arrows: White
Handicap Accessible Parking: Blue
Other On-Site Striping: Refer to Drawings for color, size and type

D. Do not apply traffic and lane markings until layout and placement has been verified with Engineer.

E. Apply pavement markings with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

F. Crosswalks, stop bars and arrows and all striping on public roadway shall be thermoplastic markings per Georgia D.O.T. Specification Section 653.

3.5 FIELD QUALITY CONTROL

A. General: Testing Company shall test aggregate base density and in-place asphalt concrete courses for compliance with requirements for compaction, thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades before further construction work is performed. An experienced geotechnical engineer shall observe the proof-rolling of the aggregate base immediately prior to paving. One copy of results of all Compaction Test and observations of proof-rolling shall be submitted to Owner, Architect and Engineer.

1. Testing company shall perform field density tests in accordance with ASTM D 2937 (drive cylinder method), ASTM D 2167 (rubber balloon method), as applicable, or nuclear method ASTM D 2922.
2. Pavement Base Material: Make at least one field density test for each 5,000 sq. ft. of pavement base area.

C. Testing company shall perform a minimum of 10 asphalt core test at locations directed by Engineer.

D. Thickness: In-place compacted thickness will not be accepted if exceeding following allowable variation from required thickness:

1. Base Course: 1/2"
2. Binder & Surface Course: 1/4"

E. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be accepted if exceeding the following tolerances for smoothness.

1. Wearing Course Surface: 3/16".

F. Check surface areas at intervals as directed by Engineer.

G. Correcting Deficient Paving: If test results determine that the average thickness of base or binder and surface course exceeds the allowable variation, the Contractor shall resurface the entire paving area with surface course materials at no expense to the Owner. The minimum thickness for asphaltic resurfacing shall be 1 inch.

END OF SECTION 321316

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Galvanized steel chain link fence and gates shown on the Drawings.
2. Refer to site Layout Plans for fencing heights and gate locations and sizes.
3. Cantilever gates and electrically controlled operators.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 31 Section “Site Clearing” for clearing for fence installation.
2. Division 31 Section "Earthwork" for filling and grading work.

1.3 SUBMITTALS

A. Product Data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gateposts, fabric, gates, operators, and accessories. Provide samples (6 inch sections) of fence fabric and typical line posts for review.

B. Shop Drawings showing location of fence, gates, each post, and details of post installation, extension arms, gate swing, hardware, and accessories.

1.4 QUALITY ASSURANCE

A. The Fence Material Manufacturer shall visit the job site and certify in writing that all materials and installation are in accordance with the Contract Documents and with the manufacturer’s written instructions.

B. Single-Source Responsibility: Obtain chain link fences and gates as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

1.5 PREINSTALLATION CONFERENCE

A. Conduct conference at Project site to comply with requirements in Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Contractor shall engage services of licensed surveyor to provide horizontal control and layout for fencing.

B. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements. Provide and install stakes for fence layout for review by Owner/Architect prior to beginning

installation of posts. Stake all corners, gate locations, points of deflection and along straight runs at 100-foot intervals.

C. Contractor shall clear and remove trees, brush, etc. as required to complete fence installation.

PART 2 - PRODUCTS

2.1 FABRIC

A. Selvage: Fabric 72 inches high and over with 2 or 1¾ inch mesh shall be knuckled at one selvage and twisted at another. All mesh 60 inches high and under shall be knuckled at both selvages.

B. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with ASTM A392 Chain Link Fence Manufacturers Institute (CLFMI) CLF 2445and requirements indicated below.

C. Fencing Mesh and Wire Schedule:

1. 2-inch mesh, 9 gage wire fabric shall be used for all permanent fencing.

2.2 FINISHES

A. Finish Coating: ASTM A392, Type II, Class I, zinc-coating applied after weaving.

1. Fabric: Not less than 1.2 oz. zinc per square foot.
2. Framing: Not less than 1.8 oz. zinc per square foot.

2.3 FRAMING

A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches.

B. Strength requirements for posts and rails conforming to ASTM F 669.

C. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in Inches	Outside Diameter (OD) in inches	Type I Steel	Type II Steel
1	1.315	1.68	1.35
1-1/4	1.660	2.27	1.84
1-1/2	1.900	2.72	2.28
2	2.375	3.65	3.12
2-1/2	2.875	5.79	4.64
3	3.500	7.58	5.71
3-1/2	4.000	9.11	6.56
4	4.500	10.79	____
6	6.625	18.97	____
8	8.625	28.55	____

D. Steel Framework, General: Posts, rails, braces, and gate frames.

1. Type I Round Posts: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.
2. Type II Round Posts: Manufactured from steel conforming to ASTM A 569 or A 446, grade D, cold formed, electric welded with minimum yield strength of 50,000 psi and triple coated with minimum 0.9 oz. zinc per sq. ft. after welding, a chromate conversion coating and a clear polymer overcoat. Corrosion protection on inside surfaces shall protect the metal from corrosion when subjected to the salt spray test of ASTM B 117 for 300 hours with the end point of 5 percent Red Rust.

E. Roll-Formed Steel Shapes: C-sections, produced from structural steel conforming to ASTM A570, Grade D. Comply with ASTM F 1043, Material Design Group II, with minimum yield strength of 45,000 psi (310 MPa); and the following coating requirements:

1. Coating: Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq.m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq.m) zinc coating per ASTM A 653/A653M.

F. Steel posts for fabric heights up to 6 feet:

1. End, corner, and pull post
   a. Up to 6 feet: 2.875 inch OD Type I or II steel pipe.
2. Line or intermediate posts
   b. Up to 6 feet: 2.375 inch OD Type I or II steel pipe or rolled-formed steel C-section equivalent.

G. Steel posts for fabric heights over 6 and not exceeding 12':

1. End, Corner, Pull Post 2.875 O.D. Type I or II
2. Line or intermediate Post 2.375 O.D. Type I or II or rolled-formed steel C-section equivalent.

H. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel pipe posts:

1. Steel posts for fabric height of 6 feet or less and gate leaf width:
   a. 4 to 12 Feet: 3.00-inch OD pipe weighing at least 5.71 lb per ft.

I. Sliding Gate Posts:

1. All Leaf Widths:
   a. Type I Posts: Round; 4.00 inch outside diameter pipe, 9.10 pounds per lineal foot.
   b. Type II Posts: 4.00 inch outside diameter pipe, 6.56 pounds per lineal foot.

J. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post. Provide top rail for all line posts.

1. Round Steel: 1.660-inch OD Type I or II steel pipe or rolled formed steel 1.625"x 1.25" channel-shaped top rail.

K. Center and intermediate rails shall be the same as top rail.

2.4 FITTINGS AND ACCESSORIES

A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.

1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
2. Aluminum: Die cast conforming to ASTM B 26, aluminum-alloy 360 or sand cast conforming to ASTM B 85, aluminum-alloy 365, ZG61A, or Tenzalloy.

B. Tie Wires: 12 gage (0.106 inch diameter) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating of surface area in accordance with ASTM A 641, Class 3 or 9 gage (0.106 inch diameter) aluminum wire alloy 1100-H14 or equal, to match fabric core material.

C. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 3/8-inch diameter rod and adjustable tightener. Provide manufacturers standard galvanized steel or cast iron or cast aluminum cap for each end.

D. Post and Line Caps: Provide weather tight closure cap for each post. Provide line post caps with loop to receive top rail.

E. Tension or Stretcher Bars: Hot-dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross-section of 3/16 inch by 3/4 inch and minimum 1.2 oz. zinc coating per sq. ft. of surface area. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

F. Tension and Brace Bands: Minimum 3/4-inch wide hot-dip galvanized steel with minimum 1.2 oz. zinc coating per sq. ft. of surface area.

1. Tension Bands: Minimum 14 gage (0.074 inch) thick.
2. Tension and Brace Bands: Minimum 12 gage (0.105 inch) thick.

G. Concrete: Provide concrete consisting of Portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi. Use at least 4 sacks of cement per cu. yd., 1-inch maximum size aggregate, maximum 3-inch slump, and 2 to 4 percent entrained air.

H. Tension Wire: 7 gage steel, metallic-coated coil spring wire, in accordance with ASTM A 824, located at bottom of fence.

2.5 GATES

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8 feet apart unless otherwise indicated.

1. Provide same fabric as for fence unless otherwise indicated. Install fabric with tension bars and bands at vertical edges and with tie wires at top and bottom edges.

2. Install diagonal cross-bracing consisting of 3/8 inch-diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.

B. Swing Gates: Comply with ASTM F 900.

1. Steel: Gates up to 8 feet wide
2. Up to 6 feet high: Fabricate perimeter frames of minimum 1.660 inch OD Type I or II steel pipe or 1.90" o.d. tubular shaped steel.

C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:

1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-deg gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 foot nominal height.
2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
3. Keeper: Provide keeper for gates, which automatically engages gate leaf and holds it in open position until manually released.
4. Gate Stops: Provide gate stops for the double gates, consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

D. Slide Gate Operator

1. Furnish and install heavy duty slide gate operator, Viking H-10NX, I HP, single phase 226/230 volts or approved equal. Furnish with phone app (i-phone), hard wired low key pad with goose neck stands, UL 325 Infra-Red Outdoor Safety Thru-Beam Set for opening and closing and detection loops. Operator Shall have a 5 Year Commercial Warranty.

   Install operation on concrete pad in accordance with manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final clearing and grading is completed, unless otherwise permitted. Install fabric with knuckled edge up and twisted edge at bottom where applicable.
B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

1. If not indicated on drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
3. Do not damage geotextile fabric supporting retaining walls. Fabric shall be cut as required to allow advancement of hold for fence post.

C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space maximum 10 feet o.c., unless otherwise indicated.

1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
   a. Unless otherwise indicated, extend concrete footings 1 inch above grade and trowel to a crown to shed water.

D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

E. Brace Assemblies: Install braces at end and gateposts and at both sides of corner and pull posts. Locate horizontal braces at mid height of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Fabric: Leave approximately 1 inch between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to post, rails, and tension wires. Install fabric on security side of fence for general fencing and anchor to framework so that fabric remains in tension after pulling force is released.

G. Tension or Stretcher Bars: Thread through or clamp to fabric 4 inches o.c., and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.

H. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.

   1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c. Tie fabric to gate frames 6" o.c.

I. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

J. Tension Wire: Tension wire to be stretched taut and secured to each line post with a tie wire and secured to each terminal post with a brace band prior to installation of fence fabric. Secure fence fabric to tension wire with 9 gauge hog rings at 18 inches on center.

3.2 GATE INSTALLATION

A. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.3 GATE OPERATOR INSTALLATION

A. Slide Gate Operators: Install gate operators in accordance with manufacturer recommendations. Installation shall include photo eyes and detection loops.

3.4 GROUNDING AND BONDING

A. Fencing Grounding: Install at maximum intervals of 750 feet.

   1. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connector conductor to each fence component at the grounding location.

B. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

1. Connections: Make connections so possibility of galvanic action or electrolysis is minimized.

END OF SECTION 323113

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 329000 - LANDSCAPE WORK

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 DESCRIPTION

A. This section includes provisions for the following items:

1. Temporary seeding and mulching including use of sand
2. Permanent seeding and mulching including the use of Polyacrylamide (PAM) materials
3. Soil Amendments
4. Landscaping with trees, shrubs and etc.
5. Sodding Landscape Areas
6. Herbicide and Insecticide Treatment.

B. The following sections contain requirements that relate to this section:

1. Division 1 Section "Summary of Work”
2. Section 312300 "Earthwork"
3. Section 329210 "Finishing Lawn and Landscape Areas"

1.3 SOURCE QUALITY CONTROL

A. Contractor shall schedule pre-installation meeting prior to beginning any final grassing, seeding or sodding.

B. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.

C. Do not make substitutions: If specified Sod material is not obtainable, submit proof of non-availability to Architect, together with proposal for use of equivalent material.

D. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions contract and Division 1 Specification Sections.

B. Plant and Material Certifications and Analysis:

1. Certificates of inspection as required by governmental authorities.
2. Manufacturers or vendor's certified analysis for soil amendments and fertilizer materials.
3. Label data substantiating that planting materials comply with specified requirements.
4. Analysis of soil materials including sand.

C. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.5 PREINSTALLATION CONFERENCE

A. Contractor shall conduct preinstallation conference at project site to comply with requirements in Division I Section “Project Management and Coordination.”

1.6 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time delivery so that sod will be placed or planted within 24 hours after harvesting. Protect sod against drying and breaking of rolled strips.

C. Trees and Shrubs: Store trees and shrubs in secure area until planting. Protect from extreme weather.

1.7 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to sod growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.8 SEQUENCING AND SCHEDULING

A. Proceed with, and complete, landscape work as rapidly as portions of site become available.

B. Temporary seeding will be required on the disturbed areas of the site. Temporary seeding shall consist of planting seed and mulching all disturbed areas left exposed for more than 14 days.

C. The Contractor shall till all areas that were temporarily grassed to not less than 6 inches and recondition soil as provided herein prior to establishing permanent vegetation.

D. The Contractor shall perform all necessary work including, but not limited to, fine grading, hand raking, fertilizing, pulverizing, seeding, sodding, landscaping, etc.

E. Refer to the Landscape Plans and Erosion Control Plans for areas to be planted with trees and shrubs, areas to be sodded, and areas to be seeded.

PART 2 - PRODUCTS

Topsoil: Topsoil will be respread over areas to be landscaped under Division 31 Section "Earthwork."

2.1 SOIL AMENDMENTS:

A. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates, grounds so that not less than 90 percent passes a 10 mesh sieve and not less than 50 percent passes a 100-mesh sieve.

B. Aluminum Sulfate: Commercial grade.

C. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs, or plants and consisting of the following:

1. Shredded and treated cypress mulch with landscape fabric weed barrier underlayment including staples.

D. Commercial Fertilizer: Complete fertilizer of neutral character with some elements derived from organic sources and containing the following percentages of available plant nutrients:

1. For lawns, provide fertilizer with percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 sq. ft. of lawn area and not less than 4 percent phosphoric acid and 2 percent potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth; at least 50 percent of nitrogen to be organic form. Fertilizer for lawn areas shall be a complete formula 10-10-10 or approved equal.

E. Sand: Coarse sand meeting the Georgia Department of Transportation Specification Section 801.2.02.

2.2 GRASS MATERIALS

A. Sod: Provide strongly rooted sod, not less than 1 year old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 3/4 inch (plus or minus 1/4 inch), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

1. Provide sod for lawn areas of uniform pad sizes with maximum 5 percent deviation in either length of width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected. Sod shall be TifTuf Bermuda.

B. Seed: Seed shall be delivered to the site in the original sacks as received from the producer, and each sack shall be tagged in accordance with the agricultural seed laws of the United States and State of in which the project is located. Each sack shall be tagged showing the dealers guarantee as to the year grown, percentage of purity, percentage of germination and the date of the test by which the percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.

1. Any seed delivered prior to use, shall be stored in such a manner that it will be protected from damage by heat, moisture, rodents, or other cause.
2. Seed Mixture:
   a. Lawn Areas Not Sodded: 87 lbs. minimum of Common Bermuda Seed per acre plus the appropriate temporary seed mixture shown in the grassing schedule on the Drawings.
   b. Refer to grassing schedule on Drawings for planting mixture and permanent vegetative cover required for slope areas.
   c. Detention Pond: Seed mix comprised of plants specified on Drawings.

C. Wood Pulp Fiber Mulch: Wood pulp fiber mulch for hydroseeding shall meet the requirements of Section 718.02 of the Georgia Department of Transportation Standard Specifications, latest edition. Wood fiber mulch shall be applied at the rate of 1000 pounds per acre.

2.3 TREES AND SHRUBS

A. Trees and shrubs shall be free from disease and pests, and shall comply with the latest edition of the Publication ANSI Z60.1 "American Standards For Nursery Stock," by the American Association of Nurserymen.

2.4 WEED BARRIER

A. Weed barrier fabric shall be installed beneath mulch in all shrub bed and mulch bed areas. Weed barrier shall be 5 oz./sq. yd. fabric as manufactured by Dewitt, Fabriscape or Rolanka International.

PART 3 - EXECUTION

3.1 PREPARATION, GENERAL

A. Mix specified soil amendments and fertilizers with topsoil at rates specified on the drawings. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

B. For lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

1. Mix lime with dry soil prior to mixing of fertilizer.
2. Prevent lime from contacting roots of acid-loving plants.

3.2 PREPARATION FOR TEMPORARY GRASSING

A. Where temporary grass is to be planted, prepare soil for planting as follows: Till to a depth of not less than 6 inches. Apply soil amendments and initial fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extaneous matter.

B. Apply specified commercial fertilizer (10-10-10) at 1500 pounds/acre and thoroughly mix into upper 2 inches of topsoil along with Lime applied at the rate of 2 tons per acre. Delay application of fertilizer if lawn planting will not follow within a few days. All seeded areas shall be mulched with wheat straw at the rate of 2-1/2 tons per acre.

3.3 PREPARATION FOR PLANTING LAWNS

A. Where lawns are to be planted, prepare soil for lawn planting as follows: Till in all temporary vegetation to a depth of not less than 6 inches. Apply soil amendments and initial fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

1. Prior to preparation of planting areas, remove existing grass, vegetation and turf. Do not turn existing vegetation over into soil being prepared for lawns.
2. Allow for sod thickness in areas to be sodded.
3. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.

B. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Fine grading shall include, but not be limited to, pulverizing with a Gill Pulverizer or equal equipment and shaping with a tractor and box blade and hand rakes. Remove stones, pebbles, earth clods, etc. larger than 3/4 inch diameter. Coordinate work with Owner and requirements of Section 32 "Finishing of Lawn and Landscape Areas."

C. Moisten prepared lawn areas before sodding or seeding if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

D. Restore lawn areas to specified condition, if eroded or otherwise disturbed after fine grading and prior to planting.

3.4 SODDING

A. Refer to Landscape Plans for areas to be sodded.

B. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen. Do not plant damaged or dry sod.

3.5 REMOVE NETTING FROM SOD PRIOR TO PLACEMENT ON ALL AREAS OF THE SITE.

A. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

1. Anchor sod on slopes with wood pegs to prevent slippage.

B. Water sod thoroughly with a fine spray immediately after planting.

3.6 HYDROSEEDING

A. Hydroseeding: All lawn and slope areas not to be landscaped with trees and shrubs or sod shall be hydroseeded. Seed shall be mixed with wood pulp fiber mulch and applied in a slurry. The slurry mixture shall be agitated during application to keep the ingredients thoroughly mixed. The mixture shall be spread uniformly over the area within one hour after being placed in the hydroseeder.

B. The mixing and application of mixture shall conform to the requirements of Section 700 of the Georgia Department of Transportation Specifications, latest edition.

3.7 PLANTING TREES AND SHRUBS

A. Prepare shrub and tree pits as indicated on the drawings. Place topsoil mixture in pit and place plants to proper height. Backfill around plants creating saucer. Stake and mulch plants as indicated.

3.8 PLANTING STORMWATER POND AREAS: Refer to Landscape Plans for planting requirements in stormwater ponds.

3.9 MAINTENANCE OF LAWN AREAS

A. Begin maintenance immediately after planting.

B. Begin maintenance of seeded grass, sod, trees and shrubs immediately after each area is planted. Continue until 90 days after Substantial Completion. If seeded grass and sodded grass is not fully established at this time, continue maintenance until an acceptable lawn is established.

C. Maintain lawns and plants by watering, fertilizing, weeding, applying herbicides and insecticides, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

D. Contractor shall include in the base bid furnishing and rolling all sodded areas two separate times with a one ton roller and topdressing these areas one time with topdresser spreader to a depth of ¼" with sand specified herein. Topdressing shall be done between the first and second rolling. Thoroughly dampen (not wet) sodded areas prior to second rolling. Notify Architect 48 hours prior to beginning topdressing

E. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep planted areas uniformly moist to a depth of 4 inches (100 mm).

1. Water grass/shrubs/groundcover at the minimum rate of 1½ inch per week.
2. Furnish and install slow-release watering bags on all newly planted trees. Monitor the bags and refill on a regular basis.

F. Mow grass as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

G. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.

H. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. of lawn area.

3.10 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.11 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, Architect will, upon request, make an inspection to determine acceptability.
1. Landscape work may be inspected for acceptance in portions as agreeable to Architect, provided each portion of work offered for inspection is complete, including maintenance.
   a. When inspected work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable.
2. As soon as the grassed areas have become established, a final inspection of the work will be made, provided a written request for such inspection is given to the Owner. If the work is found to be satisfactory and in accordance with all requirements of the contract documents, the work will be accepted.

a. It shall be the Contractor's responsibility to provide satisfactory Growth and Coverage. Growth and Coverage on areas grassed as specified shall be considered to be in reasonably close conformity with the intent of the Contract when the vegetation, exclusive of that from seed not expected to have germinated and shown growth at the time, has reached a point of maturity such that each area shows a satisfactory visible growth with not bare spots larger than one square foot. Bare spots shall be scattered and the total bare areas should not comprise more than 1/100 of any given area.

b. Areas that fail to obtain a satisfactory growth and coverage shall be regrassed, at no additional cost to the Owner, until a satisfactory stand is established.

c. All seeded and sodded areas are to be established a minimum of 60 days prior to request for substantial completion acceptance.

END OF SECTION 329000

SECTION 329210 – FINISHING LAWN AND LANDSCAPE AREAS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specification Sections, apply to this work.

B. Specification Section - "Earthwork"

C. Specification Section - "Landscape Work"

1.2 DESCRIPTION

A. This section includes provisions for the following items:

1. Fine grading of all areas to be landscaped.
2. Cleanout of sediment filled areas around inlets and in temporary storage areas.
3. Finish grade at all sidewalks and paved areas.
4. Finish grade at all storm structures, electrical manholes, sanitary manholes and curbs.
5. Finish grades of swales, berms, landscape islands, and all other yard areas.

B. The following sections contain requirements that relate to this section:

1. Specification Section "Earthwork"

1.3 QUALITY CONTROL

A. General: Review plans to familiarize equipment operators, foremen, and superintendent of requirements for final grading.

B. Visit site to review conditions prior to starting work. Starting work shall mean that conditions are acceptable as they exist.

1.4 JOB CONDITIONS

A. Utilities: Determine location of underground utilities, manholes, water valves, sanitary cleanouts, and perform work in a manner which will avoid possible damage. Hand rake and hand excavate, as required.

1.5 SEQUENCING AND SCHEDULING

A. Do not begin finish grading operations until conditions allow for permanent vegetative covers to be planted.

B. Proceed with final grassing and mulching as rapidly as portions of the site are fine graded.

C. Maintain finish grading and final grassing to prevent washing and rill erosion until a complete stand of grass is growing and accepted by the Owner.

PART 2 – PRODUCTS: Not Used.

PART 3 – EXECUTION

3.1 PREPARATION, GENERAL

A. Review plans to identify low points, catchment areas, swales, conveyances, berms, diversions, detention ponds, cut and fill slopes, etc.

B. Review graded site to identify all areas which hold water or store sediment.

C. Review plans to identify all paved areas, utility boxes, manholes, sanitary cleanouts, storm water cleanouts, valve boxes, utility vaults, etc.

D. Review installed location of each item and check elevations as necessary to identify each item that needs to be adjusted to grade and coordinate rework of paving and utilities or mark utility for future grade adjustments.

3.2 LOW POINTS & CATCHMENT AREAS

A. Clean out around each inlet to ensure that sediment build up from construction is removed and firm ground is exposed.

B. Backfill around all inlets to compensate for removal of sediment and to build up the grade to allow positive drainage to the inlet.

C. In low points and catchment areas formed by a series of inlets, transition grade between inlets and at each end of the catchment areas to allow for high points that break the water to the inlet.

3.3 SWALES AND CONVEYANCES

A. Remove all sediment build up from construction from all swales prior to beginning work.

B. Smooth grade swales and conveyances shown on plans to remove high points and backfill low points.

C. Swales and conveyances shall be graded to prevent standing water.

D. Swales within catchment areas shall be graded with high points between inlets as described above.

3.4 BERMS & DIVERSIONS

A. Grade berms and diversions to the width and height indicated on the plans.

B. Finish grading of berms and diversions shall include correcting all points weakened during construction activities by concentrated runoff, construction traffic, etc.

C. Finish grading of berms and diversions shall include rounding out the tops of berms to prevent sharp grade transitions which will hamper later maintenance.

3.5 SEDIMENT STORAGE AREAS

A. Finishing of sediment storage areas shall include dewatering.

B. Contractor shall provide pumps, etc. to accomplish dewatering.

3.6 CUT & FILL SLOPES

A. Smooth grade and compact all cut and fill slopes to remove all rill erosions and washes.

B. Reapply erosion control blankets, as necessary.

3.7 GRADING ADJACENT PAVED AREAS

A. Finish grading adjacent paved areas, curbs and walkways shall be subject to the following criteria:

1. Sodded Areas: Set 1- ½" below.
2. Seeded Areas: Set ½" below.

3.8 YARD AREAS

A. Yard areas shall be graded to avoid any sudden changes in grade, waviness, moguls, hillocks, low points, etc., unless specifically noted on the plans.

B. All yard areas shall be graded to allow lawn maintenance equipment to freely operate without "skinning" the ground or jostling and bounding the operator.

3.9 MANHOLES, INLETS, VAULTS, VALVE BOXES & CLEANOUTS

A. All manholes, inlets, valve boxes and cleanouts shall be set flush with finish grade unless specifically detailed to protrude above finished grade.

B. Finish grader shall coordinate with installer to correct faulty grades or grade to top elevations of structures.

C. Water Vaults shall be set above grade to prevent water from entering and flooding these vaults.

D. Electrical and telecommunications vaults shall be set flush with grade, unless otherwise indicated on electrical drawings.

END OF SECTION 329210

SECTION 331116 - SITE WATER DISTRIBUTION & FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Front End Specification Sections, apply to this section.

1.2 SCOPE

A. This section of the Specifications describes products to be incorporated into the water lines buried 5 feet beyond the building and requirements for the installation and use of these items. The Contractor shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications. The Contractor shall be responsible for paying all costs for this work. All materials and installation shall conform to City of McDonough Standards and Details and the Drawings and Specifications. Contractor shall furnish and install all other water and fire main lines, valves, post indicators, fittings, tamper switches, etc. shown on the Drawings and included in the Specifications.

B. Contractor shall coordinate all connections to water main with local governing authority.

C. The piping serving the fire protection system shall be installed by a fire protection contractor with a certificate of competency issued by the Georgia State Fire Marshall's Office.

1.3 APPLICABLE STANDARDS

A. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), National Fire Protection Association (NFPA), National Sanitation Foundation (NSF), or other recognized standards. Latest revisions of all standards are applicable. If requested by the Owner, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

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

1.4 MANUFACTURERS

A. Whenever a product is identified in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the Contractor may freely choose from those referenced products which ones he wishes to provide. Otherwise products shall meet the criteria set forth in the specifications for each item.

1.5 WARRANTY

A. Water distribution systems installed by Contractors which are accepted by the Owner for ownership, operation and maintenance shall be warranted and guaranteed for a period of one year from the date of final acceptance that the completed system is free from all defects due to faulty products or workmanship, and that the Contractor shall make such corrections as may be necessary by reason of such defects upon notice by the Owner.

1.6 CONSTRUCTION DRAWINGS

A. The term construction drawings shall mean drawings, prints, descriptive literature, test reports, samples, calculations, schedules, material lists and information and items of similar meaning.

1.7 SUBMITTALS REQUIRED

A. The Contractor shall furnish to the Engineer, Owner and local water purveyor for review in accordance with the procedure outlined below, drawings and descriptive literature for all manufactured or fabricated products. Additional information such as special drawings, schedules, calculations and curves, shall be provided as specifically requested by the Engineer and/or Owner.

B. The Contractor shall furnish to the Architect and local governing authority As-Built Drawings of the installed water system in accordance with Local Governing Authority Standards for As-Built Drawings.

1.8 DRAWINGS FOR CONSTRUCTION

A. Drawings or other submittals not bearing the Engineer's review notation shall not be issued to subcontractors or utilized for construction purposes. The Contractor shall maintain at the job site a complete set of construction drawings bearing the Engineer's review.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish all pipe, fittings, valves, tapping sleeves and valves, hydrants, and all other materials required for completion of the work. Furnish materials in accordance with the following:

2.2 PIPE

A. Water Distribution Pipe Smaller Than 4”: High-Density Polyethylene Pressure Pipe

1. High-Density Polyethylene: PE 4710 Resin, meeting AWWA C901/906, with butt-fused joints. Pipe shall be DR 11 with working pressure of 200 PSI. Pipe shall be approved for potable use by National Sanitation Foundation (NSF)

B. 4 Inch - 12 Inch – Ductile Iron Pipe (DIP): Ductile iron pipe shall conform to AWWA C151 and shall be a minimum of Pressure Class 350. Sizes will be as shown on the Drawings. Pipe and fittings shall be cement lined in accordance with AWWA C104. Pipe and fittings shall be furnished with a bituminous outside coating.

1. Joints shall be push-on type for pipe and standard mechanical or flanged restrained joints for fittings unless otherwise noted. Push-on and mechanical joints shall conform to AWWA C153 with gasket conforming to AWWA C111.
2. Provide the appropriate gaskets for mechanical or flange joints. Gaskets for flange joints shall be made of 1/8-inch thick cloth reinforced rubber; gaskets may be ring type or full face type, and must comply with the indicated water pressures in this specification.
3. Provide the necessary bolts for mechanical or flange connections. Bolts for flange connections shall be steel with American Regular unfinished square or hexagon heads. Nuts shall be steel with American Standard Regular hexagonal dimensions, all as specified in ANSI B 17.2. All bolts and all nuts shall be threaded in accordance with ANSI B.1.1. Coarse Thread Series, Class 2A and 2B fit.
4. All pipe shall be furnished in lengths of at least 18 feet.

C. Warning Tape and locator wire for all pipe shall be per Specification Section “Earthwork”.

D. Acceptance of all pipe will be on the basis of the Engineer's review and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2.3 DUCTILE IRON FITTINGS AND ACCESSORIES

A. Fittings shall be restrained joint ductile iron furnished in accordance with ANSI Specifications A21.10 (AWWA C110), latest revision, and shall be a minimum of 250 psi pressure class rating. Joints shall be mechanical joint with retainer glands with set screws. Cement mortar lining shall be furnished for all pipe.

1. Mechanical joints shall be ductile iron compact pattern in accordance with AWWA C153.
2. Glands, gaskets and bolts shall conform to AWWA C111.

B. 3 INCH AND SMALLER GATE VALVES (GV): Gate valves 3 inches and smaller shall have bronze body, bronze rising stem, solid wedge and threaded bronze bonnet in accordance with UL 262 and FMG Approved with 175 psi working pressure.

C. 4 - 12 INCH GATE VALVES (GV): Gate valves shall be mechanical joint end fitted with retainer glands, resilient seat, iron body, bronze mounted, non-rising stem with O-ring stem seals, open left with 2" square operating nut Gate valves 3" through 12" shall be designed for a water working pressure of 250 psi and a test pressure of 400 psi. Valves 14" and larger shall be designed for a water working pressure of 150 psi and a test pressure of 300 psi. Valves 4" through 12" will be designed for installing in a vertical position. Valves larger than 12" will be designed for a horizontal installation and equipped with bevel gearing, gear case, tracks, rollers, scrapers and by-pass valves. All valves shall be furnished with valve marker and concrete collars.

D. Gate valves shall be UL listed and FMG Approved and conform to AWWA standard specification C-509, latest revision for "Ordinary Water Works Service," with interior coating of epoxy complying with AWWA C550.

E. Valve Boxes (VB): All gate valves shall be equipped with valve boxes. Valve boxes shall comply with AWWA M44 for cast iron valve boxes. Valve boxes shall be heavy roadway type and have a minimum shaft diameter of 5-1/4". The valve boxes shall be cast iron two-piece slip or screw type with drop covers marked "WATER." The valve boxes shall be adjustable to 6 inches up or down from the nominal required cover over the pipe. Typical valve box details are shown on the plans.

1. All valve boxes shall be equipped with concrete collar as detailed on the plans.
2. Provide one operating wrench with stem of length to operate the deepest buried valve, and socket matching valve operating nut.

F. Tapping Sleeves and Valves (TS&V): Tapping sleeves shall be American Flow Control Series 2800 for lines 12" and smaller or American Flow Control Series 1004 for lines larger than 12", or an alternate acceptable to Water Authority. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The necessary bolts, glands, and gaskets shall be furnished.

G. OS&Y, Rising Stem, Resilient Seated Gate Valves: Shall conform to AWWA C500 and shall be allowed for use in the backflow preventers, only.

H. Fire Hydrants (FH): All fire hydrants shall conform to the requirements of AWWA C 502 UL 246 and FMG Approved for 250 psi working pressure. Hydrants shall be the compression type, closing with

line pressure. The valve opening shall be 5-1/4 inches. Hydrants shall match City of McDonough Standards.

1. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
2. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
3 Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
4. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
5. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or oil reservoir. A stop nut shall be positioned in the top operating mechanism so that the valve cannot contact the bottom of the shoe when fully open.
6. Hydrant shall be a non-freezing design and provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
7. Hose and pumper connections shall be breech-locked, pinned, and then caulked with lead; or threaded and pinned, to seal them permanently into the hydrant barrel. Each hydrant shall have two 2-1/2 inch hose connections, and one 4-1/2" diameter pumper connection. Equip each connection with cap and chain. Threads shall match the latest requirements of the State Fire Insurance Commission.
8. Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the 6-inch hydrant lead. The lead shall be 6" ductile iron with rods or retainer glands connecting the fire hydrant to a 6" gate valve. Gate valve shall connect to main line using a locked hydrant tee equal to American Pipe Model A-10180. When the hydrant is close enough to the valve to allow its use, the hydrant shall be connected to the valve by using a locked hydrant adapter, equal to American Pipe Model A-10895.
9. Minimum depth of bury shall be 4.0 feet to top of pipe. Provide extension section where necessary for vertical installation and in accordance with manufacturer's recommendations. The minimum height from the ground surface to the bottom of the hose nozzle shall be no less than 24".
10. All outside surfaces of the barrel above grade shall be painted with two coats red, reflective enamel paint to match water company standards.

I. Water Meters and Backflow Preventers: Refer to Drawings for requirements.

J. Concrete Vaults: Refer to Drawings for requirements.

K. Post Indicators: Indicator post for underground gate valves in the firemain shall be U.L. listed, FM approved, cast iron body with steel operating rod with locking lug, operating handle and indicator target protected by plexiglass cover. Body and operating rod length shall be field adjustable to the required depth of bury. Indicator posts shall be Stockham G-951, Nibco NIP-1A or American/Darling 1P71.

L. Fire Protection Components Security: Post Indictor Valves and Backflow Preventer to be secured in the open position. Post Indicator Valves to be padlocked at hasp. Backflow Preventer to utilize 3/8” chain through O.S. & Y Hand Wheels. Each to be secured by padlocks provided by Contractor. Keys shall be given to Owner.

M. Fire Department Connections (Siamese Connections): Fire Department connections shall be freestanding with cast-bronze body, thread inlets according to NFPA 1963 and matching City of McDonough Fire Department hose threads and threaded bottom outlet. Include lugged caps,

gaskets, and chains; lugged swivel connection and drop clapper for each hose connection inlet; brass sleeve meeting City of McDonough Fire Department's height requirements; and round escutcheon plate with marking "AUTO SPKR" and/or "STANDPIPE." Fire department connections shall comply with UL 405.

N. Tamper Switches: Furnish and install tamper switches on post indicator valves and fire line backflow preventers in accordance with the following: Tamper switches for post indicators shall be designed for installation on indicator valves with cased aluminum housing with red finish; U.L. Listed, F.M. approved. The switch shall operate when the valve is intentionally or accidentally closed. Tamper switches for backflow preventer valves shall be designed for installation on operating stem and yoke valves and shall be U.S. Listed, F.M. approved. The switch shall open when the valve is intentionally or accidentally closed. Connect to alarm devices to building fire alarm as specified in Specification Section “Fire Alarm”.

PART 3 – EXECUTION

3.1 GENERAL

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. All materials dropped or dumped will be subject to rejection without additional justification.

B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.

C. Distribution: Distribute and place pipe and materials to not interfere with traffic. Do not string pipe more than 300 feet beyond the area where pipe is being laid. Do not obstruct drainage ditches.

D. Storage: Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas. Do not interfere with other contractors right to access.

E. Construction Along Highways, Streets and Roadways: Install pipe lines and accessories along highways, streets and roadways in accordance with the applicable regulations of the County, and/or the Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.

F. Protection of Traffic: Provide and maintain suitable signs, barricades and lights for protection of traffic.

1. Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining permission from the proper authorities.
2. Provide flagmen to direct and expedite the flow of traffic.

G. Construction Operations: Perform all work along highways, streets and roadways to least interfere with traffic.

H. Stripping: Where the pipe line is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.

I. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.

J. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

K. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement.

L. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free to drain at all times.

M. Maintaining Highways, Streets, Roadways and Driveways: Maintain streets, highways, and roadways in suitable condition for movement of traffic until completion and final acceptance of the work. Use steel running plate to maintain traffic until pavement replacement is completed.

1. NOTE: Traffic must be maintained at all times. When one lane is closed, flagmen must be utilized to maintain traffic flow.
2. Repair all driveways that are cut or damaged immediately. Maintain them in a suitable condition for use until completion and final acceptance of the work.

N. Existing Underground Utilities and Obstructions: It is the responsibility of the Contractor to locate all existing utilities along the path of his construction. The drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the water main may be changed, upon written approval of the Engineer and Owner, to avoid interference.

O. Connections to Existing Pipe Lines: Before laying pipe, the Contractor shall locate the points of connection to existing pipe lines and uncover as necessary for the Engineer and Owner to confirm the nature of the connection to be made. The Contractor shall furnish materials and make the connection to all existing pipe lines. The Contractor will be observed during construction of tie-ins by the Utility Owner and the Engineer. The Contractor shall use all available practices and resources to minimize the time the customers are without water. The Contractor shall notify Water Purveyor's Customers of Water outages at least 24 hours in advance.

P. Laying Pipe:

1. General: Unless specifically indicated on the plans or called for in the specifications, water lines shall be constructed with restrained joint fittings and mechanical joint valves.
2. Field Inspection: All pipe and accessories shall be laid, jointed, tested for defects and for leakage with pressure and chlorinated in the manner herein specified in the presence of the Engineer or his authorized representative and subject to their approval.

Q. Handling Pipe and Accessories

1. Care: Pipe, fittings, valves and other accessories shall be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor; they shall at all times be handled with care to avoid damage. In loading and unloading they shall be lifted by hoists or slid or towed on skid-ways in such a manager as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
2. At Site of Work: In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench and shall be laid on high ground so that it will not be in a drainage way.
3. Bell Ends, How Faced: Pipe shall be placed on the site of the work parallel with the trench alignment and with the bell ends facing the direction in which the work will proceed, unless otherwise directed by the Engineer.

4. Pipe Kept Clean: The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.
5. Alignment and Grade: General - All pipe shall be laid and maintained in the required lines and grades, with fittings and valves at the required locations, with joints centered and spigots home, and with all valve stems plumb.

R. Depth of Pipe:

1. The top of the barrel of the pipe shall have a minimum cover of forty-eight inches. A greater depth of cover is required in certain sections of the main, such as railroad crossings, valve locations and other sections of special construction, and within State and Federal highway rights-of-way.

S. Excavation and Preparation of Trench:

1. See Specification Section "Earthwork" for additional requirements.
2. Pipe Foundation: The pipe shall be laid upon a sound earthen foundation cut true and even so that the barrel of the pipe will have a bearing for its full length.
3. Care of Surface Materials for Re-Use: If local conditions permit their re-use, all surface materials suitable for re-use in restoring the surface shall be kept separate from the general excavation material.
4. Trenching by Machine or by Hand: The use of trench digging machinery will be permitted except in places where operation of same will cause damage to existing structures above or below ground; in which case hand methods shall be employed. Excavation shall be made by ladder type machine or backhoe.

T. Pipe Installation:

1. All copper pipe shall be installed according to CDA's "Copper Tube Handbook". All pipe shall be wrapped and coated in accordance with this manual.
2. Manner of Hauling Pipe and Accessories: Proper implements, tools and facilities shall be provided and used by the contractor for the safe and convenient execution of the work. All pipe, fittings and valves shall be carefully lowered into the trench piece by piece by means of derrick ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe to pipe or accessories be dropped or dumped into the trench.
3. Pipe Kept Clean: All foreign matter or dirt shall be removed from the pipe, and it shall be kept clean by approved means during and after laying.
4. Laying of the Pipe: The spigot shall be centered in the bell, the pipe forced "home" and brought into true alignment; it shall be secured there by earth carefully tamped under and on each side of it, excepting at the bell holes. Care shall be taken to prevent dirt from entering the joint space. No "blocking up" of pipe or joints will be permitted. The joint shall be made as hereinafter described.
4. Install continuous underground warning tape and locator wire during backfilling of trench for underground water distribution piping. Locate tape 18 inches below finished grade, directly over piping. Underground warning tapes and locator wire is specified in Specification Section "Earthwork." Locator wire shall be wrapped around pipe and shall be looped up inside all valve boxes and extended to surface at all hydrants, PIVs and other water main accessories.
5. Trench Water Entering Pipe: At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.
6. Cutting Pipe: Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe.

7. Bell Ends Face Direction of Laying: Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying; and for lines on an appreciable slope, bells shall, at the discretion of the engineer face up-grade.
8. Permissible Deflections at Joints: Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, the degree of deflection shall be according to manufacturer's recommendations.
9. Unsuitable Conditions for Laying Pipe: No pipe shall be laid in water.
10. Jointing Pipe-Mechanical Joints: The following steps shall be taken in making mechanical joints:
    a. All lumps, blisters and excess coal-tar enamel shall be removed from socket and spigot of the pipe.
    b. Wash socket and plain end with soapy water containing chloride solution; then slip gland and gasket over plain end. The small side of gasket and lip gland shall face bell.
    c. Paint gasket with soapy solution containing chlorine.
    d. Push gasket into position, being sure it is evenly seated in socket.
    e. Slide gland into position; insert bolts and run nuts up finger tight.
    f. Tighten bolts to uniform tightness with correct ratchet wrench. The first bolt tightened shall be the bottom bolt, then top. All other bolts shall be tightened in sequence at 180 degrees apart.
11. Setting Valves, Valve Boxes and Fittings:
    a. General: Gate valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and jointing pipe.
12. Valve Boxes: Cast iron valve boxes shall be firmly supported, and maintained centered and plumb over the wrench nut of the gate valve, with box cover.
13. Plugging Dead Ends: Standard plugs shall be inserted into the bells of all dead ends of pipes, tees or crosses and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the manner specified above.
14. Thrust Blocking: Concrete having compressive strength of not less than 1500 psi shall be used as a cradle or thrust blocking where shown on the plans or where directed by the Engineer. Bends exceeding 22-1/4 degrees, crosses with one opening plugged, and all tees shall be backed with concrete as a thrust block. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on ground in each instance shall be that shown on the plans. The blocking shall be so placed that the pipe fitting joints will be accessible for repair. No extra payment will be made for the thrust blocks. Contractor shall notify the Fire Marshal's office for inspection of all Thrust Block locations. Fire Marshal's sign off sheet shall be turned over to the Architect.

U. Pressure and Leakage Tests (See Subsection 'X' for additional testing):

1. All fire hydrants are to be flow tested in the presence of the Architect and Civil Engineer. Once tested they shall be tagged with date and time of test. Do not shut off valve after flow test is completed.
2. Pressure During Test: Immediately after the pipe and fire hydrants have been laid and backfilled, but prior to the placement of pavement, each valved section of newly laid pipe shall be subjected to a leakage and pressure test. For any section being tested the pressure applied shall be such that at the highest point in the section, the pressure shall be 200 pounds per square inch. Test shall be conducted as per NFPA-13. Test on fire protection supply shall be witnessed by Fire Marshall, Owner and Architect/Engineer.
3. Procedures: Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of highest elevation shall be supplied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, and all necessary apparatus, gauges, and meters shall be furnished by the contractor. The contractor shall furnish all necessary labor and assistance in conducting the tests. The

owner will furnish, through connections made by the contractor to existing mains, water for filling the lines for making the test.

4. Expelling Air Before Tests: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation and afterward tightly plugged.
5. Examination Under Pressure: At intervals during the test, the route of the pipe line shall be inspected to locate any leaks or breaks. Any cracked or defective joints, cracked or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided and the test shall be repeated until satisfactory results are obtained.
6. Leakage: No detectable leakage will be allowed during the pressure testing.

V. Other Testing: All water mains and fire hydrants and their appurtenances shall be subject to all testing required by County Fire Department.

W. Backfilling:

1. Time of Backfilling: As soon as practicable after the completion of laying and jointing of the pipe, the trench shall be backfilled, and at not time shall the completed backfilling of the trench be more than 300 feet behind the pipe laying.
2. Backfill Procedure at Pipe Zone: Select backfill material free from rock fragments shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench and to an elevation of twelve inches above the top of the barrel of the pipe. The backfill material shall be moistened if necessary, tamped in thin (about 4-inch) layers and thoroughly compacted under and on each side of the pipe to provide solid backing against the external surface of the pipe.
3. Backfill Procedure Above the Pipe Zone: Succeeding layers of backfill may contain coarser materials and shall be compacted thoroughly to the natural ground surface. Refer to Specification Section "Earthwork" for requirements of trench compaction.
4. Restoration of Surfaces: The contractor shall replace all curbing, sidewalks, gutters, shrubbery, fences, sod, and other surfaces disturbed to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.

X. Disinfection of Mains:

1. The contractor shall disinfect all new mains, furnishing all labor, equipment and material necessary for the complete disinfection of the mains as hereinafter provided. Mains shall be disinfected by the application of a chlorinating agent into the water used for the initial filling of the mains. The chlorinating agent may be chlorine gas-water mixture, calcium hypo-chlorite in water, or chlorinated lime of known chlorine content in water and shall be fed through a suitable solution feed device. The chlorinating agent shall be applied at or near the beginning point from which the main is being filled and shall be injected into the main through a corporation cock tapped into the horizontal exit of the newly laid main. The water being used to fill the line shall be controlled to flow into the section to be sterilized very slowly and the rate of application of the chlorinating agent shall be in such proportion to the rate of the water entering the pipe that the chlorine dose applied to the water shall be at least 50 ppm. The chlorine treated water shall be retained in the new main at least 24 hours and a 10 ppm of residual chlorine shall remain after the 24 hour period. Following chlorination all treated water shall be flushed from the mains until replacement water shall have a chlorine content of not more than 0.1 ppm in excess of the residual in water from the supplying main and in any event not less than 0.2 ppm. Samples of the water shall be taken from several points in the new lines and submitted to a State Approved lab for bacteriological analysis. Should the analysis show

contamination, the system shall be re-chlorinated and further samples taken and submitted for analysis until no contamination is indicated.

2. Provide copies of satisfactory test results to Architect/Engineer for review prior to placing Water System in service.

END OF SECTION 331116

SECTION 333313 – SITE SANITARY SEWER CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 31 Section - "Earthwork"

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure sanitary sewerage outside the building as indicated on the Civil Drawings, with the following components:

1. Cleanouts.
2. Precast Concrete manholes.
3. Ductile Iron Sewer Pipe & Fittings.

B. The Contractor shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

C. The Contractor shall pay all costs for sewer tap fees.

1.3 DEFINITIONS

A. DIP: Ductile Iron Pipe

B. PVC: Polyvinyl Chloride

1.4 GENERAL

A. Applicable Standards: Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the Owner, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

B. Substitutions: Whenever a product is identified in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., the Contractor may freely choose from those referenced products which ones he wishes to provide.

C. Construction Drawings: The term construction drawings shall mean drawings, prints, descriptive literature, test reports, samples, calculations, schedules, materials lists and information and items of similar meaning.

D. Submittals Required: The Contractor shall furnish to the Utility Owner, Engineer, and Owner for review in accordance with the procedure outlined below, drawings and descriptive literature for all manufactured or fabricated products. Additional information such as special drawings, schedules, calculations and curves, shall be provided as specifically requested by the Utility Owner, Engineer, and/or Owner.

E. Utility Owner's Review: The Contractor shall furnish to the Utility Owner all required shop drawings, submittals, reports and inspections as deemed necessary by the Utility Owner to complete the project in accordance with the standards set forth by the Utility Owner.

F. Contractor's Review: The Contractor shall review and check drawings and submittals. He shall indicate his review by initials and date. The Contractor shall furnish the Engineer with a minimum of five copies of all submittals. A transmittal form shall accompany each submittal or group of submittals.

G. Engineer's Review: All submittals will be reviewed, stamped, and dated by the Engineer before they are returned to the Contractor.

H. One copy of reviewed submittals will be returned to the Contractor and the remaining copies retained by the Engineer.

I. Submittals requiring minor corrections will be so noted. Drawings must be resubmitted for review prior to installation or use of products.

J. Drawings for Construction: Drawings or other submittals not bearing the Engineer's review notation shall not be issued to subcontractors or utilized for construction purposes. The Contractor shall maintain at the job site a complete set of construction drawings bearing the Engineer's review.

K. As Builts: Furnish as-built drawings, indicating pipe lengths, manhole rim and invert elevations and in accordance with City of McDonough requirements.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Special pipe fittings.

B. Shop Drawings: For the following:

1. Manholes: Include plans, elevations, sections, details, and frames and covers.

2. Pipe: Include manufacturer's data for each type of pipe to be provided including joining materials.

C. Field quality-control test reports shall be submitted to the Architect, Engineer and Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle manholes according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect and Utility Owner no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Architect's and Utility Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements listed for each product listed. Where specific manufacturers are listed, Contractor may freely choose from the referenced products. Otherwise, products shall meet the criteria set forth in the specifications for each product.

2.2 PIPING MATERIALS

A. GENERAL: Refer to Drawings for the required piping materials. Pipe and fittings shall be the type listed below.

1. DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS
   a. Pipe: 4-8 inches DIP shall conform to AWWA C151 and shall be a minimum of Class 51 for 4 inch pipe and Class 50 for 6-8 inch pipe. Sizes will be as shown on the Drawings.
   b. Pipe Joints: AWWA C151, for push-on joints.
   c. Compact Fittings: AWWA C153, for push-on joints.
   d. Gaskets: AWWA C111, rubber.
   e. All pipe shall be furnished in lengths of at least 18 feet.
   f. Pipe and fittings shall be cement lined in accordance with AWWA C104.
   g. Pipe and fittings shall be furnished with a bituminous outside coating.

2. POLYVINYL CHLORIDE (PVC), GRAVITY SEWER PIPE AND FITTINGS
   a. Polyvinyl chloride (PVC) plastic pipe: PVC plastic sewer pipe shall be unplasturized polyvinyl chloride with integral wall bell and spigot joints with a rubber ring gasket. Pipe and fittings shall meet all the requirements of ASTM-D-3034, SDR 26, or ASTM F679 for use as a gravity sewer conduit. Standard lengths shall not exceed 13 feet.
   b. Minimum "pipe stiffness" (F/Y) at 5% deflection shall be 46 for all sizes when tested in accordance with ASTM Designation D-2412.
   c. External loading properties of plastic pipe by Parallel Plate loading.

d. Installation of PVC sewer pipe shall be in accordance with the provisions of ASTM-2321, "Underground Installation of Flexible Thermoplastic Sewer Pipe" with additional bedding as required in these specifications.
e. Detection Tape: Detectable mylar encased aluminum foil marking tape will be installed over all PVC sewer pipe. Tape will be at least 1½ inches wide, and shall bear the printed identification "Caution: Buried Sewer Line Below" (reverse printed), so as to be readable through the mylar. Surface printing on the tape shall be equal to Lineguard Type II Detectable. Detection tape shall be buried 2'-0" below the ground surface above the sewer.

2.3 PIPE COUPLINGS

A. Reducing or transition, metal, bolted, sleeve-type, reducing or transition coupling, for joining underground piping. Include ends of same sizes as piping to be joined.

B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.

1. Manufacturers:
   a. Cascade Waterworks Mfg.
   b. Dresser, Inc.; DMD Div.
   c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
2. Center-Sleeve Material: Manufacturer's standard.
3. Gasket Material: Natural or synthetic rubber.
4. Metal Component Finish: Corrosion-resistant coating or material.

2.4 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints, H-20 load rating for traffic areas.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
4. Riser Sections: 5-inch minimum thickness, and of length to provide depth indicated.
5. Top Section: Eccentric-cone type. Top of cone of size that matches grade rings.
6. Joint Sealant: As indicated on the drawings.

7. Resilient Pipe Connectors: As indicated on the drawings, shall be provided at each pipe connection to a manhole. Boots shall be integrally cast or provided for cored manholes.
8. Steps: As indicated on the drawings.

9. Manhole Frames and Covers: Ferrous manhole cover of the type, size and weight required by the local Utility Owner. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."

   a. Material: ASTM A 48, Class 35 gray iron, unless otherwise indicated.

b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 10-mil minimum thickness applied to all surfaces, unless otherwise indicated.
c. Precast manholes shall be furnished and set with the proper allowance for the cast iron frame and cover to be set at the correct finished grade.

2.5 CONCRETE

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

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

B. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

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

a. Invert Slope: 1/4" per foot minimum through manhole.

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

a. Slope: 3:1 slope.

PART 3 - EXECUTION

3.1 EARTHWORK

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

3.2 PIPING APPLICATIONS

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

1. Use couplings where required to join gravity-flow, sewer piping, unless otherwise indicated.

a. Rigid couplings for same or minor difference OD pipes.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Location and arrangement of piping layout take design considerations into account. Install piping as indicated, making connections to work indicated on Plumbing Plans, as required.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections.

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

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, as indicated.
2. Install piping at depth indicated on the drawings.
3. Install PVC , gravity sewer piping and fittings according to ASTM D2321.

4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
5. Install ductile-iron and special fittings according to AWWA C600 or AWWA M41.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

H. Bed and haunch pipes with crushed stone. Refer to Drawings for details.

3.4 PIPE JOINT CONSTRUCTION

A. Basic piping joint construction is specified below. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC ,gravity sewer piping and fittings according to ASTM D2321.
2. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
3. Join ductile-iron and special fittings according to AWWA C600 or AWWA M41.

3.5 MANHOLE INSTALLATION

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

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Construct cast-in-place manholes as indicated on drawings.

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

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops flush with finished lawn areas, unless otherwise indicated on the Drawings.

1. Set manhole tops and frames in full bed of mortar and secure frame to manhole.

3.6 CLEANOUT INSTALLATION

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

1. See drawings for cleanout details.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block. Set with tops flush with surrounding grade.

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

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Install wye fittings on sewer main as pipe laying progresses.

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

C. Connect to grease interceptors shown on Plumbing Plans.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installation of green warning tapes directly over piping.

1. Use warning tape over ferrous and nonferrous piping.

3.9 FIELD QUALITY CONTROL

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

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

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Crushed, broken, cracked, or otherwise damaged piping.
    c. Infiltration: Water leakage into piping or manholes.
    d. Exfiltration: Water leakage from or around piping.

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

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects. All testing shall be done by an independent testing agency paid for by the Contractor. Reports of all inspections shall be copied to the Architect and Engineer.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to the following requirements:

    a. Clean and flush lines prior to testing. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the sewers by means of rods, swabs or other instruments. Flush out lines and manholes before final inspection.

        Water used to flush out and clean sewer lines will not be permitted to enter the existing sewer system. Contractor shall plug and pump line as necessary to perform clean-up work.

    b. Gravity Sewers: Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection. Televising of the sewer lines is required by the Owner and Engineer prior to final acceptance after other tests are completed.

        1) Infiltration Tests: Not included, leakage to be determined during televising.
        2) Exfiltration tests:
            a) Low-Pressure Air Test:

            1. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in according with ASTM C 828 is as follows:

Nominal Pipe Size, Inches	T (Time Min/100) Feet

6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6

2. Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of ± two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.
3. The Contractor shall keep records of all tests made. Copy of such records will be given to the Owner and/or Engineer. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Owner and/or Engineer.
4. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

c. Closed Circuit Television: Televise and provide 3 copies of tape of televised line to Architect. Coordinate televising with City of McDonough. Report of all areas questioned by televising firm shall be furnished to Architect and Engineer.

3. Manholes: Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between Precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass the following tests:

a. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc. or Cherne Industries.

4. Submit separate report for each test.

5. Contractor shall clean, pump out, open, close and make personnel available, as necessary, to accommodate inspection of sewer system.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified. Seal all leaks in manholes with hydraulic grout.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous material.

END OF SECTION 333313

SECTION 334116 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Georgia Department of Transportation Specifications and Details, latest edition or revision.

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure storm drainage with the following components:

1. Cleanouts.
2. Drains.
3. Precast concrete drainage structures.

B. Related Sections include the following:

1. Specification Section "Earthwork" for excavation, trenching, and backfilling requirements.

1.3 DEFINITIONS

A. RCP: Reinforced Concrete Pipe.

B. HDPE: High Density Polyethylene Plastic Pipe/Smooth Interior (and exterior) Corrugated Polyethylene Pipe.

C. D.I.P.: Ductile Iron Pipe

D. PVC: Polyvinyl Chloride Plastic Pipe.

E. H.D.P.P.: High Density Polypropylene Plastic Pipe (Smooth Interior and Corrugated Exterior)

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Drainage Piping: Pipe shall be as specified under Part 2 - Products.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Special pipe fittings.
2. Drains.
3. Channel drainage systems.

4. Storage and leaching chambers.

B. Shop Drawings: For the following:

1. Drainage Structures: Include elevations, sections, details, frames and covers, reinforcing, thickness and grate type for each type structure indicated on the plans.

C. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Handle manholes according to manufacturer's written rigging instructions.

C. Handle stormwater inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers that offer products complying with the specifications.

2.2 PIPING MATERIALS

A. 12 Inch and Smaller Storm Sewers: Pipe and fittings shall meet all the requirements of ASTM-D 3034, SDR35, with gasketed joints meeting ASTM F-477, or HDPE (Smooth Interior Corrugated Polyethylene Pipe) as per AASHTO M294 or Contech A 2000 pipe for 12 inch and smaller drains will be acceptable. Joints and fittings for HDPE shall be as specified below.

B. 15 Inch and Larger Storm Sewers: Refer to drawings for areas where a specified type of pipe must be used. Unless a specific type of pipe is called for on the Drawings, the Contractor shall have the option of installing one of the types of storm sewers listed below.

1. Reinforced Concrete Pipe (RCP): Reinforced concrete pipe (RCP) shall meet the requirements of ASTM Designation C-76, Class III and the latest revisions thereof. Pipe

joints shall be either tongue and groove with mortar joint or "O" ring type joints. Pipe shall meet GA D.O.T. Specifications and shall be stamped by D.O.T.

2. Ductile Iron Pipe (D.I.P.): Ductile iron pipe shall conform to AWWA C151 and shall be a minimum of Pressure Class 350. Fittings shall be in accordance with AWWA C153. Gaskets shall be in accordance with AWWA C111.
3. Smooth Interior Corrugated Polyethylene Pipe (HDPE), 4"-60":
   a. Polyethylene Pipe shall be high density polyethylene corrugated pipe with an integrally formed smooth interior.
   b. This specification is applicable to nominal sizes 4-60 inch diameter. Requirements for test methods, dimensions, and markings are those found in AASHTO Designations M252 and M294.
   c. Pipe and fittings shall be made of polyethylene compounds which meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D1248 with the applicable requirements defined in ASTM D1248. Clean, reworked material may be used.

      Minimum parallel plate pipe stiffness values shall be as follows:

Diameter	Pipe Stiffness*
4"	50 psi
6"	50 psi
8"	50 psi
10"	50 psi
12"	45 psi
15"	42 psi
18"	40 psi
24"	34 psi
30"	28 psi
36"	22 psi
42”	20 psi
48”	18 psi
60”	14 psi

      *Per ASTM Test Method D2412
   d. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.
   e. The nominal size for pipe and fittings is based on the nominal inside diameter of the pipe. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Project Engineer.
   f. Joints shall be made with couplings with O-ring rubber gaskets.
   g. Installation shall be in accordance with ASTM Recommended Practice D2321 or as specified by the Project Engineer or local approving agency.
4. High Density Polypropylene Pipe (HDPP), 12"-60":
   a. a. Polypropylene pipe shall have a smooth interior and annular exterior corrugations and meet or exceed ASTM F2881 and AASHTO M330.
   b. b. Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2881 and shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant from the manufacturer shall be used on the gasket and bell during joint assembly.

c. c. Installation shall be in accordance with ASTM D2321 and manufacturer's guidelines, with the exception that minimum cover in traffic areas for 12"-48" diameter pipes shall be one foot and for 60" diameter pipes, the minimum cover shall be 2 feet. Backfill for minimum cover situations shall consist of Class 1, Class 2 (minimum 90% SPD) or Class 3 (minimum 95%) material.

2.3 MISCELLANEOUS STORM APPURTENANCES

A. Cast-in-place concrete shall have minimum compressive strength of 3000 psi at 28 days. Slump shall be 3" + 1". Reinforcing shall be sufficient to match ASTM C478.

B. Brick: Brick for manholes and catch basins shall be first quality, sound, hard burned, perfect shaped brick, presenting a smooth regular shape. Brick shall not absorb more than 16 percent of water by weight when submerged in water for 24 hours, having been in a thoroughly dry state prior to placing in water. Where pre-cast structures are not feasible for use or at the Contractor's options, brick shall be used to form structures to the dimensions indicated for each structure on the detail sheets.

C. Mortar: All cement used in mortar shall conform to ASTM Designation C150, and the latest revision thereof. All mortar used shall be composed of one part Portland Cement and two parts of fine sand.

D. Cast Iron: Cast iron for manhole frames and covers and catch basin frames and grates, and manhole steps shall conform to the shape and dimensions shown on the Plans, and shall be clean and perfect, free from sand and blow holes or other defects. Cast iron shall conform to ASTM Designation A-48-74 for Class No. 30 gray cast iron.

2.4 CLEANOUTS

A. Cleanouts: Shall be as shown on the plan details for storm sewer with countersunk, tapered-thread, brass closure plug, and concrete collar.

1. Top-Loading Classification(s): Heavy duty.
2. Sewer Pipe Fitting and Riser to Cleanout: Shall be as shown on the Drawings.

2.5 DRAINAGE STRUCTURES

A. Standard Precast Concrete Drainage Structures: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: 6-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
2. Riser Sections: 6-inch minimum thickness, lengths to provide depth indicated, and diameter provided for piping and deflections as shown on plans.
3. Top Section: Provide necessary adapters, brick construction, precast concrete trays and intermediate tops necessary to accommodate inlet tops as shown on the details.
4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

5. Steps: Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 36-inches. Steps shall be as shown in the detail Drawings.

6. Pipe Connections: All pipe connection to precast concrete structures shall be grouted in place on both interior and exterior with full bed of grout.

2.6 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to details. Curb inlet hoods shall be USF 5167 standards, unless shown otherwise.

B. Drop Inlets: Made with horizontal opening, of materials and dimensions according to details. Include heavy-duty frames and grates with H-20 load rating.

C. Junction Boxes: Heavy-duty frames and grates (H-20 Load Rating) according to details.

D. Catch Basins: Shall be constructed as indicated by Georgia Department of Transportation Standard Details (included by reference).

E. Area Drains: Shall be as detailed on the Drawings.

2.7 PIPE OUTLETS

A. Head Walls: Pre-Cast or Cast-in-place reinforced concrete, with apron and tapered sides, per details on the plans, or as referenced by Georgia Department of Transportation Standards.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Specification Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Gravity-Flow, Nonpressure Sewer Piping: Use the pipe materials previously specified for each run of pipe. Where a specific type of pipe has not been identified, the Contractor may freely choose from the available listed products.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into stormwater structure is indicated.

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

E. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at slope indicated.
2. Install ductile-iron culvert piping according to ASTM A 716.
3. Install ductile-iron and special fittings according to AWWA C600 or AWWA M41.
4. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
6. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
7. Install HDPP piping according to ASTM D2321 (and manufacturer's guidelines where more stringent).

F. Bed and haunch pipe per details shown on the Drawings.

3.4 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
2. Join corrugated PE piping according to CPPA 100 and the following:
   a. Joints for pipe shall be watertight.
3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
5. Join HDPP piping in accordance with ASTM F1417 or ASTM F2487. Joints shall be watertight.

3.5 CLEANOUT INSTALLATION

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

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 6 inches deep. Set with tops flush with surrounding earth grade.

3.6 DRAINAGE STRUCTURE INSTALLATION

A. Construct catch basins to sizes and shapes indicated by each size and type of pipe specified.

B. Set frames and grates to elevations indicated, secure to structure with full bed of mortar.

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping from building and downspouts as indicated on Plumbing and Architectural Drawings.

1. Use commercially manufactured wye fittings for piping branch connections.
2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making branch connections. Remove debris or other extraneous material that may accumulate.

3.8 FIELD QUALITY CONTROL

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

1. Defects requiring correction include the following:

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

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

B. Contractor shall clean and pump out pipes and provide qualified personnel as necessary for all inspections by Owner, Architect or Engineer.

C. Provide complete As-Built Survey of the constructed storm drainage system to include location of all downspout piping, downspout pipe cleanouts, pipe sizes, pipe types, pipe inverts, structure tops, throats and inverts, and complete data on all above ground and underground detention systems for verification and certification of proper installation and performance.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

B. Clean all structures of dirt and superfluous materials.

END OF SECTION 334116