SPECIFICATIONS

FORT BRADEN SCHOOL
LEON COUNTY SCHOOL BOARD

TALLAHASSEE, FLORIDA

1 of 1
Set Number

27 February 2015
Date Issued

100% Construction Documents
Project Phase

BARNETT FRONCZAK
BARLOWE ARCHITECTS
Gallie's Hall, 225 S. Adams Street, Tallahassee, FL 32301 (850) 224-6301

PROJECT MANUAL

FORT BRADEN SCHOOL

NEW CLASSROOM ADDITION & RENOVATION

LEON COUNTY SCHOOL BOARD

TALLAHASSEE, FLORIDA

BARNETT FRONCZAK BARLOWE ARCHITECTS
225 SOUTH ADAMS STREET
TALLAHASSEE, FLORIDA 32301

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TALLAHASSEE, FLORIDA

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SECTION 01027 - APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Procedures for preparation and submittal of Application for Payment.

1.2 RELATED REQUIREMENTS

A. Bidding Conditions

B. Contractual Conditions

C. Section 01340 - Submittals: Submission Requirements

D. Section 01370 - Schedule of Values

E. Section 01700 - Contract Closeout: Final Application for Payment

1.3 FORMAT

A. Application for Payment Form - AIA Standard G702.

1.4 PREPARATION OF APPLICATIONS

A. Submit applications for payment to Architect in accordance with the schedule established by conditions of the Contract and agreement between Owner and Contractor.

1. Type required information, or use media-driven printout.
2. Execute certification by signature of authorized officer.

B. Submit Schedule of Values for review and acceptance by the Architect/Engineer and Owner per Section 01370. Schedule of Values shall be broken down for each Work item and shall indicated both materials and labor.

C. Use data on accepted Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed.

D. Initial progress payment shall not be made until Contractor has established a Contractor's site office, with telephone service, and a temporary field office for the Project Representative.

E. Prepare Application for Final Payment as specified in Section 01700.

F. Submit Application for Payment in rough format (percentages complete) for Owner and Architect/Engineer review five (5) days prior to submittal of Application.

1.5 SUBMITTAL PROCEDURES

A. Submit seven (7) copies of each Application for payment at times stipulated.

B. Contractor shall submit to Architect/Engineer not later than the first working day of each month an application for payment completed and signed by the Contractor.

1.6 SUBSTANTIATING DATA

A. When Architect/Engineer requires substantiating information, submit data justifying line item amounts in question.

B. Submit suitable information for each copy of application with a cover letter identifying:

1. Project
2. Application number and date
3. Detailed list of enclosures

C. Submit one copy of data and cover letter for each copy of application.

D. Submit with each copy of application continuation sheet providing the following:

1. Fill in total list of all schedule component items of work, with item number and scheduled dollar values for each item.
2. Fill in dollar value in each column for each schedule line item when work has been performed or materials stored.
3. list each change order executed prior to date of submission, at the end of the continuation sheets.

E. Submit data and applicable insurance as required by Owner to establish Owner's title

to material and equipment suitably stored at the site.

1. The Contractor shall be responsible for all expenses of the Architect/Engineer to verify the quantity of stored materials off of the site.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01027

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Contractor shall supervise and direct the work competently and efficiently, devoting such attention thereto and applying such skills as may be necessary to perform the work in accordance with the Contract Documents.

B. Contractor shall be solely responsible for all means, methods, techniques, sequences and procedures of construction, and for providing adequate safety precautions and coordinating all portions of the work under the Contract Documents.

C. Contractor shall be responsible to see that the finished work complies accurately with the Contract Documents.

D. Contractor shall be responsible for all project coordination.

1.2 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work
B. I. Bidding Conditions
C. II. Contractual Requirements
D. Section 01200 - Project Meetings
E. Section 01410 - Special Testing/Inspection Requirements
F. Section 01700 - Contract Closeout

1.3 DESCRIPTION

A. Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

1. Maintain reports and records at job site:

a. Daily log of progress of work and other pertinent data. Maintain log accessible to Owner, Architect/Engineer and his representative.
b. Assemble documentation for handling of any claims or disputes which may arise.

2. Inspections and Testing:

a. Inspect the work to assure that it is performed in accordance with the requirements of the Contract Documents.
b. Arrange with the Architect/Engineer and/or owner as applicable for special inspections or testing required by Section 01410 or other specification sections.
c. Reject work which does not conform to requirements of the Contract Documents.

B. Coordinate sequence of work to insure proposed completion dates are met.

1. Construction Schedule:

a. Prepare detailed schedule of Contractor's operations and for all subcontractors on the project.

b. Monitor schedules as work progresses.

1. Identify potential variances between scheduled and probable completion date.
2. Recommend to Architect/Engineer any adjustments in schedule to meet required completion date.
3. Provide monthly summary reports of each monitoring.

c. Observe work to monitor compliance with schedule.

1. Verify that labor and equipment are adequate to meet and maintain the schedule for the work.
2. Verify that product deliveries are adequate to meet and maintain the schedule for the work.
3. Report any non-compliance to Architect/Engineer, with recommendations for remedy.
4. Verify that adequate services are provided to comply with requirements for work and climatic conditions.
5. Verify proper maintenance and operation of temporary facilities.
6. Administer traffic and parking controls for construction workers. Construction traffic shall not interfere with surrounding traffic movement.

2. Coordination of Subcontractors:

a. Coordinate work of all subcontractors and relationship between them.
b. Establish on-site lines of authority and communication. Schedule and conduct progress meetings among Owner and Architect/Engineer representatives and subcontractors.
c. Ensure that specified cleaning is done during progress of the work

and at completion of contract.

1.4 MEETINGS

a. In addition to progress meeting specified in Section 01200, hold coordination meetings and pre-installation conferences with personnel and subcontractors to assure coordination of work.

1.5 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in Section 01340.

1. Administer processing of shop drawings, product data, and samples.

B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

1. Coordinate Testing Laboratory Services:

a. Notify laboratory of test schedule.
b. Verify that required personnel are present.
c. Verify that specified tests are made as scheduled.
d. Verify compliance of the test results with specified criteria. Determine need for retesting and submit recommendations to Architect/Engineer. Administer and pay for required retesting.

2. Coordinate with Sub-contractors as required:

a. Provide temporary utilities (electric, water) required by the Subcontractors in the performance of their work.
b. Provide designated location where the Subcontractors may place construction debris for removal by the Contractor.

C. Coordinate requests for changes to assure compatibility of space, of operating elements, and effect on work of other sections.

1. Recommend necessary of desirable changes to Architect/Engineer.
2. Review subcontractor's requests for changes and substitutions. Submit recommendations to Architect/Engineer.
3. Process Change Orders in accord with General Conditions and Change Order Procedures.

1.6 COORDINATION OF SPACE

A. Coordinate use of Project space and sequence of installation of subcontractor work which is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.7 INTERPRETATION OF CONTRACT DOCUMENTS

A. Consult with Architect/Engineer to obtain interpretation or clarifications for any portions of the contract documents which are unclear or ambiguous. Transmit all requests for interpretation in writing.

B. Assist in the answering of any questions which may arise.

C. Transmit written interpretations to Sub Contractors, Suppliers and Others who's work may be affected by the clarification.

D. Interpretations shall be based on the Architect/Engineers review of the Contract Documents. In case of conflicting data, assumption shall be made that the item of greater quality, cost of quantity was bid.

1.8 START-UP

A. Direct the check-out of utilities, operational systems, and equipment.

B. Assist in initial start-up and testing.

C. Record dates of the start of the operations of systems and equipment.

D. Submit to Architect/Engineer written notice of the beginning of warranty period for equipment put into service.

1.9 COORDINATION OF CONTRACT CLOSEOUT

A. Substantial Completion:

1. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.
2. Upon determination of Substantial Completion of work or portion thereof, prepare for the Architect/Engineer a list of incomplete or unsatisfactory items.

B. Final Completion:

1. Upon determination that work is at final completion:

   a. Submit written notice to Architect/Engineer that the work is ready for final inspection.
   b. Secure and transmit to Architect/Engineer required closeout submittals.

2. Turn over to Architect/Engineer.

   a. Operations and maintenance data.
   b. Spare parts and maintenance materials.
   c. Warranties and other data as required for these specifications.
   d. Owner file copies of all submittals, changes, etc.

C. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

D. Assemble and coordinate closeout submittals specified.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Provide and pay for field engineering services required for project.

1. Survey work required for execution of Project.
2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction schedule.

B. Architect/Engineer and/or Owner's representative will identify existing control points and property line as indicated on the drawings.

1.2 RELATED REQUIREMENTS

A. Bidding Conditions

B. Contractual Requirements

C. Section 01010 - "Summary of Work"

1.3 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Qualified Registered Engineer or Registered Land Surveyor registered in the state of Florida, acceptable to Contractor, Owner and Architect/Engineer.

B. Registered professional Engineer of the discipline required for the specific service on the Project, licensed in the state of Florida.

1.4 SURVEY REFERENCED POINTS

A. Existing basic horizontal and vertical control points for the Project are those designated on the drawings.

B. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.

1. Make no change or relocations without prior written notice to

Architect/Engineer and Owner.

2. Report to Architect/Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to replace Project Control Points which may be lost or destroyed.

    a. Establish replacement based on original survey control.

1.5 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two permanent bench marks on site, referenced to data established by survey control points.

1. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, location and layout, by instrumentation and similar appropriate means:

1. Site Improvements:

    a. Stakes for grading, fill and topsoil placement.
    b. Utility slopes and invert elevations.

2. Batter boards for structures.
3. Building foundation, column locations and floor levels.
4. Controlling lines and levels required for mechanical and electrical trades.

C. Verify building dimensions, layout, location on site and finish floor elevations. Notify Architect/Engineer of any discrepancies in the dimensioning on the drawings.

D. On a monthly basis, verify layouts by same methods.

1.6 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. On completion of foundation walls and major site improvements, prepare a certified survey showing all dimensions, locations, angles and elevation of construction. Provide three (3) copies and one reproducible of certified survey to Architect/Engineer for distribution.

1.7 SUBMITTALS

A. Submit name and address of Surveyor and professional engineer to Architect/Engineer.

B. On request of Architect/Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit Certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance, or nonconformance with Contract Documents.

D. Submit six signed and sealed tie-in-surveys upon completion of the ground floor slab. Such survey shall indicated elevations and tie dimensions to existing structures.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01050

SECTION 01090 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used on Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to extent not stated more explicitly in another provision of Contract Documents.

B. General Requirements: The provision or requirements of Division 1 section. General Requirements apply to entire work of contract and, where so indicated, to other elements which are included in project.

C. Indicated: The term "indicated" is a cross reference to details, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by Architect/Engineer", "requested by Architect/Engineer", etc. However, no such implied meaning will be interpreted to extend Architect's/Engineer's responsibility into Contractor's area of construction supervision.

E. Reviewed: Where used in conjunction with Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "reviewed" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "review" by Architect/Engineer to be interpreted as a release of

Contractor from responsibilities to fulfill requirements of Contract Documents.

F. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on the drawings, and may or may not be identical with description of land upon which project is to be built.

G. Furnish: Except as otherwise defined in greater detail, term "furnish: is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

H. Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, storage, unpacking, assembly, erection, placing, anchoring, applying, work to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

J. Installer: The entity (person or firm) engaged by Contractor or its subcontractor or subcontractor for performance or a particular unit or work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in operations they are engaged to perform.

K. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the work, either at project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

L. Owner Furnished - Contractor Installed: Equipment or components of a system that are purchased by the Owner and furnished to the Contractor for installation in the project. The Contractor shall receive, store, protect, install, connect and test each time unless otherwise indicated.

M. Contractor Furnished - Contractor Installed: Equipment or components of a system that are purchased, furnished, and installed by the Contractor.

N. Owner Furnished - Owner Installed: Equipment or components of a system that are purchased, furnished and installed by the Owner or his vendors.

1.3 FORMAT AND SPECIFICATION EXPLANATIONS:

A. Specification Production: None of these explanations will be interpreted to modify

substance of requirements. Portions of these specifications have been produced by Architect's/Engineer's standard methods of editing master specifications, and may contain minor deviations from traditional writing formats. Such deviations are a normal result to this production technique, and no other meaning will be implied or permitted.

B. Format Explanation: The format of principal portions of these specifications can be described as follows; although other portions may not fully comply and no particular significance will be attached to such compliance or noncompliance.

1. Sections and Divisions: For convenience, basic unit of specification text is a "section", each unit of which is named and numbered. These are organized into related families of sections, and various families of sections are organized into "divisions", which are recognized as the present industry consensus on uniform organization and sequencing of specifications. The section title is not intended to limit meaning or content of section, not to be fully descriptive or requirements specified therein, not to be an integral part of text.

    a. Each section of specifications has been subdivided into 3 (or less) "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These do not limit the meaning or and are not an integral part of text which specifies requirements.

2. Underscoring: used strictly to assist reader of specification text in scanning text for key works in content (for quick recall). No emphasis on or relative importance of text is intended where underscoring is used.
3. Imperative Language: Used generally in specifications. Except as otherwise indicated requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or when so noted, by others.
4. Section Numbering: Used to facilitate cross-references in Contract Documents. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification section on Contract Documents.
5. Page Numbering: Numbered independently for each section' recorded in listing of sections (Index or Table of Contents) in Project Manual. Section number is shown with page number at top right of each page, to facilitate location of text in Project Manual.

C. Specification Content: Because of methods by which this project specification has been produced, certain general characteristics of content, and conventions in use of

language are explained as follows:

1. Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.
2. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets or requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels or quality, most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless specifically detailed language written into contract documents (not by way of reference to an industry standard) clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Architect/Engineer for a decision before proceeding.

    a. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.

3. Minimum Quality/Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect/Engineer for decision before proceeding.
4. Specialists; Assignments: In certain instances, specification text requires (or at least implies) that specific work be assigned to specialists or expert entities, who must be engaged for performance of those units of work. These must be recognized as special requirements over which Contractor has no choice or option. These assignments must not be confused with (and are not intended to interfere with) normal application of regulations union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specified unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final responsibility for fulfillment of entire set of requirements remains with Contractor.
5. Trades: Except as otherwise indicated, the use of title such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized trades person of corresponding generic name (such

as "carpenter"), nor that specified requirements apply exclusively to work by trades persons of that corresponding generic name.

6. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirement with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated.
7. Singular works will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates.

D. Drawing Symbols:

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

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

E. Industry Standards:

1. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of contract Documents) as if published copies were bound herewith.

   a. Referenced Standards: (referenced directly in Contract Documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
   b. Non-referenced standards are hereby defined to have not particular applicability to the work, except as a general measurement of whether work complies with standards recognized in construction industry.

2. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with the latest edition of the standard in effect as of date of Contract Documents.

3. Copies of Standards: Provide as needed for proper performance of the work; obtain directly from publication sources. Architect/Engineer may specifically required the Contractor to obtain copies of certain standards.

4. Abbreviations and names: The following acronyms or abbreviations as referenced in Contract Documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue NW; Washington, D.C. 20006; 202/862-5100
AAMA	Architectural Aluminum Manufacturers Association 35 E. Wacker Dr.; Chicago, IL 60601; 312/782-8256
AAN	American Association of Nurserymen 230 Southern Bldg.; Washington, D.C. 20005; 202/737-4060
AASHTO	American Association of State Highway & Transportation Officials 444 N. Capital; Washington, D.C. 20001; 202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215; Research Triangle Park, N.C. 27709; 919/549-8141
ACI	American Concrete Institute P.O. Box 19150; Detroit, MI 48219; 313/532-2600
ACIL	American Council of Independent Laboratories 1725 K Street, NW; Washington, D.C.; 20006; 202/659-3766
ADC	Air Diffusion Council 230 N. Michigan Avenue; Chicago, IL 60601; 312/372-9800
AGA	American Gas Association 1515 Wilson Blvd.; Arlington, VA 22209; 703/841-8400
AI	Asphalt Institute Asphalt Institute Building; College Park, MD 20740; 301/277-4258
AIA	American Institute of Architects 1735 New York Avenue, NW; Washington, D.C. 20006; 202/626-7474

A.I.A.	American Insurance Company 85 John Street; New York, NY 10038; 212/699-0400
AISC	American Institute of Steel Construction 400 North Michigan Avenue; Chicago, IL 60611; 312/670-2400
AISI	American Iron and Steel Institute 1000 16th Street, NW; Washington, D.C. 20036; 202/452-7100
AITC	American Institute of Timber Construction 333 W. Hampden Avenue Englewood, Colorado 80110; 303/761-3212
AMCA	Air Movement and Control Association 30 W. University Dr. Arlington Heights, IL 60004;312/394-0150
ANSI	American National Standards Institute 1430 Broadway New York, New York 10018; 212/354-3300
APA	American Plywood Association Post Office Box 11700 Tacoma, Washington 98411;206/565-6600
ARI	Air Conditioning & Refrigeration Institute 1815 North Fort Myer Dr. Arlington, Virginia 22209;703/524-8800
ASC	Adhesive and Sealant Council 1600 Wilson Boulevard Arlington, Virginia 22209;703/841-1112
ASHRAE	American Society of Heating, Refrigeration & Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, Georgia 30329; 404/636-8400
ASME	American Society of Plumbing Engineers 345 E. 47th Street New York, New York 10017; 212/644-7722
ASPE	American Society of Plumbing Engineers 15233 Ventura Boulevard

Sherman Oaks, California 91403;213/783-4845

ASSE	American Society of Sanitary Engineering Post Office Box 9712 Bay Village, Ohio 44140; 216/835-3040
ASTM	American Society for Testing and Material 1916 Race Street Philadelphia, PA 19103; 215/299-5400
AWI	Architectural Woodwork Institute 2310 South Walter Reed Dr. Arlington, Virginia 22206; 703/671-9100
AWPA	American Wood-Preservers' Association 7735 Old Georgetown Road Bethesda, Maryland 20014; 301/652-2109
AWPB	American Wood-Preservers Bureau 2772 South Randolph Street Arlington, Virginia 22206; 703/931-8180
AWS	American Welding Society 550 LeJune Road Miami, Florida 33135; 305/642-7090
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, Colorado 80235; 303/794-7711
BHMA	Builder's Hardware Manufacturer's Association (c/o TGAM) 60 EAst 42nd St. Rm. 1807 New York, New York 10017; 212/682-8142
BIA	Brick Institute of America 1750 Old Meadow Rd. McLean, Virginia 22101; 703/893-4010
CDA	Copper Development Association 405 Lexington Avenue New York, New York 10017; 212/953-7300
CE	Corps or Engineers (U.S. Dept. of the Army) Washington, D.C. 20315

CISPI	Cast Iron Soil Pipe Institute 1499 ChainBridge Rd. McLean, Virginia 22101; 703/827-9177
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street Chicago, Illinois 60601; 312/372-5059
CS	Commercial Standard of NBS (U.S. Dept. of Commerce) Government Printing Office Washington, D.C. 20402
DHI	Door and Hardware Institute 1815 N. Ft. Meyer Dr. Arlington, Virginia 22209; 703/527-2060
EIA	Electronic Industries Association 2001 Eye Street, NW Washington, D.C. 20006; 202/457-4900
FAA	Federal Aviation Administration (U.S. Dept. of Transportation) 800 Independence Avenue, SW Washington, D.C. 20590
FCC	Federal Communications Commission 1919 M Street, NW Washington, D.C. 20554; 202/632-7000
FCI	Fluid Controls Institute Post Office Box 3854 Tequesta, Florida 33458; 407/746-6466
FGMA	Flat Glass Marketing Association 3310 Harrison Topeka, Kansas 66611; 913/266-7013
FHA	Federal Housing Administration (U.S. Dept. of HUD) 451 7th Street, SW Washington, D.C. 20201
FM	Factory Mutual Engineering Corp. 1151 Boston-Providene Turnpike Norwood, MA 02062; 617/762-4300

FS	Federal Specification (General Services Administration) Building 197, Washington Navy Yard, SE Washington, D.C. 20407
FTI	Facing Tile Institute Box 8880 Canton, Ohio 44711; 216/488-1211
GA	Gypsum Association 1603 Orrington Avenue Evanston, Illinois 60201; 312/491-1744
HPMA	Hardwood Plywood Manufacturers Association Post Office Box 2789 Reston, Virginia 22090; 703/435-2900
IES	Illuminating Engineering Society of North America 345 E. 47th Street New York, New York 10017; 212/644-7926
ILI	Indiana Limestone Institute of America Stone City Bank Building Bedford, Indiana 47421; 812/275-4426
IRI	Industrial Rick Insurers 85 Woodland Street Hartford, CT 06102; 203/525-2601
MCAA	Mechanical Contractors Association of America 5530 Wisconsin Avenue Washington, D.C. 20015; 202/654-7960
MIA	Marble Institute of America 33505 State Street Farmington, MI 48024; 313/476-5558
MIL	Military Standardization Documents (U.S. Dept. of Defense) Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MLSFA	Metal Lath/Steel Framing Association 221 N. LaSalle Street Chicago, IL 60601; 312/346-1600

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 5203 Leesburg Pike Falls Church, Virginia 22041; 702/998-7996
NAAMM	The National Association of Architectural Metal Manufacturers 221 N. LaSalle Street Chicago, Illinois 60601; 312/346-1600
NAPF	National Association of Plastic Fabricators 1701 N. Street, NW Washington, D.C. 20036; 202/656-8874
NBGOA	National Building Granite Quarries Association 202 South Third Avenue Cold Spring, MN 55107
NBS	National Bureau of Standards (U.S. Dept. of Commerce) Gaithersburg, Maryland 20234
NCMA	National Concrete Masonry Association Post Office Box 781 Herndon, Virginia 22070; 703/435-4900
NEC	National Electric Code (by NFPA)
NECA	National Electric Contractors Association 7315 Wisconsin Avenue Washington, D.C. 20014; 202/657-3110
NEII	National Elevator Industry, Inc. 600 Third Avenue New York, New York 10016; 212/986-1545
NEMA	National Electrical Manufacturers Association 2101 L Street, NW Washington, D.C. 20037; 202/457-8400
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210; 617/482-8755
N.F.P.A.	National Forest Products ASsociation 1619 Massachusetts Avenue, NW Washington, D.C. 20036; 202/797-5800

NHLA	National Hardwood Lumber Association Post Office Box 34518 Memphis, Tennessee 38104; 901/377-1818
NPA	National Particleboard Association 2306 Perkins Place Silver Spring, Maryland 20910; 301/587-2204
NRCA	National Roofing Contractors Association One O'Hare Center 6250 River Road Rosemont, Illinois 60018; 312/318-6722
NSF	National Sanitation Foundation 3475 Plymouth Rd. Ann Arbor, Michigan 48106; 313/769-8010
NSSEA	National School Supply & Equipment Association 1500 Wilson Boulevard Arlington, Virginia 22209; 703/524-8819
NTMA	The National Terrazzo and Mosaic Association 3166 Des Plains Avenue Des Plains, Illinois 60018; 312/635-7744
NWMA	National Wood Manufacturer's Association 205 W. Touhy Avenue Park Ridge, Illinois 60068; 312/823-6747
OSHA	Occupational Safety Health Administration (U.S. Dept. of Labor) Government Printing Office Washington, D.C. 20402
PCI	Prestressed Concrete Institute 20 N. Wacker Dr. Chicago, Illinois 60606; 312/346-4071
PDI	Plumbing and Draining Institute 5342 Boulevard Place Indianapolis, Indiana 46208; 317/251-5298
PEI	Porcelain Enamel Institute 1911 N. Fort Myer Arlington, Virginia 22209; 703/527-5257

PS	Product Standard of NBS (U.S. Dept. of Commerce) Government Printing Office Washington, D.C. 20402
RFCI	Resilient Floor Covering Institute 1030 15th Street, NW Washington, D.C. 20005; 202/833-2635
RIS	Redwood Inspection Service (Grading Rules) 627 Montgomery San Francisco, California 94111
SAMAS	Scientific Apparatus Makers Association 1101 16th Street, NW Washington, D.C. 20036; 202/223-1360
SDI	Steel Deck Institute Post Office Box 3812 St. Louis, MO 63122; 314/965-1741
S.D.I.	Steel Door Institute 712 Lakewood Center, N. Cleveland, Ohio 44107; 216/226-7700
SHLMA	Southern Hardwood Lumber Manufacturers Association 805 Sterick Boulevard Memphis, Tennessee 38103; 901/525-8221
SIGMA	Sealed insulating Glass Manufacturers Association 111 E. Wacker Dr. Chicago, Illinois 60601; 312/644-6610
SJI	Steel Joist Institute 1703 Parham Rd. Richmond, Virginia 23229; 804/288-3071
SMACNA	Sheet Metal & Air Conditioning Contractors' National Association Post Office Box 70 Merrifield, Virginia 22116
SPIB	Southern Pine Inspection Bureau (Grading Rules) 4709 Scenic Highway Pensacola, Florida 32504; 904/434-2611

SSPC	Steel Structures Painting Council 4400 5th Avenue Pgh, PA 15213; 412/578-3327
TCA	Tile Council of America Post Office Box 326 Princeton, New Jersey 08540; 609/921-7050
TIMA	Thermal Insulation Manufacturers Association 7 Kirby Plaza Mt. Kisco, New York 10549; 914/241-2284
TPI	Truss Plate Institute 100 W. Church St. Frederick, Maryland 21701; 301/694-6100
UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, Illinois 60062; 312/272-8800
WCLIB	West Coast Lumber Inspection Bureau (Grading Rules) Post Office Box 2315 Portland, Oregon 97223; 503/649-0651
WIC	Woodwork Institute of California 1833 Broadway Fresno, California 93773; 209/233-9035
WRI	Wire Reinforcement Institute 8900 Westpark Drive McLean, Virginia 22101; 703/790-9790
WSFI	Wood and Synthetic Flooring Institute 2400 E. Devon Des Plaines, Illinois 60018; 312/635-7700
WWPA	Western Wood Products Association (Grading Rules) 1500 Yeon Building Portland, Oregon 97204; 503/224-3930
W.W.P.A.	Woven Wire Products Association 108 W. Lake Street Chicago, Illinois 60601; 312/332-6502

F. Governing Regulations/Authorities:

1. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing Contract Documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contract governing authorities directly for necessary information and decisions having a bearing on performance of the work.

G. Submittals:

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

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION 01090

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. Work by Owner.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.
8. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification:

1. Project Location: Fort Braden School – New Classroom Addition and Renovation, 15100 Blountstown Highway, Tallahassee, Florida, 32310.

B. Owner; The School Board of Leon County, Florida, 2757 West Pensacola Street, Tallahassee, Florida 32304-2998

1. Owner's Representative: Russ Waters

C. Architect: Barnett Fronczak Barlowe Architects, 225 South Adams Street, Tallahassee, Florida, 32301.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: Bliss & Nyitray, Inc., 227 North Bronough Street, Tallahassee, Florida, 32301.
2. Civil Engineer: Spectra Engineering & Research, Inc., 3056 Highlands Oak Terrace, Tallahassee, Florida, 32301.
3. Mechanical, Electrical, Fire Protection and Plumbing Engineer: McGinnis and Flemming Engineering, 1401 Miccosukee Road Tallahassee, Florida, 32308.

E. Construction Manager: Albritton Williams, Inc., 2850 Industrial Plaza Drive, Tallahassee, Florida, 32301.

1. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The Project consists of a six Classroom addition in a separate building and expansion to both the Dining and Media rooms to Fort Braden School located at 15100 Blountstown Highway, Tallahassee, Florida. The Work includes sitework, concrete work, light gauge steel framing, brick masonry walls, aluminum windows and shingle roofing. Finishes include painted masonry walls, carpet and vct flooring and gypsum wallboard/acoustical panel ceilings.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Relocation of Playground equipment and installation of classroom technology.

C. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.

1. Classroom furniture and furnishing accessories.

1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways 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.

1.7 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day 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 approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance 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.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

C. 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 Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.10 MISCELLANEOUS PROVISIONS

A. The new building addition shall meet the requirements of the United States Green Building Council Leadership in Energy and Design Requirements for a LEED Certified Building in accordance with Sections 3.2(4) and 4.3(8)(a)1, State Requirements for Educational Facilities and Section 255.2575, Florida Statutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED:

A. Contractor shall attend a Pre-Construction meeting administered by the Architect/Engineer.

B. Contractor shall schedule and administer monthly progress meetings and specially called meetings throughout progress of work.

1. Prepare agenda for meetings.
2. Distribute written agenda of each meeting four days in advance of meeting date.
3. Make physical arrangements for meetings.
4. Preside at meetings.
5. Record the minutes; include significant proceedings and decisions.
6. Reproduce and distribute copies of minutes within three days after each meeting.

a. To participants in the meeting.
b. To parties affected by decisions made at the meetings.
c. Furnish three copies of minutes to Architect/Engineer.

C. Representative of Contractors, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

D. Owner and Architect/Engineer shall be invited to all such meetings and may attend to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.2 RELATED REQUIREMENTS:

A. Bidding Conditions.

B. Contractual Conditions.

C. Shop drawings, product data and samples.

D. Section 01010 - Summary of Work

E. Section 01040 - Coordination.

1.3 PRECONSTRUCTION MEETING:

A. Location: A site designated by owner.

B. Attendance:

1. Owner's Project Manager.
2. Architect/Engineer and/or his professional consultants.
3. Contractor's Superintendent.
4. Major Subcontractors.
5. Others as Appropriate.

C. Suggested Agendum:

1. Distribution and discussion of:

   a. List of major subcontractors and suppliers.
   b. Projected Construction Schedules.

2. Critical work sequencing.
3. Major equipment deliveries and priorities.
4. Project Coordination:

   a. Designation of responsible personnel.

5. Procedures and processing of:

   a. Field decisions.
   b. Proposal requests.
   c. Submittals.
   d. Change Orders.
   e. Applications for Payment.

6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of Premises:

   a. Office, work and storage areas.
   b. Owner's requirements.

9. Construction facilities, controls and construction aids.
10. Temporary Utilities.

11. Safety and first-aid procedures.
12. Security procedures.
13. Housekeeping procedures.

1.4 PROGRESS MEETINGS:

A. Contractor shall schedule regular periodic meetings at least monthly or more often if deemed appropriate by the Architect.

B. Hold called meetings as required by progress of work.

C. Location of the meetings: Project field office of Contractor.

D. Attendance:

1. Owner and Architect/Engineers and his professional consultants as needed.
2. Subcontractors as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others.

E. Suggested Agendum:

1. Review, approval of minutes of previous meetings.
2. Review of work progress since previous meetings.
3. Field observations, problems, conflicts.
4. Problems which impeded Construction Schedule.
5. Review of off-site fabrication, delivery schedule.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:

a. Effect on Construction Schedule and on completion date.
b. Effect on other contracts of the Project.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01200

SECTION 01210 - PROCEDURES AND PERFORMANCES

PART 1 - PROCEDURES

A. Observation: The Architect and his Consulting Engineers may review all the work including Architectural, Civil, Structural, Plumbing, Electrical and Mechanical on this project.

B. Tests: Required tests on the project will be Soil Density Tests noted in Division 2, concrete cylinder and slump tests noted in Division 3 of the Contract Documents or Drawings, and others as may be deemed appropriated by the Architect/Engineer and Owner.

PART 2 - PERFORMANCE

A. Measurements and Dimensions: Before ordering materials or doing work which is dependent for proper size, or installation upon coordination with building conditions, the Contractor shall verify all dimensions by taking measurements at the building and shall be responsible for the correctness of same. No consideration will be given any claim based on the difference between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or the specifications and the existing conditions shall be referred to the Architect for adjustment before any work affected thereby is begun.

PART 3 - EXECUTION

Not used.

END OF SECTION 01210.

SECTION 01310 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 The progress schedule required under the General Conditions shall be prepared using the critical path method as described in the Supplementary General Conditions and herein.

A. The critical path schedules requirement will consist of a two-part network submittal (interim schedule, and detailed schedule), along with monthly progress status reports (Monthly Report), quarterly progress forecast reports (Quarterly Report), and monthly update to the networks and analysis. The planning, scheduling, management, and execution of the Work is the sole responsibility of the Contractor. The progress schedule requirement is established to allow Owner to review Contractor's planning, scheduling, management and execution of the work; to assist owner in evaluating work progress and make progress payments; and to allow other contractors to cooperate and coordinate their activities with those of the Contractor.

B. Review of the schedule of submittals shall not relieve Contractor from responsibility for any deviations from the Contract Documents unless Contractor has, in writing, submission and received written concurrence to the specific deviations, nor shall any concurrence by Owner and Architect/Engineer relieve Contractor from, responsibility for errors and omissions in the submittals.

1.2 INTERIM SCHEDULE SUBMITTALS

A. Submittal set shall include a time-scaled graphic arrow diagram, a detailed schedule of values incorporating shop drawing submittals, and interim status reports. The initial submittal shall be delivered within fourteen (14) calendar days of the effective date of the Agreement and shall use the Notice to Proceed as the data date. The submittal shall be submitted on time, be completed, comply with all contract conditions, and represent realistic approach to the Work. No progress payments for work performed shall be made until this submittal set is submitted and accepted.

B. The graphic arrow diagram shall show one (1) detailed activity for all work to be performed during the first 120 calendar days after Notice to Proceed, and two (2) summary activities for the remainder of the contract.

C. Interim status reports shall be revised and submitted monthly following the initial preliminary schedule submittal, and continue through the first 120 calendar days.

1.3 DETAILED SCHEDULE SUBMITTAL

A. Submittals shall include a time-scaled (day after Notice to Proceed) graphic arrow

diagram showing all contract activities, computer printout reports, and a supporting narrative. The initial detailed schedule submittal shall be delivered within 60 calendar days after the Notice to Proceed, and shall use the Notice to Proceed as the data date. The submittal shall be on time, complete, comply with all Contract conditions, and represent a reasonable approach to the Work. No progress payments shall be made for work performed after the first 120 days of the Contract until the detailed schedule submittal is submitted and accepted.

B. The graphic arrow diagram shall be formatted in accordance with the paragraph 2A above. The diagram shall include all detailed activities included in the interim schedule submittal grouped by major areas of work and detailed activities, as shown on the Schedule of Values.

1.4 QUARTERLY PROGRESS REPORTS

A. Not later than 120 calendar days after the Notice to Proceed, and at three month intervals thereafter, Contractor shall submit to the Architect/Engineer, a draft Quarterly Progress Report with data as of the last day of the current pay period. Submittals of a Quarterly Progress Report shall be in lieu of the corresponding Monthly Report. Within thirty calendar days after receipt of this report, Owner, Architect/Engineer, and Contractor shall meet to discuss the draft report and reach an agreement on job progress. Job progress shall specifically include:

1. Actual completion dates for activities completed during the quarterly report period, and actual start dates for activities commenced during the quarterly report period.
2. Estimated start dates for activities scheduled to commence during the following quarterly report period.
3. Changes in the duration of any activity and minor logic changes.
4. Activities not included in the currently accepted, detailed graphic arrow diagram.
5. Major changes in scope and other identifiable changes.

1.5 SUBMISSIONS

A. Submit initial schedules within 14 days after award of Contract.

1. Architect will review schedules and return review copy within 10 days after receipt.
2. If required, resubmit within 7 days after return of review copy.

B. Submit revised and/or updated progress schedules with each application for payment.

1.6 DISTRIBUTION

A. Distribute copies of the reviewed schedules to:

1. Architect/Engineer
2. Owner's Representative
3. Subcontractors
4. Other concerned parties

B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

1.7 COMPLIANCE

A. See the Supplementary General Conditions for consequences of non-compliance.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01310.

SECTION 01340 - SUBMITTALS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED:

A. Submit Shop Drawings, Product Data and Samples required by Contract Documents.

1.2 RELATED REQUIREMENTS:

A. Definitions and Additional Responsibilities of Parties: General Conditions of the Contract.

B. Designate in the Construction Schedule, Application for Payments, or in a separate coordinated schedule, the dates for submission of Shop Drawings, Product Data and Samples.

C. Contractual Conditions

1.3 SHOP DRAWINGS:

A. Drawings shall be presented in a clear and thorough manner.

1. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.

B. Drawings shall be original drawings, prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the work, showing fabrication, layout, setting or erection details. DUPLICATION OF CONTRACT DOCUMENTS FOR ANY SUBMITTAL SHALL NOT BE ACCEPTABLE.

1. Prepared by a qualified detailer.
2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
3. The contractor may, at his expense, purchase a limited set of electronic files of the Contract Documents from the Architect/Engineer to assist in the production of the Shop Drawings. The file set shall be limited to the specific area of interest to the Contractor. All fee schedules for the files shall be set by the Architect/Engineer. The Architect/Engineer reserves all rights to the

files under copyright laws and reserves the right to not release any electronic files.

C. Shop Drawing transmittal letter shall be submitted separate for each required section as provided at the end of this section. Submittal shall note any and all deviations from Contract Documents.

1.4 PRODUCT DATA:

A. Preparation

1. Clearly mark each copy to identify pertinent products or models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring or piping diagrams and controls.
5. Note deviations from Contract Documents.

B. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the work.
2. Supplement standard information to provide information specifically applicable to the work.
3. Note deviations from Contract Documents.

1.5 SAMPLES:

A. Office samples shall be of sufficient size and quantity to clearly illustrate materials, equipment or workmanship, and to establish standards by which completed work is to be judged.

1. Functional characteristics of the product, with integrally related parts and attachment devices.
2. Full range of color, texture and pattern.
3. After review, samples shall be used for comparison in construction of project.
4. Note deviations from Contract Documents.

B. Field samples and mock-ups.

1. Erect at project site at location acceptable to Architect/Engineer.
2. Construct each sample or mock-up complete, including work of all trades

required in finished work.

3. Note deviations from Contract Documents.

1.6 CONTRACTOR RESPONSIBILITIES:

A. Review Shop Drawings, Product Data and Samples prior to submission.

1. Check and stamp submittal with his approval.

B. Determine and verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with specifications.
5. Note deviations from Contract Documents.

C. Coordinate each submittal with requirements of the work and of the Contract Documents.

D. Notify the Architect/Engineer in writing, at time of submission, of his review and approval of submittal and of any deviations in the submittals from requirements of the Contract Documents.

1. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architects/Engineers review of submittals, unless specific deviations are called to the attention of the Architect/Engineer in writing and the Architect/Engineer gives written acceptance of specific deviations.
2. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's/Engineer's review of submittals.

E. Begin no fabrication or work which requires submittals until return of submittals with Architect/Engineer review.

F. Submittals not reviewed and approved by the Contractor will be rejected.

1.7 SUBMISSION REQUIREMENTS:

A. Make submittals promptly in accordance with accepted schedule, and in such sequence as to cause no delay in the work or in the work of any other Contractor.

Use transmittal format included herein.

B. Number of submittals required:

1. Shop Drawings: Submit sufficient quantity of prints of shop drawing for the Contractor's use and two (2) copies to be retained by the Architect.
2. Product Data: Submit sufficient quantity of Product Data for the Contractor's use and two (2) copies to be retained by the Architect.
3. Samples: Submit the number stated in each specification section. Provide two (2) samples if not indicated.

C. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The project title and number.
3. Contract identification.
4. The names of Contractor, Supplier and Manufacturer.
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Identification of revisions on re-submittals.
9. Applicable Standards (such as ASTM or Federal Specification numbers).
10. An 8 inch x 3 inch blank space for contractor and Architect/Engineer or provide review status cover page.
11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

1.8 RE-SUBMISSION REQUIREMENTS:

A. Make any corrections or changes in the submittals required by the Architect/Engineer and resubmit until accepted.

B. Shop drawings and product data:

1. Revise initial drawings of data, and resubmit as specified for the initial submittal.
2. Cloud any change which has been made.
3. Indicate shop drawing is being resubmitted, use Architect's/Engineer's shop drawing identification number if provided.

C. Samples: Submit new samples if requested by Architect.

1.9 DISTRIBUTION

A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Architect/Engineer stamp of acceptance to:

1. Job site file.
2. Subcontractors.
3. Supplier or Fabricator.
4. Project close-out documents (Section 01700).

1.10 ARCHITECT/ENGINEER DUTIES

A. Review submittals; allowing Architect/Engineer a period of 14 calendar days for review and return of Shop drawings.

B. Affix stamp and initials or signature and indicate requirements for resubmittal or approval of submittal.

C. Return submittals to Contractor for distribution of for re-submission.

D. Forward copy of submittal for Owner's use and information. This shall not relieve contractor's requirements in other sections to provide the Owner with a complete record copy at job close-out.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SHOP DRAWING SUBMITTALS SHALL BE REVIEWED IN ACCORD WITH THE FOLLOWING:

A. Review by Architect/Engineer of Record of submittals is for general conformance with the design concept as presented by the Contract Documents. No detailed check of quantities or dimensions will be made.

B. The General Contractor/Construction Manager is responsible for assuring that all submittals comply with the latest project plans, specifications, governing codes and regulations and is solely responsible for confirming all quantities, dimensions, fabrication techniques and coordinating work with all trades.

C. Shop drawings are to be submitted in a timely manner allowing adequate time for processing. An average submittal is reviewed by the Architect/Engineer of Record within 14 calendar days of receipt.

D. Submit shop drawings for specific components, such as columns, footings, etc., in their entirety. Shop drawings for similar floors shall be submitted in the same package.

E. All submittals are to be accompanied by a letter of transmittal. Do not combine different submittals on the same transmittal.

F. All shop drawings must bear evidence of the Contractor's approval prior to submitting to the Architect/Engineer of Record.

G. Submit quantities per Part 1; 7.B.

H. All changes and additions made on re-submittals must be clearly flagged and noted. The purpose of the re-submittals must be clearly noted on the letter of transmittal. Architect/Engineer of Record review is limited to those items causing the resubmission.

I. For criteria applicable to shop drawings requiring engineering input by a specialty engineer, see below.

J. Shop drawings not meeting the above criteria or submitted after fabrication will not be reviewed.

K. The Contract Documents are not to be reproduced for use as shop drawings.

3.2 SHOP DRAWINGS REQUIRING INPUT BY SPECIALTY ENGINEER SHALL BE REVIEWED IN ACCORD WITH THE FOLLOWING:

A. Specialty Engineer:

1. Definition - A Florida registered professional engineer, not the structural engineer of record, who specializes in and who undertakes the design of

structural components or structural systems included in a specific submittal prepared for this project.

2. Shall be:

    a. An employee or officer of a fabricator.
    b. An employee or officer of an entity supplying components to a fabricator.
    c. An independent consultant retained by the fabricator of his supplier.

B. Shop Drawings requiring a specialty engineer are fabrication and erection drawings prepared for, but not limited to the following items:

    1. Aluminum or light gage steel exterior wall systems, prefabricated steel stairs, handrails, precast concrete components, post-tensioning systems, prefabricated wood components, open web steel joists, formwork and falsework shoring and reshoring.

C. Submittals shall clearly identify the specific project, applicable codes, list the design criteria, and shall show all details and plans necessary for proper fabrication and installation. Calculations and shop drawings shall identify specific product utilized. Generic products will not be accepted.

D. Shop drawings and calculations must be prepared under the direct supervision and control of the specialty engineer.

E. Shop drawings and calculations require the impressed seal, date and signature of the specialty engineer. Computer printouts are an acceptable substitute for manual computations provided they are accompanied by sufficient descriptive information to permit their proper evaluation. Such descriptive information shall bear the impressed seal and signature of the specialty engineer as an indication that he has accepted responsibility for the results. Architect/Engineer of Record will retain one signed and sealed print for record.

F. Drawings prepared solely to serve as a guide for fabrication and installation (such as reinforcing steel shop drawings or structural steel erection drawings) and requiring no engineering input do not require the seal of a specialty engineer.

G. Catalog information on standard products does not required the seal of a specialty engineer.

H. Review by the Architect and Structural Engineer of record of submittals is limited to verifying the following:

1. That the specified structural submittals have been furnished.
2. That the structural submittals have been signed and sealed by the specialty engineer.
3. That the specialty engineer has understood the design intent and has used the specified structural criteria. (No detailed check of calculations will be made.)
4. That the configuration set forth in the structural submittals is consistent with the contract documents. (No detailed check of dimensions or quantities will be made.)

I. List of drawings shall be prepared and maintained for all shop drawings requiring participation of a specialty engineer. The list shall contain project name, name of General Contractor/Construction Manager, name of subcontractor, name of specialty engineer, drawings number, drawing title and latest revision number and date. For partial submittals, the list shall contain all anticipated drawing numbers and titles required to complete the contract. The General Contractor/Construction Manager is responsible for submitting the latest updated list of drawings with each submittal.

J. Upon the completion of the submittal process for the project, the Contractor shall submit to the Architect/Engineer of Record a notarized affidavit stating the following:

1. "This is to certify that the undersigned as General Contractor/Construction Manager for the referenced project has furnished to and has received acceptance from the Architect/Engineer of Record for all structural submittals requiring participation of a specialty engineer. These submittals were prepared for work performed by the following subcontractors: (name of subcontractors)..." The final lists of shop drawings shall be attached to the affidavit.

K. Submittals not meeting the above criteria will not be reviewed.

L. Submit quantities per Part 1; 7.B.

END OF SECTION 01340

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

A. Related requirements specified elsewhere.

1. Progress Meetings: Section 01200.
2. Construction Schedule: Section 01310.

B. Submit to the Architect/Engineer a Schedule of Values, no later than 14 calendar days after date of Notice to Proceed.

C. Upon request by Architect/Engineer, support values given with data that will substantiate their correctness.

D. Use Schedule of Values only as basis for Contractor's Application for Payment.

1.2 FORM OF SUBMITTAL:

A. Submit Typewritten Schedule of Values on AIA form G702, and G703. Computer generated formats of this form are acceptable.

B. Use table of Contents of this specification as a minimum basis for format for listing cost of Work. Additional breakdowns shall be as determined and required by the Architect/Engineer and Owner. Work shall be broken into labor and material costs.

C. Identify each line item with number and title as listed in Table of Contents of this Specification.

1.3 PREPARING SCHEDULE OF VALUES:

A. Itemize separate line item cost for each of the following general cost items as applicable.

1. Performance and Payment Bonds.
2. Field Supervision and Layout.
3. General Conditions.
4. Temporary Facilities and Controls.
5. Other items as deemed appropriate.

6. Mobilization
7. De-Mobilization

B. Itemize separate line cost for work required by each section of this Specification. Quantities should be sufficiently detailed and subdivided as necessary to describe all of the labor and materials incorporated into the work to accurately measure the Contractor's progress for periodic payments.

C. Round off figures to nearest dollar.

D. Make sum of total cost of all items listed in each schedule equal in total Contract Sum.

1.4 REVIEW AND RESUBMITTAL:

A. After review by owner and Architect/Engineer, revise and resubmit Schedule of Values as required.

B. Resubmit revised Schedule of Values in the same format.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTIONS

Not used.

END OF SECTION 01370

SECTION 01410 - SPECIAL TESTING & INSPECTION REQUIREMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED:

A. Owner will employ and pay for the services of an independent testing laboratory to perform specified testing. Testing to be provided by Owner includes, but is not limited to, construction materials, soil compaction, subsurface improvements, concrete, mortar, grout, steel, roofing and HVAC test and balance.

1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the work of the Contract.
3. RETESTS DUE TO FAILURE FOR ANY AND ALL REASONS SHALL BE AT THE EXPENSE OF THE CONTRACTOR. Costs of retests shall be recovered by deducting the costs of same from the Contract amount by Change Order.

1.2 RELATED REQUIREMENTS:

A. General Condition of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders of approvals of public authorities.

B. Respective sections of specifications: Certification of products.

C. Each specification section where required: laboratory tests required, and standards for testing.

1.3 LABORATORY DUTIES:

A. Cooperate with Architect/Engineer and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specific standards.

2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify Architect/Engineer and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; two (2) copies each to Architect/Engineer and Contractor, and one (1) copy to Owner's Representative. Each report shall include:

1. Date issued.
2. Project title and number.
3. Testing Laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the project.
10. Type of inspection or test.
11. Results or tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by Architect/Engineer.

E. Perform additional tests as required by Architect/Engineer or the Owner.

1.4 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY:

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the work.
3. Perform any duties of the Contractor.

1.5 CONTRACTOR'S RESPONSIBILITIES:

A. Contractors requesting inspections shall provide UBCI a minimum of 24 hour notice in written format. Inspection will not be conducted under normal circumstances on Saturdays, Sundays, or observed holidays. If required due to extenuating conditions, an inspection may be requested on these days with 3 working days written notice. The UBCI reserves the right to approve or deny such requests.

1. The following information is to be included in ALL submitted requests:
   - Permit number
   - Job location
   - Contractor requesting inspection
   - Contact number of requesting party
   - Type of inspection requested
   - Date and time when the item will be ready for inspection

B. Cooperate with laboratory personnel, provide access to work, or to manufacturer's operations.

C. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

D. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.

E. Furnish copies of Products test reports as required.

F. Furnish incidental labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at the Project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

G. Notify the appropriate persons sufficiently in advance (24 hr. minimum) of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed in a timely manner by no fault of the Owner after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to contractor's negligence.

H. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

I. Maintain a log at the site of all inspections and tests performed. The log shall indicate the date, time and type of inspection and/or test and shall be initialed by the person who performed the same.

J. At the A/E's or UBCI's discretion, uncover any work concealed by subsequent

construction that was not inspected and/or tested by the appropriate persons. The uncovering shall be performed at the Contractor's expense without change in the Contract time.

1.6 PROJECT INSPECTION ITEMS:

A. Items requiring inspection or notification by the Contractor include, but are not limited to the list below using the following key:

B. Items for which inspection by the UBCI is mandatory.

C. Items for which the Contractor shall provide notification. The UBCI shall inspect the item or waive the inspection or the A/E may perform the inspection in the UBCI's stead.

D. General:

1. Any inspections performed by Manufacturer's Representative for any products incorporated in the work
2. Sitework:

    a. Soil removal for over-excavation.
    b. Soil compaction.
    c. Soil compaction testing.
    d. Subsurface preparation for all landscaping.
    e. Placing piles for foundations.

3. Concrete (Note: Each occurrence, regardless of size, requires notification):

    a. Footings immediately prior to placing concrete (dewatered with rebar in place).
    b. Concrete slabs immediately prior to placing concrete (reinforcing, vapor barrier and utilities in place).
    c. Rebar placement and formwork for all structural concrete elements
    d. Structural concrete placement.

4. Masonry (Note: Each occurrence, regardless of size, requires notification):

    a. CMU cells with reinforcing in place prior to filling with grout.
    b. Placing grout in CMU cells.

5. Steel:

   a. Structural steel erection.
   b. Testing of structural steel connections.
   c. Structural steel members and connections prior to concealment by subsequent construction.

6. Thermal & Moisture Protection:

   a. Inspect deck condition prior to commencement of roofing.
   b. Commencement of roof insulation installation.
   c. Application of roofing membrane plys (or cap sheet).
   d. Installation of metal roofing.
   e. Inspection of finished roof by Manufacturer's Representative.
   f. Insulation placement prior to concealment.

7. Windows:

   a. Inspection of finished installation by Window Manufacturer's Representative.

8. Finishes:

   a. Metal stud walls prior to application of Gypsum Panel Products.
   b. "Screw Inspection" prior to commencing taping and finishing of Gypsum Panel Products.
   c. Installation of ceramic tile, carpet, VCT or other building finishes.

9. Buried Pipe:

   a. Before insulation.
   b. Prior to any pour of anchors or other underground concrete over pipes, including foundations.
   c. Prior to backfill (Insulation Inspection).
   d. Witness pressure tests.

10. Ductwork:

    a. Prior to external insulation.
    b. Blower leak test.
    c. Above gypsum ceilings - before ceiling installed.

11. Above Ground Pipe:

    a. Prior to any concrete pour around pipe penetration.
    b. Prior to insulation.

12. Gas Pipe, Buried:

    a. Under slab-inspect before installation in sleeves.
    b. Inspect all gas pipe in sleeves or not, prior to burial.
    c. Witness pressure test.

13. Underground Tanks:

    a. Inspect steel in deadmen or slabs prior to pour.
    b. Inspect pit and tank prior to lowering tank.
    c. Inspect tank and tie-down prior to backfill.

14. Domestic Water Pipe Below Slab:

    a. Inspect and witness pressure test before backfill.

15. Electrical:

    a. Testing of all electrical systems (intercom, clocks, power, etc.).
    b. Installation of electrical conduit, wiring and equipment.
    c. Inspect underground conduits prior to backfilling.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION 01410

SECTION 01510 - TEMPORARY UTILITY CONNECTIONS

PART 1 - GENERAL

1.1 REQUIREMENTS: Furnish, install and maintain temporary utilities required for construction, remove on completion of work. These may include, but are not limited to, the following:

A. Temporary lighting and power for all construction activities, including extension of temporary electrical service into building.

B. Temporary heat and ventilation.

C. Temporary water for construction, including all distribution systems.

D. Temporary sanitary facilities for construction personnel.

E. Temporary fire protection system as required by local authorities.

F. Provide and make available for use by Subcontractors temporary light, power and water required in the performance of their Work as part of the Work of this Section.

1.2 RELATED REQUIREMENTS:

A. Section 01010, Summary of Work.

B. Section 01590, Field Offices and Sheds.

1.3 REQUIREMENTS OF REGULATORY AGENCIES:

A. Comply with National Electric Code.

B. Comply with Federal, State and local codes and regulations and with utility company requirements.

PART 2 - PRODUCTS

2.1 MATERIALS: May be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions and must not violate requirements of applicable codes and standards.

2.2 TEMPORARY ELECTRICITY AND LIGHTING:

A. Arrange with utility company, provide service required for power and lighting, and pay all costs for service and for power used.

1. Provide required disconnects, grounding, and all other devices and appurtenances required by all applicable agencies and codes, and remove same upon completion of work.
2. Provide generator, if required, to obtain power required which is greater than temporary services furnished.
3. Provide all required transformers, fused main switches, distribution boards, panels, but-outs, wiring and grounding, sockets, lamps, fuses and motor connections to suit all load and safety requirements.

B. Install circuit and branch wiring, with are distribution boxes located so that power and lighting is available throughout the construction by the use of construction type power cords.

C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for Work and for areas accessible to the public.

D. Provide and maintain temporary feeders to permanent mechanical equipment requiring service, including ventilation, until permanent feeds are connected and energized.

E. When directed by Architect/Engineer after permanent power has been switched over, remove those portions of temporary light and power installation which are the responsibility of the Contractor.

F. Provide temporary site security lighting to maintain 3 fc measured minimum light level.

2.3 TEMPORARY HEAT AND VENTILATION:

A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity.

B. Provide adequate forced ventilation of enclosed areas for curing of installed

materials, to disperse humidity and to prevent hazardous accumulations of dust, fumes, vapors or gases.

C. Portable heaters shall be standard acceptable units complete with controls.

D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

2.4 TEMPORARY FIRE PROTECTION SYSTEM: Provide temporary fire protection systems for the project in accord with NFPA Standard #241.

PART 3 - EXECUTION

3.1 GENERAL:

A. Comply with applicable requirements specified in Division 15 Mechanical and in Division 16 Electrical.

B. Maintain and operate systems to assure continuous service.

C. Modify and extend systems as work progress requires.

3.2 REMOVAL:

A. Completely remove temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

C. Restore existing facilities used for temporary services to specified, or to original condition.

D. Restore permanent utilities used for temporary services to specified condition. Prior to Final Inspection, remove temporary lamps and install new lamps.

END OF SECTION 01510

SECTION 01590 - FIELD OFFICES AND SHEDS, AND TEMPORARY BARRIERS

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Furnish, install and maintain temporary field office during entire construction period.

B. Furnish, install and maintain storage and work sheds needed for construction.

C. Furnish and install all barriers, fences and gates, concrete encasement, signs and all other personnel warning and safety measures and devices of every kind required by code, local utility company, or site conditions.

D. At completion of work, remove field offices, sheds and contents.

1.2 RELATED DOCUMENTS:

A. Section 01010 - Summary of Work

B. Section 01510 - Temporary utilities

C. Section 01580 - Project Identification Signs

1.3 OTHER REQUIREMENTS:

A. Prior to installation of offices and sheds, consult with Owner and Architect/Engineer on location, access and related facilities.

B. Review location of temporary fencing with Owner and Architect/Engineer prior to installation.

C. Installation of any temporary item shall not unnecessarily restrict the daily activities of the school. If necessary, a schedule of erection and removal shall be developed with school personnel and coordinated with the Owner and Architect/Engineer.

1.4 REQUIREMENTS FOR FACILITIES:

A. Field Offices: This Contractor shall provide and maintain at acceptable locations on

the site, a field office for his use and for the field administration of the work by the Architect/Engineer and his consultants.

1. The field office shall be a (minimum) size of 300 s.f. in area, and shall include a door with a locking device, electric lighting and power, heat (in winter), air conditioning (in summer) and one telephones (refer to temporary utilities).

   The Contractor shall furnish a plan rack, one layout tables, one small conference table and six chairs. Additional furniture may be included at the Contractors discretion. No couches, Futons or bedding shall be allowed in the trailer.

   The building and furniture provided shall remain the property of the Contractor at completion and shall be removed from the site at time of project completion. This office shall be provided with separate exterior entry. Job related long-distance calls shall be logged and pre-approved cost paid by the Contractor.

2. The Contractor's field office shall be as required for his use.

B. Access and Parking:

1. Minimum of five (5) vehicle parking spaces are to be provided and maintained for visitor use; Designate Architect/Engineer (2); Owner (2) and Other (1).
2. Construction equipment and vehicles shall safely enter or exit site without interrupting local traffic. Coordinate location with Owner and Architect/Engineer.

C. Subcontractors Field Office: This shall not preclude subcontractors from setting up their own field offices if accepted by the Owner and Architect/Engineer.

D. Storage:

1. Provide storage facilities as needed. Storage space for subcontractors shall be as agreed upon by Contractor and his subcontractors.
2. Locate storage facilities as directed by Owner and Architect/Engineer.

E. Project Construction Sign:

1. Provide project construction sign in accordance with Specification Section 01580 - Project Identification Signs. No added signs by the General or his

Subcontractors will be allowed.

F. Directional Signage:

1. Contractor shall provide additional directional signage as deemed appropriate and or required by the Owner and Architect/Engineer.

G. Temporary Fencing and Gates:

1. Refer to section 02821 Chain Link Fencing and Gates for material requirements for temporary fencing.
2. Refer to Civil Engineering Sheets in Construction Documents for temporary silt fence and signage details.
3. Install fence posts in a manner that provides adequate load resistance but allows for removal at time of project completion. All surfaces damaged by fence installation shall be repaired or replaced.
4. Install visual screening on all fencing identified by Owner and Architect/Engineer at time of pre-installation review and as designated in Construction Documents.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT & FURNISHINGS:

A. May be new or used, but must be serviceable, adequate for required purpose, and must not violate applicable codes or regulations.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Fill and grade sites for temporary structures to provide surface drainage.

3.2 INSTALLATION:

A. Construction temporary field offices and storage sheds on proper subgrade, provide connections for utility services.

1. Secure portable or mobile buildings when used.

2. Provide steps and landings at entrance doors.

B. Mount thermometer at convenient outside location, not in direct sunlight.

3.3 MAINTENANCE AND CLEANING:

A. Provide periodic (weekly minimum) maintenance and cleaning for temporary structures, furnishings, equipment and services.

3.4 REMOVAL:

A. Remove temporary field offices, contents and services at a time no longer needed.

B. Remove storage sheds when no longer needed.

C. Remove foundations and debris; grade site to required elevations and clean the areas and replace any plant material damaged.

D. Remove temporary fencing, gates and signage at the end of project. Replace or repair any damaged surfaces and or plant material.

END OF SECTION 01590

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Material and Equipment Incorporated into the Work:

1. Conform to the applicable specifications and standards.
2. Comply with size, make, type and quality specified, or as specifically accepted in writing by the Architect/Engineer.
3. Manufactured and Fabricated Products:

a. Design, fabricate and assemble in accord with the best engineering and shop practices.
b. Manufacturer like parts of duplicate units to standard sizes and gauges, to be interchangeable.
c. Two or more items of the same kind shall be identical, by the same manufacturer.
d. Products shall be suitable for service conditions.
e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.2 RELATED DOCUMENTS:

A. Contractual Conditions

B. Section 01010 - Summary of Work

C. Section 01300 - Submittals

D. Section 01710 - Cleaning

1.3 MANUFACTURER'S INSTRUCTIONS:

A. When Contract Documents require that installation of Work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions

to parties involved in the installation, including two (2) copies each to Owner and Architect/Engineer.

B. Maintain one set of complete instructions at the job site during installation and until complete.

C. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect/Engineer for further instructions.
2. Do not proceed with work without clear instructions.

C. Perform Work in accord with manufacturer's instructions, unless otherwise specified. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.4 TRANSPORTATION AND HANDLING:

A. Arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with Work and conditions at the site.

1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and submittals, and that Products are properly protected and undamaged.

B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.5 STORAGE AND PROTECTION:

A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather-tight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage.

1. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
3. All storage means and methods are subject to acceptance by the Owner and Architect/Engineer.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

D. Protection After Installation:

1. Provide substantial coverings as necessary, to protect installed products from damage from traffic, water and subsequent construction operations. Remove when no longer needed.
2. All protection means and methods are subject to acceptance by the Owner and Architect/Engineer.

1.6 SUBSTITUTIONS AND PRODUCT OPTIONS:

A. Products List:

1. Within 30 days after Contract Date, submit to Architect, a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. Product Options:

1. For Products specified only by reference standard, select any product meeting that standard.
2. For Products specified by basis for design and naming several acceptable manufacturers, select any one of the acceptable manufacturers named, which complies with the specification.
3. For Products specified by naming only one Product and manufacturer, there is no option.

C. Substitutions

1. Substitutions after bidding are not acceptable except as indicated in C.2 below.
2. Substitutions of products will be considered after bids are opened only under the following conditions:

    a. The Contractor shall place orders for specified materials and equipment promptly upon award of contract. No excuse or proposed substitution will be considered for materials and equipment due to unavailability unless proof is submitted that firm orders were placed ten days after review by the Architect/Engineer of the item listed in the specifications.
    b. The reason for the unavailability is beyond the control of the Contractor; unavailability will be construed as being due to strikes, lockouts, bankruptcy, discontinuance of the manufacture of the product, or acts of God.
    c. Requests for such substitution shall be made all in writing to the Architect after the award of a contract and within 10 days of the date that the Contractor ascertains that he cannot obtain the material or equipment specified.
    d. Requests shall be accompanied by a complete description of the material or equipment which the contractor wishes to use as a substitute. Substitutions must be recommended by the Architect/Engineer to the Owner who will accept in writing.
    e. Contractor's Representative:

        1. A request for substitution constitutes a representation that Contractor:
        2. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
        3. Will provide the same warranties or bonds for the substitution as for the Product specified.
        4. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
        5. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

    f. Architect/Engineer will review request for substitutions with reasonable promptness and notify Contractor, in writing, of the decision to accept or reject the requested substitution.
    g. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:

1. Comparison of the qualities of the proposed substitution with that specified. Provide data of specified product for comparison.
2. Changes required in other elements of the work because of the substitution.
3. Effect on the construction schedule.
4. Cost data comparing the proposed substitution with the Product specified.
5. Any required license fees or royalties.
6. Availability of maintenance service, and source of replacement materials.
7. Submit a sample of the basis for design and the requested substitution; samples will not be returned. Should basis for design not be available, submit product by listed acceptable manufacturer.

h. Architect/Engineer shall be the sole judge of the acceptability of the proposed substitution.

i. Review of substitutions shall be at Contractor's expense. Architect/Engineer shall charge the Contractor his standard hourly rates.

j. Modification of Contract Documents to accept such substitutions shall be at Contractor's expense. Architect/Engineer shall charge the Contractor his standard hourly rates.

3. Substitutions of products will be considered during bidding only under the following conditions:

a. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:

1. Comparison of the qualities of the proposed substitution with that specified. Provide data of specified product for comparison.
2. Changes required in other elements of the work because of the substitution.
3. Effect on the construction schedule.
4. Cost data comparing the proposed substitution with the Product specified.
5. Any required license fees or royalties.
6. Availability of maintenance service, and source of replacement materials.
7. Submit a sample of the basis for design and the requested

substitution; Samples will not be returned.

b. Architect/Engineer shall be the sole judge of the acceptability of the proposed substitution.

c. Modifications of contract Documents to accept such substitutions accepted during bidding, should same be used by the Contractor in his bid and presented during the submittal process, shall be charged to the Contractor at the Architect's standard hourly rates.

d. Substitutions must be presented to the Architect 15 days prior to the date set for the receipt of bids; telephone requests shall not be accepted. persons requesting substitutions will be notified only by mail, whether request is acceptable; all bidders holding plans during bidding will receive addenda incorporating acceptable substitutions.

1.7 REUSE OF EXISTING MATERIAL:

A. Except as specifically indicated or specified, materials and equipment removed from an existing structure shall not be used in the completed work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01600

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Closeout is hereby defined to include general requirement near end of Contract Time in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the Work. Time of closeout is directly related to "Substantial Completion" and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

1.2 PREREQUISITES TO SUBSTANTIAL COMPLETION:

A. Prior to requesting Architect's/Engineer's inspection for certification of substantial completion for either entire Work or portions thereof, complete the following and list known exceptions in request:

1. In progress payment request, show either 100% completion for portion of work claimed as "substantially complete" or list incomplete items, value of incompletion and reasons for being incomplete.
2. Include supporting documentation for completion as indicated in these Contract Documents.
3. Submit statement showing accounting of changes to the Contract sum.
4. Advise Owner of pending insurance change-over requirements.
5. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
6. Obtain and submit releases enabling Owner's full and unrestricted use of the Work and access to services and utilities, including (where required) occupancy permits, operating certificates and similar releases.
7. Deliver tools, spare parts, extra stocks of materials and similar physical items to Owner.
8. Complete start-up testing of systems and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups and similar elements.
9. Deliver original, fully executed hard PERMIT Card with all appropriate signatures indicating each applicable Division is finally completed and signed off by the appropriate tradesperson.

B. Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise contractor of prerequisites not fulfilled. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion or advise the contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.3 PREREQUISITES TO FINAL ACCEPTANCE

A. Prior to requesting Architect's/Engineer's final inspection for certification of final acceptance and final payment as required by General Conditions, complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit updated final statement accounting for additional (final) changes to Contract Sum.
3. Submit certified copy of Architect's/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect/Engineer.
4. Asbestos: [Reference: State Requirements for Educational Facilities, Section 4.2(3)(e) Asbestos: *The federal Asbestos Hazard Emergency Response Act (AHERA) of October 22, 1986, requires the architect or engineer of record to sign a statement that NO asbestos-containing building materials were specified, or, to the best of his/her knowledge, were used as a building material in the project. The contractor should certify to the board that to the best of his/her knowledge, no asbestos containing building materials were used as a building material in the project. Section 255.40, F.S. prohibits the use of asbestos-containing materials in the construction of new public buildings.*
5. Submit final meter readings for utilities, measured record of stored fuel and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.
6. Submit original Consent of Surety.
7. Submit final liquidated damages settlement statement, acceptable to Owner.
8. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey and similar final record information.
9. Complete final cleaning up requirements, including touch-up of marred

surfaces.

10. Touch-up and otherwise repair and restore marred exposed finishes.
11. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.
12. Certificates of elevator inspection.
13. Mechanical:

    a. Air System Test and Balance (prepared by Owner's independent agent)
    b. Piping pressure tests and certificates
    c. Project certification

14. Electrical:

    a. System tests
    b. Project certification

B. Reinspection Procedure:

1. Upon receipt of Contractor's notice that work has been completed including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Architect/Engineer will reinspect work. Upon completion of reinspection, Architect/Engineer will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.
2. If re-inspections of above referenced items are required by the Architect/Engineer due to the failure of any of the Work t comply with the claims made by the Contractor as to the status of their completeness, the Owner will deduct the costs incurred by such re-inspections from the Contract amount.

1.3 RECORD DOCUMENT SUBMITTAL:

A. Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in Section 01340. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Architect's/Engineer's reference during normal working hours.

At time of final acceptance, submit complete sets of all required record documents to the Architect/Engineer for Owner's records.

B. As-Built Record Drawings:

1. Maintain a white-print set of contract drawings and shop drawings in clean, undamaged condition with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawings are most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark-up new information which is recognized to be of importance to Owner but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work which would be difficult to measure and record at a later date. Note related change order numbers where applicable.
2. Upon completion of the Work, this data shall be recorded to scale, by a competent draftsman on transparent paper of the Contract Drawings. Where changes are to be recorded, the prints shall be erased in such a way as to properly represent the work as installed. Where the work was installed exactly as shown on the Contract drawings, the prints shall not be disturbed. In showing the changes, the same legend shall be used to identify piping, etc., as was used on the Contract Drawings.
3. The Contractor shall review the completed record drawings and ascertain that all data furnished on the drawings are accurate and truly represent the Work as actually installed. When manholes, boxes, underground conduits, plumbing, hot or chilled water lines, etc., are involved as part of the Work, the Contractor shall furnish true elevations and locations, all properly referenced for the site. Information for reference data can be obtained from the office of the Architect/Engineer. Upon completion, the subcontractor involved shall date and sign the drawings, signifying compliance with the requirements set forth herein prior to submission of prints required.
4. The Contractor shall sign all pages to certify completeness of the As-Built Record Set of Drawings. Contractor shall submit the marked-up of prints to the Architect/Engineer for the Owner.
5. In addition to the marked-up as-built record drawings, the Contractor shall submit two (2) sets of, bound white prints, of the complete record drawings to the Architect/Engineer; which shall bc carefully checked and transmitted to the Owner.

C. Electronic Files of Record Drawings

1. If the Construction Documents were created by Computer Aided Drafting (CAD) then upon the receipt of the final record drawings from the Contractor, the Architect/Engineer shall revise the electronic files to reflect the as-built conditions. The CAD files shall be in a file format that can be read by Autocad version 2014 and above.

2. A copy of the electronic files shall be recorded onto compact disk media. Two (2) copies of the disk shall be submitted to the Owner at time of transference of the Record Drawings.

   a. Each disk shall be labeled with:
      - Name of Project
      - Name of General Contractor and or Construction
      - Manager at Risk
      - Name of Architect, or Engineer, and their Address
      - Description of software used to create files

D. As-Built Record Specifications:

1. Maintain one copy of specifications including addenda, change orders and similar modifications issued in printed form during construction and mark-up variations (of substance) in actual Work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data where applicable.

2. Upon completion of the Record Specifications, the Contractor shall submit two (2) bound and printed copies to the Architect/Engineer; which shall be carefully checked and transmitted to the Owner.

E. Record Shop Drawings and Product Data:

1. Maintain one copy of each product data submittal and mark-up significant variations in actual work in comparison with submitted information. Include both variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up or record drawings and specifications.

F. Record Sample Submittal:

1. Immediately prior to date(s) of substantial completion, Architect/Engineer (and including Owner's personnel where desired) will meet with Contractor at site and will determine which (if any) of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Architect's/Engineer's instructions for packaging, identification marking and delivery to owner's sample storage

space.

G. Miscellaneous Record Submittals:

1. Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference.

H. Operation and Maintenance Data:

1. See section 01730

I. Warranties and Bonds:

1. See section 01740

J. Spare Parts and Maintenance Materials:

1. See section 01750

1.4 FINAL CLEANING

A. Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress or work is specified in General Conditions and as temporary service in "Temporary Facilities" section of this Division. Provide final cleaning of the work at time indicated, consisting of cleaning each surface or unit of Work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples of cleaning levels required:

1. Remove labels which are not required as permanent labels.
2. Clean transparent materials including mirrors and window or glass to a polished condition removing substances which are noticeable as vision-obscuring materials. replace broken glass and damaged transparent materials.
3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
4. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substance.

5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes and similar spaces.
6. Clean concrete floors in non-occupied spaces broom clean.
7. Vacuum clean carpeted surfaces and similar soft surfaces.
8. Clean plumbing fixtures to a sanitary condition free of stains including those resulting from water exposure.
9. Clean light fixtures and lamps so as to function with full efficiency.
10. Clean project site (yard and grounds) of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.
11. Vacuum clean and sanitize all cabinetwork, equipment, etc. for a move-in condition.

B. Removal of Protection:

1. Remove temporary protection devices and facilities which were installed during course of the Work to protect previously completed Work during remainder of construction period.

C. Compliances:

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

1.5 CLOSEOUT DOCUMENTS CHECKLIST

A. All items listed below, with the exception of Item No. 1 and Item No. 2 shall be bound in individual heavy duty 3-ring vinyl covered binders. Mark appropriate identification on front and spine of each binder.

B. All items shall be submitted in triplicate within fifteen day of Substantial Completion for the project.

1. Application and Certification for Payment (Final). Four copies with original signatures and seals.
2. Final schedule of contract values. Four copies attached to Application and Certification for Payment.

3. Contractor's Affidavit of Payment of Debts (AIA G706).
4. Contractor's Affidavit of Release of Liens from all Contractors, Subcontractors, and Suppliers (AIA G706A).
5. Power of Attorney from Surety to make Final Payment.
6. Consent of Surety to Final Payment (AIA G707).
7. Contractor's Guarantee and Warranties as specified under Division 01740.
8. Fully executed Roof Warranty in the name of the Owner.
9. Special warranties as required by the specifications, in the name of the Owner.
10. Provide a list summarizing the various guarantees and warranties and stating the following with respect to each:

    a. Character of work affected.
    b. Name, address and telephone number of each Subcontractor.
    c. Name, address and telephone number of each local firm designated to provide warranty service for an out-of-town firm. Copy of agreement between the firms.
    d. Period of guarantee and effective date.
    e. Statement of guarantee in the following form.

    "If within any guarantee period, repairs or changes are required in conjunction with the guarantee work, which in the opinion of the Architect or Engineer is rendered necessary as the result of the use of materials, equipment or workmanship, which are defective or inferior, or not in accordance with the terms of the Contract, the Contractor shall, upon written notice from the Owner, and without expense to the Owner, proceed within twenty four (24) house to place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein; and make good all damages to the structure or site or equipment or contents thereof disturbed in fulfilling any such guarantee work.

11. Verification that the Owner's personnel has been trained in the use of their new equipment. Submit attendance lists and videotape record of all training sessions.
12. Operation and Maintenance Manuals.
13. Equipment Inventory List - A list of the following equipment furnished for the project, to include drawings code designation, location (FISH number) description, manufacturer, full model number, serial number, warranty period and warranty expiration date.

    a. All HVAC equipment.
    b. Any plumbing equipment which carries a serial number (water heaters, compressors, electric water coolers, etc.)
    c. Emergency generator.

d. Contractor furnished appliances.

14. Notarized Affidavit of all Subcontractor payrolls, bills for materials/equipment and other indebtedness paid and satisfied.
15. As-built drawings. Provide in accordance with other specification sections.
16. Energy management system programming, operation, maintenance, and parts service manuals. Guaranteed parts price list.
17. Date certain schedule for LCS personnel to be trained at Energy Management Supplier's training facility.
18. Punch lists signed off by Owner's Representatives.

SECTION 01730 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Format and content of manuals.

B. Instruction of Owner's personnel.

C. Schedule of submittals.

1.2 RELATED REQUIREMENTS:

A. Shop Drawings, Product Data, and Samples.

B. Testing, Adjusting, and Balancing of Systems: Test and balance reports.

C. Section 01700 - Contract Closeout

D. Warranties and Bonds

E. Individual Specification Sections: Specific requirements for operation and maintenance data.

1.3 FORMAT:

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8-1/2 x 11, three-ring binders with hardback, cleanable, vinyl covers.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; use volumes as needed.

D. Arrange content by systems, process flow, under section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed fly leaf for each separate project and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data.

G. Drawings: Provide with reinforced pocket folders. Bind in with text; fold drawings; insert into pocket folders.

1.4 CONTENTS OF EACH VOLUME:

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Warranties and Bonds: Bind in copy of each.

1.5 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, color and texture designations. provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

E. Warranties and Bonds: Bind in copy of each.

1.6 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual Specifications sections.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number or replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

C. Include as-installed color coded wiring diagrams.

D. Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operations and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide as-installed control diagrams by controls manufacturer.

K. Provide Contractor's coordination drawings, with as-installed color coded piping diagrams.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports as specified.

O. Additional Requirements: As specified individual specifications sections.

P. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.8 INSTRUCTION OF OWNER PERSONNEL:

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Prepare and insert additional data in Operation and Maintenance Manual when need for such data become apparent during instruction.

1.9 SUBMITTALS:

A. Submit one (1) copy of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Architect/Engineer comments. Revise content of documents as required prior to final submittal.

B. Submit three (3) copies of revised volumes of data in final form within ten days

after final inspection.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Preparation and submittal of warranties and bonds.

B. Schedule of submittals.

1.2 RELATED REQUIREMENTS:

A. Section of 01700 - Contract Closeout

B. Individual Specifications Sections: Submit Warranties and Bonds required for specific Products or Work as required by the Contract Documents.

1.3 FORM OF SUBMITTALS:

A. Bind with operation and maintenance manuals specified in Section 01730.

1.4 PREPARATION OF SUBMITTALS:

A. Obtain warranties and bonds, executed in triplicate (3) by responsible subcontractors, suppliers, and manufacturer's within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

1.5 TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.

B. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 WARRANTY SERVICE

A. The Contractor shall proceed with warranty repair or replacement within 24 hours of being notified that a warranty deficiency exists.

B. In order to insure prompt and effective correction of warranty deficiencies, the Contractor shall, if he or any of his Subcontractors do not maintain fully staffed service organizations within Leon County, designate firms within Leon County authorized to perform warranty work on the Contractor's behalf. The name, addresses, and phone numbers of these designated firms shall be included within the closeout documents, along with affidavits signed by officers of the designated firms stating that they have been retained and will perform required warranty service.

END OF SECTION 01740

SECTION 01750 - SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.1 REQUIREMENTS:

A. Products required.

B. Storage and delivery of products.

1.2 RELATED REQUIREMENTS:

A. Materials and Equipment: Storage and protection.

B. Contract Closeout.

C. Individual Specifications Sections: Specific spare parts and materials required are specified in individual sections of these specifications.

1.3 PRODUCTS REQUIRED:

A. Provide quantity of products, spare parts, maintenance tools, and maintenance materials specified in individual sections to be provided to Owner, in addition to that required for completion of Work.

B. Products: Identical to those installed in the Work. Include quantities in original purchase from supplier or manufacturer to avoid variations in manufacture.

1.4 STORAGE AND MAINTENANCE:

A. Store products with products to be installed in the Work, under provisions of Section 01600.

B. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

1.5 DELIVERY:

A. Coordinate with Owner: Deliver and unload spare products to Owner at Project site and obtain receipt prior to final payment.

PART 2 - PRODUCTS:

Not used.

PART 3 - EXECUTION:

Not used.

END OF SECTION 01750

SECTION 02100 – SUBSURFACE

PART 1 - GENERAL

1.1 DESCRIPTION

A. A soil investigation report which has been prepared by Ardaman & Associates, Inc. is hereby included and made part of this specification.

B. The General Provisions of the Contract, including the General and Supplementary Conditions apply to the work specified in this section.

1.2 ADDITIONAL INFORMATION

A. The Contractor should visit the site and acquaint himself with all existing conditions prior to bidding. Bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Owner.

1.3 QUALITY ASSURANCE

A. A Soil Engineer may retained by the Owner to observe performance of work in connection with excavating, filling, compaction and grading. Readjust all work performed that does not meet technical or design requirements but make no deviations from the contract documents without specific and written approval of the Engineer.

END OF SECTION 02100

SECTION 02110 – DEMOLITION CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this section consists of demolition, clearing, and grubbing and includes:

1. Felling of trees and removal of stumps and roots.

2. Demolition and removal of existing structure(s).

3. Disconnecting and removing all existing utility lines on site except those designated to remain.

4. Removal of all debris.

B. Related Documents:

The General Provisions, including the General and Supplementary Conditions apply to the work specified in this section. The following related work is specified in other sections:

1. Subsurface Conditions - Section 02100.

2. Site Grading - Section 02210

3. Excavating, backfilling and compacting-Section 02221.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Comply with all pertinent Codes and with the requirements of all insurance carriers providing coverage for the work.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

1.4 JOB CONDITIONS

A. Dust Control:

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

B. Burning:

On site burning will not be permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials, not specifically described but required for proper completion of the work of this Section, as selected by the Contractor subject to the approval of the Engineer.

B. Do not use explosives on this work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Notification:

Notify the Engineer at least two full working days prior to commencing the work of this Section.

B. Site Inspection:

1. Prior to all work of this section, carefully inspect the entire site and all objects designated to be removed and to be preserved.

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

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

C. Clarification:

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

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

D. Scheduling:

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

2. Coordinate demolition, clearing and grubbing activities with FAMU staff for salvage of specific items noted on the plans

3. Avoid interference with the use of adjacent public roadway.

E. Disconnection of Utilities:

Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved.

F. Protection:

1. Protect existing utilities indicated or made known.

2. Protection of persons and property:

a. Barricade open depressions and holes occurring as part of this work, and post warning lights on property adjacent to or with public access.

b. Operate warning lights during hours from dusk to dawn each day or as otherwise required.

c. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, silt, lateral movement, undermining, washout, and other hazards created by operations under this Section.

3. Maintain access to the site at all times.

3.2 DEMOLITION

A. Demolish and remove all objects so designated.

3.3 CLEARING AND GRUBBING

A. Felling Trees:

1. Fell, cut, and trim trees and shrubs in a manner not to damage adjacent property and the roots and branches of trees indicated to remain.

2. Immediately after felling a tree, remove the branches and clear the debris.

B. Grubbing:

1. Remove all surface rocks and all stumps, roots and other vegetation within the limits of construction as indicated by the limits of clearing and grubbing on the drawings.

2. If stumps exist in areas which must be proof rolled, remove stumps.

3. If stumps exist in areas on which less than five feet of fill will be placed, remove stumps.

4. If stumps exist in areas on which pavement will be constructed, but on which no fill will be placed, remove stumps.

5. If roots larger than three inches exist within two feet of surfaces which must be proof rolled, remove roots.

6. If roots larger than three inches exist within two feet of surfaces on which less than five feet of fill will be placed, remove roots.

7. If roots larger than three inches exist within two feet of surface on which pavement will be constructed but on which no fill will be placed, remove roots.

8. Treat all roots remaining in soil with a weed killer approved by the Engineer.

3.4 REMOVAL OF DEBRIS

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

END OF SECTION 02110

Section 02200 deleted per Addendum 1

SECTION 02210 – SITE GRADING

PART 1 GENERAL

1.1 DESCRIPTION

A. The work of this section consists of excavating, backfilling, compacting, and grading the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. The General Provisions of the Contract, including General and Supplementary conditions and General Requirements, apply to the work specified in this section.

The following related work is specified in other sections:

1. Subsurface Conditions: Section 02100.

2. Demolition, Clearing, and Grubbing: Section 02110.

3. Trenching, Backfilling and Compacting: Section 02221.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section

B. Use Equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the soils engineer.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 4" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2" in their greatest dimension.

2. Fill material is subject to the approval of the soils engineer, and is that material removed from excavations, predominantly granular non-expansive soils, free from roots and other deleterious matter, having a plastic index of 12 or less.

3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill or embankment.

2.2 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provisions of Division 1.

3.3 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of Persons and Property:

1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, silt, lateral movement, washout, and other hazards created by operations under this Section. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

C. Texturing:

1. Remove all water, including rain water, encountered during trenching excavation work to an approved location by pump, drains and other approved methods.

2. Deep excavations and site construction area free from water by use of berms or channels.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

3.4 Maintain access to adjacent areas at all times.

A. Excavate every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Satisfactory excavated materials:

1. Transport to, and place in, fill or embankment areas within the limits of the Work.

C. Unsatisfactory excavated materials:

1. Excavate to a distance below grade as directed by the soils engineer, and replace with satisfactory materials.

2. Include excavation of unsatisfactory materials, and replacement by satisfactory materials, as parts of the work of this Section.

D. Surplus materials:

1. Dispose of unsatisfactory excavated materials, surplus away from the site at disposal areas arranged and paid for by the Contractor.

E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Ditches:

1. Cut accurately to the cross sections, grades and elevations shown.

2. Maintain excavations free from detrimental debris until completion of the Work

3. Dispose of excavated materials as directed by the Engineer, Do not deposit materials less than 3'-0" from the edge of a ditch.

H. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated suborder elevations or dimensions without specific instruction from the Engineer or the soils engineer.

2. Backfill and compact unauthorized excavations as specified for authorized excavation, unless otherwise directed by the soils engineer.

I. Stability of excavations:

1. Slope sides excavation to 2:1 or flatter, unless otherwise indicated on the drawings or directed by the soils engineer.

2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

J Shoring and Bracing:

1. Provide materials for shoring and bracing as maybe necessary of safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.

3. Carry shoring and bracing down as excavation progresses.

3.5 FILLING AND BACKFILLING

A. Backfill excavations as promptly as progress of the Work permits, but not until:

1. Acceptance of construction below finish grade.

2. Inspecting, testing, approving, and recording locations of underground utilities.

3. Shoring and bracing are removed, and voids have been backfill with satisfactory materials.

4. Trash and debris have been removed.

5. Horizontal bracing is in place on horizontally supported walls.

B. Ground and compacting:

1. Place backfill and fill materials in layers not more than 6" in loose depth.

2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.

3. Compact each layer to required percentage of maximum density for the area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

3.6 GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.

2. Smooth the finished surfaces within specified tolerance.

3. Compact with uniform grades or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8'-0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Tolerance:

1. Shape the surface of areas scheduled to be under pavement to line, grade, and cross-section, with finished surface not more than 0.05 ft. above or below the required suborder elevation.

3.7 COMPACTING

A. Control soil compaction during construction. Provide the minimum percentage of density specified for each area.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in-place, and as approved by the soils engineer.

1. Unpaved areas:

a. Compact the top 8" of suborder in cut areas and each layer of fill material or backfill material at 95% of maximum density in accordance with the Modified Proctor Compaction Test (ASTM D1557-02e1).

2. Pavements:

a. Compact the top 12" of suborder in cut areas and the top 12" of suborder in fill areas at 98% of maximum density in accordance with the Modified Proctor Compaction Test (ASTM D1557-02e1).

b. Compact all fill below the bottom of suborder at 100% of maximum density in accordance with the Standard Proctor Test (ASTM D698-00ae1)

C. Moisture Control:

1. Where suborder or layer of soil material must be moisture conditioned before compacting, uniformly apply water to surface of suborder or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.

3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until determined by moisture density relation tests approved by the soil engineer.

3.9 FIELD QUALITY CONTROL

A. Secure the soils engineer's inspection approval of soubrettes and fill layers before subsequent construction is permitted thereon.

B. Provide at least the following tests to the approval of the soils engineer:

1. In each compacted fill layer outside of roadway right-of-way, one field density test for every 4,000 square feet of fill area.

2. Along roadway fill and in stabilized suborder, one field density test per lift every 500 linear foot of roadway

C. If, in the soils engineer's opinion based on reports of the testing laboratory, suborder or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Division 1 of these Specifications.

3.10 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.

2. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.11 CERTIFICATION

A. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner a written report from the soil engineer certifying that the compaction requirements have been obtained. State in the report the area of fill or embankment, the compaction density obtained, and the type of classification of fill material placed.

END OF SECTION 02210

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of trenching, backfilling, and compacting as specified herein and as needed for installation of underground utilities and storm drainage facilities associated with the Work.

B. The General Provisions of the contract including the General and Supplementary Conditions apply to the work specified in this section. The following related work is specified in other sections:

1. Subsurface Conditions - Section 02100.

2. Site Grading - Section 02210.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the soil engineer.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill material:

1. Provide soil materials free from organic matter. and deleterious substances, containing no rocks or lumps over 4" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2" in their greatest dimension.

2. Fill material is subject to the approval of the soil engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter having a plasticity index of 12 or less.

3. Do not permit rocks having a dimension greater than 1" in the upper 12" of fill.

2.2 OTHER MATERIALS

A. Provide other materials, such as bedding, required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provision of Division 1.

3.3 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines and drainage pipe shown on the drawings or otherwise make known to the contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instruction.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards crated by operations under this Section. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

C. Texturing:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.

2. Keep trenches and site construction areas free from water.

D. Use any means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.4 TRENCHING

TRENCH SAFETY ACT OF FLORIDA

It is the contractors responsibility to become familiar with and to abide by all of the requirements of the Trench Safety Act [chapter 90-96, Laws of Florida] and the Contractor shall:

(a) Provide written assurance of compliance with this law.

(b) A separate cost item identifying the cost of compliance.

(c) A trench safety system shall be designed by the Contractor.

The contractor agrees that by execution of the proposal document that trench safety standards set forth in chapter 90-96 of the Laws of Florida shall be complied with on this Contract. Furthermore, the Bidder agrees that by identifying the cost of compliance it is implied that such trench safety measures will actually be installed by the Contractor. The Contractor will not be paid separate for trench safety measures in-place. However, a cost deduction will be made at the unit cost rate indicated in the Proposal, for those trench safety items not actually installed or implemented.

A. Comply with pertinent provisions of Section 02 210, and the provisions of this Section.

B. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.

1. Prior to backfilling, remove all sheeting.

2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect/Engineer, field conditions or the type of sheeting or methods of construction bedding are such as to make removal of sheeting impractical. In such cases, the Owner may permit portions of sheeting to be cut off and remain in the trench.

C. Open cut:

1. Excavate for utilities by open cut.

2. If conditions at the site prevent such open cut, and if approved by the Architect, trenching may be used.

3. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the soil engineer.

4. When the void is below the suborder for the utility bedding, use suitable earth materials and compact to the relative density directed by the soil engineer, but in no case to a relative density less than 100% of Standard Proctor (ASTMD698-00ae1).

5. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidate as approved by the soil engineer, but in no case to a relative density less than 100% of Standard Proctor (ASTMD698-00ae1).

6. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

7. Excavating for Appurtenances:

a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or clean concrete as directed by the soil engineer, and at no additional cost to the Owner.

D. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

E. Depressions:

1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.

2. Except where rock is encountered, do not excavate below the depth indicated or specified.

3. Where rock is encountered, excavate rock to a minimum over depth of 4" below the trench depth indicated or specified.

F. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract documents.

G. Cover:

1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or suborder:

a. Areas subject to vehicular traffic:

(1)	Sanitary sewer	48";
(2)	Storm drains:	36";

b. Areas not subject to vehicular traffic:

(1)	Sanitary sewer:	30";
(2)	Storm drains:	18";

c. All areas:

(1)	Water lines:	36";
(2)	Natural gas lines:	36";
(3)	Electrical cables:	N/A
(4)	Electrical ducts	N/A

d. Concrete encased:

(1)	Pipe sleeves for water and gas lines:	24";
(2)	Sanitary sewers and storm drains:	12";
(3)	Electrical ducts:	24";

3.5 BEDDING

A. Provide bedding as indicated on the drawings.

3.6 BACKFILLING

A. General:

1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.

2. Except as otherwise specified or directed for special conditions, backfilled trenches to the ground surface with selected material approved by the soil engineer.

3. Reopen trenches, which have been improperly backfill, to a depth as required for proper compaction.

4. Refill and compact as specified, or otherwise correct to the approval of the soil engineer.

5. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.

6. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to 100% of maximum density in accordance with ASTM D698-78 to the elevation shown on the Drawings for sewers and 12" over other utility lines.

2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 4" or 1/2 the layered thickness, whichever is smaller in and dimension.

2. Deposit backfill material in layers of 6" maximum thickness and compact to 100% of maximum density in accordance with ASTMD698-00ae1.

E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the soil engineer, in areas other pavement areas.

3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORMDRAINS

A. Check sewers and stormdrains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.

B. Flash a light between manholes or, if the manholes have not yet been constricted, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.

C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the Owner.

3.8 FIELD QUALITY CONTROL

A. The soil engineer will inspect and approve open cut and trenches before installation of utilities, and will make the following tests:

1. Assure that trenches are not backfill until all tests have been completed:

2. Check backfilling for proper layer thickness and compaction. Trench backfill should be tested for each 500 square feet of fill on each 2 foot lift.

3. Verify that test results conform to the specified requirements, and that sufficient tests are performed.

4. Assure that defective work is removed and properly replaced.

END OF SECTION 02221

SECTION 02276 – EROSION & SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered in this Section consists of providing, maintaining, and removing temporary erosion and sedimentation controls as well as providing permanent grassing.

1. Temporary erosion controls, include, but are not limited to, silt traps, dams, barriers, grassing, mulching, seeding, watering, and reseeding on-site surfaces to ensure that they are within acceptable limits as established by the State and County.

2. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

B. Related Documents:

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

The following related work is specified in other sections:

1. Demolition, Clearing and Grubbing - Section 02110.

2. Site Grading - Section 02210

1.3 REFERENCE DOCUMENTS

A. State of Florida, Department of Transportation, Standard Specifications for Construction of Roads and Bridges.

PART 2 PRODUCTS

2.1 EROSION CONTROL

A. Grassing:

Grass and seed mixtures shall contain fresh, new seed of the latest crop, which shall meet the requirements of the Florida State Department of Agriculture and shall be approved by the Engineer before being sown.

All seed shall be slurry treated with a fungicide-insecticide (equal to DuPont's formula 62) to reduce the possibility of damage from seed and soil borne diseases. The seed shall be sown according to the following rates and mixtures:

1. From April 15 to October 15 - 430 pounds per acre, 130 pounds of scarified Argentine Bahia 80% pure live seed. 300 pounds of common Bermuda-75% pure live seed (hulled).

2. From October 15 to April 15 - 475 pounds per acre 75 pounds of non-scarified Argentine Bahia-80% pure live seed. 200 pounds of common Bermuda-75% pure live seed (hulled). 200 pounds of annual Rye - 75% pure live seed.

3. The weed content of the aforementioned seed shall not exceed 0.2 percent and shall be free of all noxious weeds as listed by the Florida Department of Agriculture. All of the foregoing shall be stored in a cool, dry place until used, packed in uniform, net weight, approved containers. The Engineer will be present when the seed is mixed and hall check the weights and quantity of seed. At this option, the Engineer may request the State Seed

Inspection Service to sample the delivered seed and test it for purity, germination and weed content. Any seed, in which variety substitutions have been made and which is below recognized commercial standards for quality, will be rejected unless otherwise authorized in writing by the Engineer. The findings of the State Seed Laboratory shall be final.

B. Mulch:

Mulch shall be fresh rye, oat or wheat straw. Rate of application specified herein shall correspond to depth not less than 1-in. or more than 3-in. according to texture and moisture content of mulch material.

C. Fertilizer:

Fertilizer shall be 8-8-8 (NC) with 40% of nitrogen derived from natural or synthetic organic sources and potash derived from sulfate or potash.

2.2 SEDIMENTATION CONTROL

A. Bales - clean, seeder cereal hay type.

B. Netting - fabricated of material acceptable to the Engineer.

C. Filter stone - crushed stone conforming to Florida Department of Transportation Specifications, Section 901, No. 57.

PART 3: EXECUTION

3.1 EROSION CONTROL

A. Seeding Procedure:

1. Areas to be seeded shall be fertilized just prior to seeding with thirty pounds specified fertilizer per one thousand (1000) square feet. This fertilizer shall be lightly incorporated with the surface soil to a depth of one to two inches.

2. Distribute or broadcast seed by a calibrated machine which will spread the specified quantity of seed evenly per square foot. The seed shall be incorporated into the soil to a depth of one to two inches.

3. Immediately after seeding, the area shall be leveled by dragging or other methods and compacted with a heavy roller producing a compaction weight of 90 pounds per square inch. Best compaction will be obtained when soil is moist. After seeding and rolling operations are completed grades shall be true to finish grades shown on plans, smooth and even at all points.

4. Light, frequent watering shall be done each day between 10:00 a.m. and 3:00 p.m. until grass is well established. The seeded area will be inspected 3 weeks after seeding and all bare spots one square foot in diameter shall be reseeded and treated according to the original specified procedure.

B. Maintenance:

1. Maintenance shall begin immediately after each area is planted and shall continue until accepted in part or whole.

2. Maintenance shall consist of watering, mowing, and replanting as necessary to establish a uniform standard of grass after planting and until accepted.

C. Guarantee and Replacement:

1. Contractor shall guarantee the germination and establishment of the seeded areas. The areas will be considered established when they are green in appearance and one or more of the specified grasses is vigorous and growing well on each square foot of lawn area. In the event that grass coverage is achieved by one or more of the specified grasses other than Argentine Bahia, the area will be accepted on the certification and approval of the Engineer that all the work has been done in accordance with the specifications. For the purpose of establishing an acceptable standard, scattered bare spots, one of which is larger than one square foot, will be allowed up to a maximum of three percent of any area.

3.2 SEDIMENTATION CONTROL

A. Install and maintain silt barriers, hay bales, and appurtenances as shown on the Drawings. Hay bales which deteriorate, silt fences, which become damaged, and filter stone which is dislodged shall be replaced.

B. Flush and clean storm drainage system after permanent erosion control devices are established. Remove all debris resulting from temporary erosion control from project site.

3.3 PERFORMANCE

A. Should any of the erosion and sediment control measures employed by the Contractor fail to produce results which comply with requirements of Leon County, City of Tallahassee or the State of Florida, Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION 02276

SECTION 02300 - EARTHWORK

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. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches within building lines.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
2. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
3. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
4. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

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. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548.

1.6 PROJECT CONDITIONS

A. 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

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 GENERAL

A. Foundation Design, Soil Preparation and Compaction for Structures and Roadways based upon the Report titled "Subsurface Soil Exploration and Geotechnical Engineering Evaluation for the Proposed Building 9 Classroom Addition at Ft. Braden

School, Leon County, Florida", by Ardaman & Associates, Inc., dated 26 February , 2015, File No. 113-15-40-1033. Soil Preparation and Compaction shall be performed as required by the Geotechnical Engineer or as modified by the Documents to exceed this minimum standard

1. A copy of this report is attached to the end of this section.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

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

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavation to subgrade elevations classified as earth.

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 rock or unauthorized excavation.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches (300 mm) on each side of pipe or conduit or as indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 APPROVAL OF SUBGRADE

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade as required

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.

4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

B. Compact soil to not less than the percentages of maximum dry unit as required by the Geotechnical report.

1. Under Lawn or unpaved areas, scarify and recompact top 6 inches (150mm) below subgrade and compact each layer of backfill or trench material at 95 percent of a Standard Proctor maximum dry density.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

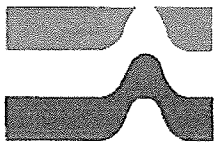
3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

Report- Subsurface Soil Exploration and Geotechnical Engineering Evaluation for the Proposed Building 9 Classroom Addition at Ft. Braden Elementary School, Leon County, Florida

File No. 113-15-40-1033
February 26, 2015



Ardaman & Associates, Inc.

OFFICES

Orlando - 8008 S. Orange Avenue, Orlando, Florida 32809 - Phone (407) 855-3860
Alexandria - 3609 Mac Lee Drive, Alexandria, Louisiana 71302 - Phone (318) 443-2888
Bartow - 1525 Centennial Drive, Bartow, Florida 33830 - Phone (863) 533-0858
Baton Rouge - 316 Highlandia Drive, Baton Rouge, Louisiana 70884 - Phone (225) 752-4790
Cocoa - 1300 N. Cocoa Blvd., Cocoa, Florida 32922 - Phone (321) 632-2503
Fort Myers - 9970 Bavaria Road, Fort Myers, Florida 33913 - Phone (239) 768-6600
Miami - 2608 W. 84th Street, Hialeah, Florida 33016 - Phone (305) 825-2683
Monroe - 1122 Hayes Street, West Monroe, Louisiana 71292 - Phone (318) 387-4103
New Orleans - 1305 Distributors Row, Suite I, Jefferson, Louisiana 70123 - Phone (504) 835-2593
Port St. Lucie - 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986 - Phone (772) 878-0072
Sarasota - 78 Sarasota Center Blvd., Sarasota, Florida 34240 - Phone (941) 922-3526
Shreveport - 7222 Greenwood Road, Shreveport, Louisiana 71119 - Phone (318) 636-3673
Tallahassee - 3175 West Tharpe Street, Tallahassee, Florida 32303 - Phone (850) 576-6131
Tampa - 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619 - Phone (813) 620-3389
West Palm Beach - 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409 - Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
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Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

February 26, 2015
File No. 113-15-40-1033

Leon County School Board
3420 West Tharpe Street
Tallahassee, Florida 32303

Attention: Mr. Russ Waters

Subject: Report of Subsurface Soil Exploration and Geotechnical Engineering Evaluation for the Proposed Building 9 Classroom Addition at Ft. Braden Elementary School, Leon County, Florida

Dear Mr. Waters:

Ardaman and Associates, Inc. (Ardaman) has completed the subsurface soil exploration and geotechnical engineering evaluation for the proposed additions. Based upon information provided by you, and a Barnett Fronczak Barlowe floor plan (Drawing SB-1, dated 2-3-15), we understand that an approximate 115-foot x 75-foot classroom addition is proposed in the southwest portion of the campus.

We presume that minor changes in grade will be required to reach finished floor elevations, in general less than 2 to 3-feet. Maximum loading conditions for the single-story addition are presumed to be on the order of 2-to 3 kips/foot for wall foundations and 75-kips for individual column foundations. Floor loads are presumed to be 100 pounds per square foot or less.

Subsurface Exploration Program

The subsurface exploration included five (5) Standard Penetration Test (SPT) borings (ASTM D1586) performed to 20-feet below grade. The attached **Figure 1** presents the Test Boring locations. Our drillers field-classified the soils, and returned soil specimens from each sampling depth for further classification by engineers, and assignment of laboratory tests on the soils.

Ground Penetrating Radar (GPR) soundings were also performed by Ardaman to detect underground structures in the area. These findings have been reported separately.

The results of our exploration, evaluations and recommendations for earthwork and foundation design for the proposed structures are presented below:

Soil and Groundwater Conditions Encountered

Our interpretations of subsurface conditions encountered are portrayed as *Soil Boring Profiles* on the attached Figure 1. Laboratory testing was performed on selected soil samples, and the results are presented alongside the *Soil Boring Profiles*, at the respective depths from which the tested samples were recovered. The lab tests included Natural Moisture content (NM; ASTM D-2216) and Percent Finer than the U.S. No. 200 Sieve (-200; ASTM D-1140, percent silt and clay).

The numbered *Soil Legend* descriptions on Figure 1 correlate with the soil numbering on the right side of the boring profiles, based upon our engineers' visual classifications in accordance with ASTM D-2488, AASHTO M-145, and laboratory test results in accordance with ASTM D-2487.

In general, the borings initially encountered a relatively thin layer of brown to dark brown medium to fine sand with silt (Stratum 1). At test boring location TH-4, asphaltic concrete rubble was mixed in with Stratum 1 in the top 1-inch of the boring. Underlying Stratum 1 was light orangish-brown medium to fine sand with silt (Stratum 2). Stratum 2 was typically encountered to approximately 12-feet below grade.

And beneath Stratum 2, at 12-feet, tan to white, sometimes mottled, medium to fine sand with silt (Stratum 3) was encountered to boring termination.

We typically collected SPT samples continuously from 0 to 10.5-feet below grade, except at TH-4 where the initial 4.5-feet was augered by hand due to underground utility uncertainties. In general, the encountered sands were "loose", as indicated by SPT "N"-values between 4 and 10.

Groundwater was not encountered during the time of exploration. Given the sandy nature of the encountered soils, we do not anticipate a groundwater table within 10-feet of the ground surface during construction.

Evaluations and Recommendations for Classroom Addition

Based upon subsurface conditions encountered, it is our opinion that a conventional shallow footing foundation system with slab-on-grade is appropriate for the proposed single-story building. The support soils shall be prepared as follows:

1. Strip and grub all vegetation within, and 5-feet beyond the proposed building footprint, remove deleterious materials such as the asphaltic concrete rubble encountered in TH-4, then cut to proposed grades (if any cut required). Do not undermine any nearby hardscape. Shore the soils supporting existing hardscapes as necessary to provide stability if undermining is a possibility.

2. Compact the cleared/cut areas and the exposed bearing surfaces using appropriate compaction equipment to a minimum of 95% of the Modified Proctor maximum dry density (ASTM D-1557) to a depth of 12-inches below the compacted surface. Assure that the existing hardscapes are not disturbed during to the compaction process. We recommend only using hand operated compaction equipment, such as a vibratory plate tamp, within 15-feet of the existing hardscapes.

3. Fill (if required) shall be placed in 1-foot maximum loose lifts; each lift compacted to 95% (minimum) of the Modified Proctor maximum dry density. Fill soils shall consist of clean, natural silica sands to silty sands with less than 15% passing the U.S. No. 200 sieve.

4. Next excavate to proposed bottom of foundation grades. Shore the soils supporting existing hardscapes as necessary to provide stability if undermining is a possibility.

5. Compact the cut bearing surfaces using appropriate compaction equipment (see Item 2, above) to a minimum of 95% of the Modified Proctor maximum dry density to a depth of 12-inches below the foundation bearing surface.

6. We recommend performing a minimum of three (3) density tests in the proof-rolled slab subgrades, and three (3) density tests in each compacted lift of fill. We recommend one (1) density test for every 50 lineal feet beneath the strip footings and one (1) for each individual column foundation (if any). It is important to contact Ardaman at least a few days prior to the compaction process, so that bulk samples of the site soils and proposed fill soils can be obtained, and Proctor tests performed in the laboratory.

Contingent upon the above earthwork preparation, foundations may be designed for a maximum soil contact pressure of 1,500 psf (net) or less. Column footings shall be a minimum of 24-inches wide and wall footings shall be a minimum of 18-inches wide. Minimum soil coverage of 18-inches shall be maintained between the bottom of the foundation and the adjacent finished grades.

Based on the soil boring profiles, the recommended allowable soil contact pressure will yield a minimum factor of safety in excess of two (2) against bearing capacity failure. The recommended allowable soil contact pressure is settlement controlled, which we estimate to be on the order of 1-inch or less. We estimate that differential settlement will be approximately ½-inch in 25-feet.

Site Preparation Recommendations for Pavement Area

In order to perform a detailed Pavement Section Design analysis to determine the thicknesses of the pavement section components, data needed to perform such analyses includes an estimate of the accumulated 18-kip Single Axial Loads over the life of the project ($ESAL_D$). These data are not available at this time, so the following data was assumed to determine the minimum thicknesses of the pavement section components:

Subgrade Minimum Limerock Bearing Ratio:	20
Reliability (R%):	80%
Resilient Modulus (based on assumed LBR):	7,500 psi
$ESAL_D$ for Standard Duty:	<300,000 (standard light duty traffic)

The following analysis and the assumed data above are based on the pavement areas prepared, proof-compacted, and filled in accordance with the following:

1. The entire proposed pavement area, plus a minimum margin of 2-feet, shall be stripped and grubbed of vegetation and any deleterious materials encountered. Ardaman shall be requested to inspect and test the exposed subgrade soils during earthwork, to delineate any objectionable inclusions for undercutting and replacement.

   Next, excavate to an elevation at least 12-inches below the bottom of the proposed base course, as required to reach bottom of Stabilized Subgrade elevation (excavation is not required where the cleared surface is already 12-inches below proposed base course).

   The soils within 24-inches below the base course will comprise, in descending order, the Stabilized Subgrade and the Subgrade. These courses shall consist of AASHTO M145 types A-1, A-3, and A-2-4, per FDOT Index 500. Strata 2 and 3 appear to meet this criteria.

2. The cleared/cut surfaces in construction areas shall be proof-rolled using appropriate compaction equipment for site and soil conditions. Adjust the moisture content of the soils as necessary to aid compaction. Minimum 95% of the Modified Proctor maximum dry density (AASHTO T180) shall be achieved in the top 12-inches below the compacted surface. Compaction criteria for the subgrade and stabilized subgrade are provided in the first bullet point in the *Flexible Pavement Section,* below.

   It is important to contact Ardaman & Associates, Inc. at least a few days prior to proof-rolling, so that we can obtain bulk samples, and perform the Proctor tests in the laboratory. In this manner, the Maximum Dry Density values will be available at the time of proof-rolling and density testing.

3. If any areas "yield" during proof-rolling, they must be explored to evaluate the condition of the soils. Should yielding result from excessive soil moisture, scarify and dry the soils and recompact. Remove any materials if determined to be deleterious or excessively plastic, in areas that "yield" during the proof-rolling operation, and replace with select fill.

4. After satisfactory proof-rolling of the cleared/cut areas, filling, if required to reach bottom of Stabilized Subgrade, may proceed in level, maximum 12-inch lifts in un-compacted thicknesses. Each lift shall be compacted by repeated passes with appropriate compaction equipment to achieve minimum 95% of the Modified Proctor maximum dry density. The filling and compaction operations shall continue until the bottom of Stabilized Subgrade elevations are achieved.

Flexible Pavement Section

Based on the above assumed traffic data, a preliminary pavement design analysis was performed. Provided below, are minimum thicknesses of the pavement section components.

- The top 24-inches of soil beneath the Base Course (which comprise the Subgrade and Stabilized Subgrade) must be compacted to achieve at least **95%** of the Modified Proctor maximum dry density (AASHTO T-180) in the bottom foot, and minimum **98%** of the Modified Proctor maximum dry density in the top foot.

- The top 12-inches of the 24-inches beneath the base course (the Stabilized Subgrade) must exhibit a minimum laboratory LBR of 40. LBR testing of the proposed Stabilized Subgrade soils must be performed well in advance of pavement section construction. If necessary to achieve LBR=40, perform stabilization in accordance with FDOT *Standard Specifications for Road and Bridge Construction*, latest edition, Section 160, Type B.

- For the base course, we recommend either one of the following:

    - Limerock base meeting the requirements of FDOT "Standard Specifications", Sections 200 and 911, placed in accordance with Section 200 of the Standard Specifications, compacted to at least 98% of the Modified Proctor maximum dry density (AASHTO T-180), with a minimum LBR value of 100.

    - Or, Graded Aggregate Base, such as Reclaimed Concrete, meeting the requirements of the FDOT Standard Specs. Special Provisions Section 204-2.1 and 204-2.2, exhibiting a minimum LBR value of 120.

- After placement of a prime coat or tack coat (FDOT Section 300), install SP asphaltic concrete in accordance with Section 334 in the FDOT Standard Specifications.

SUMMARY DESIGN OF PAVEMENT
Pavement Slope: 2% to 3%
Subgrade Density: 95% (ASTM D 1557/AASHTO T-180) (Select fill)

ASPHALT CONCRETE PAVEMENT SN=2.9 STANDARD LIGHT DUTY TRAFFIC

COMPONENT	STANDARD DUTY	MATERIAL	% COMPACTION (ASTM D1557)	MINIMUM REQUIREMENTS
Stabilized (Type B) Subgrade	12"	Controlled Fill	98%	LBR = 40
Base Material	6" or	Limerock or	98 %	LBR = 100 or
	8"	Graded Aggregate	98%	LBR = 120
Asphalt Structural Course	1.25"	SP 12.5	FDOT Spec. (Sec 334)	(1 lift)
Asphalt Friction Course	0.75"	SP 9.5	FDOT Spec. (Sec. 334)	(1 lift)*

ASPHALT CONCRETE PAVEMENT SN=3.7 FOR HEAVY DUTY TRAFFIC

COMPONENT	STANDARD DUTY	MATERIAL	% COMPACTION (ASTM D1557)	MINIMUM REQUIREMENTS
Stabilized (Type B) Subgrade	12"	Controlled Fill	98%	LBR = 40
Base Material	8" or	Limerock or	98 %	LBR = 100 or
	10"	Graded Aggregate	98%	LBR = 120
Asphalt Structural Course	2.0"	SP 12.5	FDOT Spec. (Sec 334)	(1 lift)
Asphalt Friction Course	1.0"	SP 9.5	FDOT Spec. (Sec. 334)	(1 lift)*

*Less than minimum per FDOT Specifications (334-1.4)

Limitations

The recommendations submitted in this report are based upon the data obtained from the soil borings presented on Figure 1. This report does not reflect any variations which may occur between or away from the borings, or over the course of time. If site or soil variations become evident, it will be necessary to reevaluate the recommendations of this report. In the event any changes occur in the design, nature, or locations of the proposed construction, Ardaman and Associates, Inc. must review the applicability of the conclusions and recommendations in this report. Recommendations in this report shall not be applicable if all the above is not fulfilled by the client or the consultant involved in the project.

This evaluation does not address the possibility of sinkhole development at the site. This report has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

If you have any questions regarding the above information, please contact the undersigned.

Sincerely,
ARDAMAN & ASSOCIATES, INC.
Florida Certificate of Authorization No.: 5950

JEREMY MATTHEW CLARK ★ LICENSE 2-26-15 No. 77660 ★ STATE OF FLORIDA ★ PROFESSIONAL ENGINEER

William S. Jordan, P.E.
Senior Project Manager
FL Engineer No.: 33026

Jeremy M. Clark, P.E.
Project Engineer
FL Engineer No.: 77660

JMC/WSJ/mss

SOIL BORING PROFILES

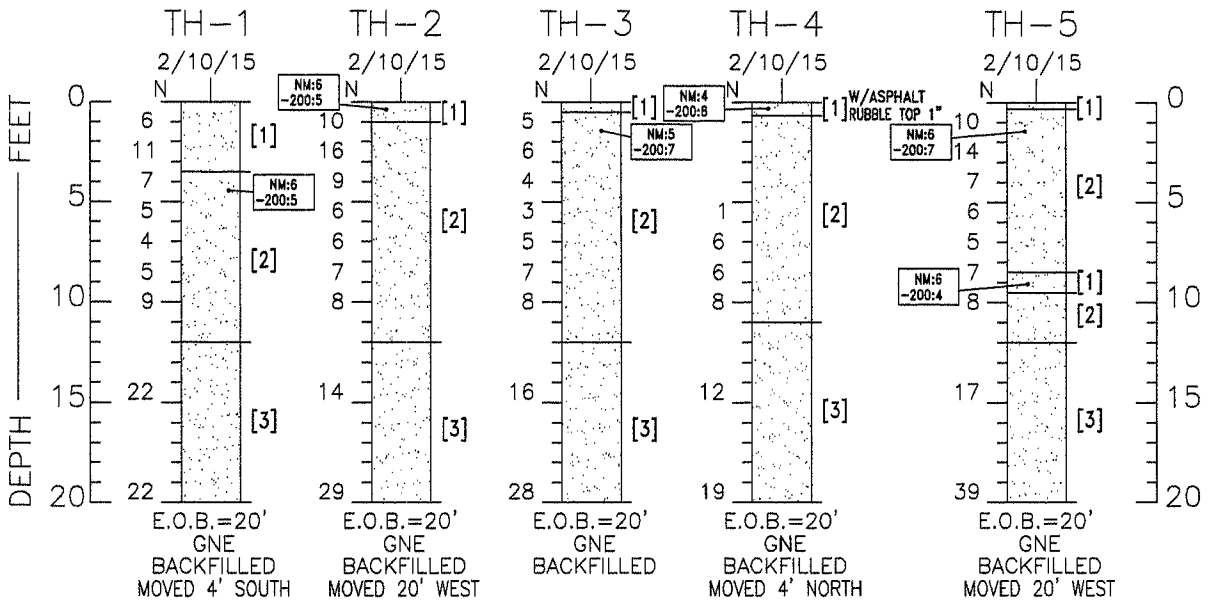


FIGURE KEY

TH	APPROXIMATE TEST BORING LOCATION
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
EOB	END OF BORING
GNE	GROUNDWATER NOT ENCOUNTERED
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
-200	PERCENT PASSING NO. 200 SIEVE (PERCENT FINES)(ASTM D-1140)
SP-SM, SM, SC	UNIFIED SOIL CLASSIFICATION SYSTEM
A-3, A-2-4	AASHTO SOIL CLASSIFICATION SYSTEM
DRILLERS:	KM, SH

SOIL LEGEND

- [1] BROWN TO DARK BROWN MEDIUM TO FINE SAND W/SILT (SP-SM; A-3)
- [2] LIGHT ORANGISH-BROWN MEDIUM TO FINE SAND W/SILT (SP-SM; A-3)
- [3] TAN TO WHITE, SOMETIMES MOTTLED, MEDIUM TO FINE SAND W/SILT (SP-SM; A-3)

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

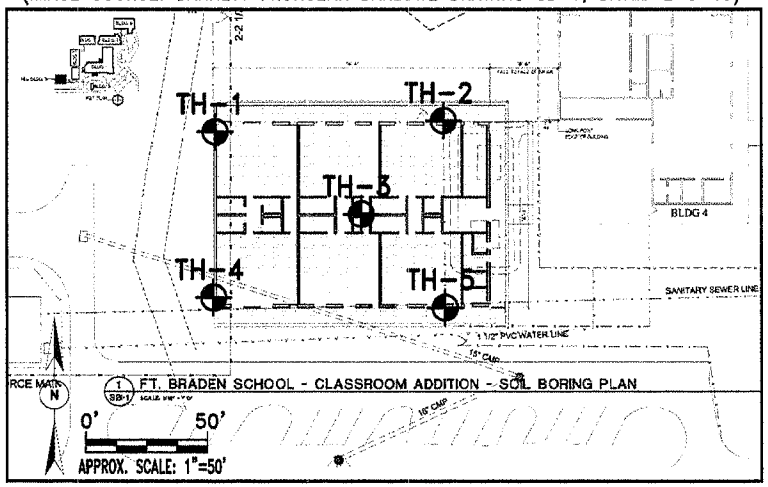
DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
MEDIUM STIFF	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

TEST BORING LOCATION PLAN

(IMAGE SOURCE: BARNETT FRONCZAK BARLOWE DRAWING SB-1, DATED 2-3-15)



WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTICS OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS IN THE FUTURE.

Ardaman & Associates, Inc.
3175 W. Tharpe Street
Tallahassee, Florida 32303
(850) 576-6131

SHEET TITLE:

SUBSURFACE SOIL EXPLORATION FOR PROPOSED
FT. BRADEN ELEMENTARY SCHOOL ADDITION
TALLAHASSEE, LEON COUNTY, FLORIDA

DRAWN BY: JEREMY CLARK	CHECKED BY: WILLIAM JORDAN	DATE: FEBRUARY 24, 2015
FILE NO. 113-15-40-1033	APPROVED BY: W.S. JORDAN, P.E.	FIGURE 1

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 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 dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items 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, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or 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 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

B. 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.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

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. Hazardous materials will be removed by Owner before start of the Work.
2. 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. 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.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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 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 Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

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.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off 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. 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.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to 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 and leave in place.
    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 and leave in place.

3.3 PROTECTION

A. Temporary Protection: 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."

B. Temporary Shoring: Design, 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.

C. Remove temporary barricades and protections where hazards no longer exist.

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. 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. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. 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 portable fire-suppression devices during flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. 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.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Store items in a secure area until delivery to Owner.
3. 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. Protect items from damage during transport and storage.
3. 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 sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings.

E. 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.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site.

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.

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

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered in this section consists of providing asphaltic concrete paving, including base course, stabilized suborder and suborder preparation for roadways, as specified herein, and as needed for a complete and proper installation.

B. Related Documents:

The General Provisions of the contract, including General and Supplementary Conditions, Division 1, apply to the work specified in this section.

The following related work is specified in another section:

Site Grading - Section 02210.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

Composition of mixtures: Job-Mix Designs shall be in accordance with Florida D.O.T. Specification Section 331-86.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.

Product Data: within 35 calendar days after the Contractor has received the Owner's notice-to-proceed, submit:

Materials list of items proposed to be provided under this section;

Certificates, signed by the materials producer and the asphalt paving subcontractor, stating that materials meet or exceed the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1

PART 2 PRODUCT

2.1

A. Asphaltic Cement: Florida D.O.T. 916-1-90.

B. Limerock Base: Florida D.O.T. 240-90, 912-90.

C. Surface Course: Florida D.O.T. 331-90, (If required)

Type S-1 1; 337-90, Type FC-1.

D. Coarse Aggregate: Florida D.O.T. 901-90.

E. Fine Aggregate: Florida D.O.T. 902-90.

F. Material for Subgrade Stabilization: Florida D.O.T. 914-90

2.2 HEADERS AND STAKES

A. Provide Construction grade.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINAL PREPARATION OF SUBORDERS

A. After preparation of suborder as specified in another Section of these Specifications, thoroughly scarify and sprinkle the entire area to be paved, and then compact to a smooth, hard, even surf-ace of 98% maximum density in accordance with ASTM D 1557-02e1).

3.3 PLACEMENT OF BASE COURSE

A. Base:

1. Spread the specified base material to a thickness providing the compacted thickness shown on the Drawings.

2. Compact to 98% maximum density in accordance with ASTM D1557.

B. Moisture Content: use only the amount of moisture needed to achieve the specified compaction.

3.4 PLACEMENT OF ASPHALTIC CONCRETE PAVING

A. Install the specified headers and stakes to achieve the arrangement of paving shown on the Drawings.

B. Remove all loose materials from the compacted base.

C. Adjust frames and covers, if so required, to meet final grades.

D Receipt of asphaltic concrete materials:

1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 280 degrees F.

2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 50 degrees F, nor during fog, rain, or other unsuitable conditions.

E. Spreading:

1. Spread material in a manner which requires the least handling.

2. Spread asphaltic concrete in one layer.

G. Rolling:

1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the Drawings.

3. Finished paving smoothness tolerance:

a. Free from bird baths.
b. No deviations greater than 1/8" in six feet.

4. Compaction shall be 98% in accordance with testing procedures specified by ASTM D1188-07. The completed pavement should be cored periodically and each lifted tested for density in accordance with ASTM D-1188-07. Contractor shall replace pavement at cored areas at his own expense.

3.6 PROTECTION

A. Protect the surface course asphaltic concrete paved areas from traffic until is set and cured and does not pick up under foot or wheeled traffic.

END OF SECTION 02513

SECTION 02516– LIMEROCK BASE COURSE

PART 1 - GENERAL

1.01 SCOPE OF WORK

1.01.1 The work specified in this Section includes all labor, materials, transportation and equipment necessary to properly perform all work specified here, indicated on the drawings or reasonably implied to complete the construction of base course composed of limerock. It shall be constructed on a prepared subgrade, in accordance with these Specifications and in conformity with the lines, grades, notes and typical cross-sections shown on the Drawings and in the Plans. Included as a part of this work are the following items:

A. Limerock Base Course (single and double course)

1.02 RELATED WORK

1.02.1 The following items of related work are included and specified in other Sections of these Specifications:

A. Earthwork
B. Stabilized Subgrade
C. Curbs and Gutters
D. Asphalt Concrete Surface Course

1.03 SCHEDULE

1.03.1 The Contractor, will construct a Limerock Base Course when such an alternate is shown on the Plans. If selected for construction it shall be used throughout the project. It shall NOT be mixed with other types of base courses for construction of contiguous portions of the work.

1.03.2 Limerock Base Course construction shall not commence (nor shall limerock material be placed on the roadway) until the drainage system (including underdrains) is completed and 100 percent functional and the curbs and gutters, if any, have been properly constructed, except at temporary access roads.

1.03.3 Base Course construction shall commence within 24 hours of completion of the stabilized subgrade work.

1.04 COMPLIANCE WITH STANDARDS

1.04.1 Except as modified or supplemented herein, all work in this Section shall meet the requirements and standards listed. In case of conflict between the referenced Specifications or standards, the one having the more stringent requirements shall govern.

1.04.2 American Association of State Highway and Transportation Officials - AASHTO
Florida Department of Transportation - FDOT

1.05 SUBMITTALS

1.05.1 Submit reports to Engineer demonstrating materials comply with requirements herein.

1.05.2 Test Results: Submit results of all tests conducted to the Engineer.

PART 2 - MATERIALS

2.01 LIMEROCK

2.01.1 The Limerock material shall meet the requirements of FDOT "Standard Specifications for Road and Bridge Construction", Section 911. At the Contractor's option limerock of either Miami or Ocala formation may be used but only limerock of one formation may be used on this contract. The material shall originate quarries currently on the FDOT approved list for limerock base material sources. Provide certificate of conformance to the requirements of Section 911, FDOT.

2.02 PRIME COAT (REQUIRED)

2.02.1 The material used for prime coat shall be cut-back Asphalt Grade RC-70 or RC-250 meeting the requirements of Section 916-2, of the FDOT Specifications, Emulsified Asphalt Grades SS-1 or CSS-1, SS-1H or CSS-1H diluted in equal proportion with water; Asphalt Emulsified Grades AE-60, AE-90, AE-150 or AE-200 diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; special MS-Emulsion diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Asphalt Emulsion Prime (AEP) meeting the requirements of Section 916-4, of the FDOT Specifications, or other types and grades of bituminous material which may be called for in the Plans or Special Provisions.

2.02.2 The Contractor may select any of the specified bituminous materials unless the Plans or Special Provisions indicate the use of a specific material. Types and Grades of bituminous material other than those specified above may be allowed if it can be shown that the alternate material will properly perform the function of prime coat material.

2.03 COVER MATERIAL FOR PRIME COAT (REQUIRED)

2.03.1 If an emulsified asphalt is used for prime coat, the Engineer may require that cover material be hot-asphalt coated (mix to contain from two to four percent asphalt-cement) if necessary to achieve a prime coat which will remain reasonably intact until the surface course is placed.

2.03.2 If material other than emulsified asphalt is used for the prime coat, the cover material shall be either sand (bare or hot-asphalt coated) or screenings, at the Contractor's option. The sand shall be non-plastic and free from any appreciable amount of silt, clay balls and root particles, and from any noticeable sticks, trash, vegetation or other organic matter.

2.04 TACK COAT

2.04.1 Unless a specific type or grade of material is called for in the Plans or Special Provisions, the material used for tack coat may be any of the following: Emulsified Asphalt, Grades RS-2 or CRS-2; Emulsified Asphalt, Grades SS-1 or CSS-1, SS-1H or CSS-1H (all diluted in equal proportions with water); Emulsified Asphalt, Grades AE-60, AE-90, AE-150 or AE-200, diluted at the ratio of 6 parts emulsified asphalt to 4 parts water; Emulsified Asphalt, Grade CRS-2H; Special MS-Emulsion; Asphalt Emulsion Prime (AEP) (may be diluted with water at the ratio not to exceed 6 parts emulsified asphalt to 4 parts water) meeting the requirements of Section 916-4, of the FDOT Specifications.

PART 3 - EXECUTION

3.01 LIMEROCK BASE COURSE

3.01.1 Equipment to construct the base course shall be as set forth in Section 200-3, FDOT Specifications.

3.01.2 Limerock shall be transported to the point where it is to be used (placed on the roadbed) by hauling over previously placed rock and deposited at the end of the preceding spread material.

3.01.3 The limerock shall be spread, compacted, finished, tested, primed and maintained in accordance with Sections 200-5 through 200-9 (inclusive) of the FDOT Specifications.

3.01.4 In addition to the above requirements, the following shall apply:

A. Section 200-7 shall only apply when the asphalt concrete surface course is to be paid for by the ton.

B. The Contractor shall not be compensated for areas of limerock base that are thicker than shown on the Plans or Drawings. Areas of excess thickness shall not be used to compensate for areas of deficient thickness as set forth in Section 200-9.

C. In maintaining the base the Contractor is required to place sandbag berms at each inlet so as to divert stormwater into the inlet. In all road sections with a grade greater than 2%, per the Drawings, the Contractor shall place sandbag berms at distances no greater than 200 feet between inlets.

3.02 PRIME COAT AND COVER MATERIAL (REQUIRED)

3.02.1 Equipment to construct the prime coat and spread the cover material shall be as set forth in Section 300-3, FDOT Specifications.

3.02.2 Cover material shall be transported over the portions of the roadbed previously coated with cover material.

3.02.3 The prime coat and cover material shall be constructed in accordance with Section 300-4, -5, and -6 of the FDOT Specifications.

3.03 TACK COAT

3.03.1 When a tack coat is required it shall be constructed as set forth in Section 300-7 of the FDOT Specifications.

3.04 TESTING

3.04.1 General

A. Testing Agency - The Agency shall be approved by the Engineer, and shall be the type and possess the degree of experience required. If required, furnish evidence of agency's ability to perform the test required in this Specification.

B. All testing shall be arranged and paid for by the ~~Contractor~~ Owner

C. The horizontal and vertical locations of the tests shall be reported. Station numbers shall be used with distances right or left of centerline or baseline. Testing to comply to Section 108.

3.04.2 Frequency of Tests

A. LBR Test by FDOT - One (1) for each 750 tons or portion thereof delivered to site. The LBR shall be conducted by the quarry and results sent to the Engineer.

B. In-situ Density - One (1) for each 500 square yards or part thereof finished as a unit, but in no case less than two tests.

C. Thickness - Thickness of the base shall be determined at all density test sites.

D. Proof Rolling - Prior to asphaltic concrete placement, the base shall be proof-rolled with heavy pneumatic-tired rollers having unit pressures of 200 psi. All soft, loose, or yielding areas of base shall be excavated and filled with sand-asphalt hot mix (500 lb. Marshall Stability) and compacted.

END OF SECTION 02516

PART 1 – GENERAL

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered in this section consists of providing the water distribution system as shown on the Drawings, specified herein, and as required for a complete and proper installation.

B. Related Documents:

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

C. The following related work is specified in another section:

1. Trenching, Backfilling and Compacting - Section 02221.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

3. Names and address of the nearest service and maintenance organization that stocks repair parts.

4. Manufacturer's recommended installation procedures which, after being reviewed by the Engineer, will become the basis for accepting or rejecting the actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. General:

1. Connection point to building service lines is approximately five feet outside buildings and structures to which service is required.

2. All pipe shall be Polyvinyl Chloride (PVC) Pressure Pipe AWWA Pressure Class 150, AWWA design C900.

B. Pipe:

1. Polyvinyl Chloride (PVC) Pressure Pipe

a. PVC Pipe for potable water in sizes 4-inch through 12-inch shall conform to AWWA standard C900, "PVC Pressure Pipe for Water". Laying lengths shall be 20 feet ± 1 inch for all sizes.

b. Pipe shall have an integral wall-thickened bell end or extruded coupling with gasket which is in compliance with the requirements of ASTM D3139.

c. Pipe shall be Class 150. Each piece of pipe shall be hydrostatically tested to 600 psi by Manufacturer. Marking shall include normal size, material code designation (PVC 1120), dimension ratio number, AWWA pressure Class 150, ASSA designation code C900. All PVC pipe shall be UL/FM approved.

d. PVC in 2-inch pipe shall be 200 psi (SDR 21) in IPS dimensions manufactured from 1120 PVC resin. Pipe shall have integral wall bells or extruded coupling with gasket seal.

C. Joints:

1. Use mechanical joints of the stuffing-box type complying with AWWA requirements for polyvinyl Chloride (PVC).

D. Fittings and specials:

1. Polyvinyl Chloride (PVC) Pipe:

Fittings installed in polyvinyl pipe lines shall conform to the same specifications as the pipe line in which they are installed.

E. Valves:

a. Use gate valves designed for a working pressure of not less than 150 psi.

b. Provide end connections as required for the piping in which they are installed.

c. Provide a clear waterway equal to the full nominal diameter of the valve, openable by turning counter clockwise.

d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.

e. Valves 3" and larger:

(1) Design in accordance with AWWA C500-71, standard bronze trimmed, non-rising stem, solid wedge disc valves.
(2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
(3) Provide tee handle socket operating wrenches of suitable size

F. Fire Hydrants:

1. Hydrants shall have two 2-1/2 inch hose connections and one 4-1/2 inch steamer connection. Connections shall have National fire hose threads and couplings.

2.2 TAPPING SLEEVES

A. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASS series 15).

1. Acceptable products.

a. Clow Corporation, Corona, California; boltless type:

(1) Model C1 series for existing cast iron mains, complying with AWWA class A;
(2) Model CA for class 150 and class 200 existing asbestos cement mains.

2. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.3 VALVE BOXES

A. Use service box of cast iron, extension type of the required length, with screw adjustment.

B. Provide the word "WATER" cast into the cover.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until all unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

A. Make all necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 HANDLING

A. Handle pipe and accessories in such a way as to ensure delivery to the trench in sound, undamaged condition:

1. Carry pipe into position; do not drag.

2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other methods approved by the Engineer.

C. Before installation, inspect each piece of pipe and each fitting for defects:

1. Materials found to be defective before or after laying shall be replaced with sound material meeting the specified requirements without additional cost to the Owner.

D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.4 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.

1. Use wheel cutters when practicable.

3.5 LOCATING

A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.

1. A vertical separation of 18" shall be maintained when a 10' horizontal separation is not possible. Concrete encasement of Pipe for a distance of 10' each side of Sewer shall be maintained.

B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing, or provide pressure pipe with no joint located within 36 inches of the crossing.

1. Encase in concrete those joints in the sewer main closer, horizontally, than 36 inches to the crossing.

C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.6 JOINT DEFLECTION

A. Polyvinyl Chloride (PVC) Pipe:

1. Maximum allowable deflection shall be as allowed in AWWA .

2. If joint is required to construct the water mains as shown on the plans, the maximum deflection shall not exceed the manufacture's maximum recommended deflection. Deflection joint pipe shown on the drawings is shown only as an assistance in illustrating a preferred means of illustration in specific locations and is not intended to indicate all deflected joint pipe necessary to effect the illustration as show in the plan

3.7 PLACING AND LAYING

A. General:

1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the Engineer.

2. Do not dump or drop any of the materials of this Section into the trench.

3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.

4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.

5. Take up and relay pipe that has the grade or joint disturbed after laying.

6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep trench dewatered until .

7. Securely close open ends of pipe, fittings, and valves when work is not in progress.

8. Where any part of coating or lining is damaged, replace pipe at no additional cost to the Owner.

B. Connections: Use specials fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the Engineer.

C. Sleeves:

1. Where pipe passes through walls of valve pits, provide cast iron walls sleeves

2. Fill annular space between walls and sleeves with rich cement mortar

3. Fill annular space between pipe and sleeves with mastic.

3.8 JOINTING

1. Mechanical joints and push-on type joints: Install in accordance with AWWA C 600-82, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.

2. Make connections between different types of pipe and accessories with transition fittings.

3. Rubber gaskets: Handle, lubricate where necessary, and install in strict accordance with the recommendations of the manufacturer.

3.9 SETTING VALVES AND HYDRANTS

A. General:

1. Center valve boxes on the valves, setting plumb.

2. Tamp earth fill around each valve box to a distance of four feet on all sides, or to the undisturbed trench face if less than four feet.

3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Hydrants:

1. Set hydrants plumb and install as shown on the Drawings.

2. Fully open and close each hydrant valve to assure that all parts are in working condition.

3.10 THRUST BLOCKS

A. General

1. Provide thrust blocks, on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally.

2. Provide concrete thrust blocking with a compressive strength of 3000 PSI in 28 days.

B. Installation:

1. Locate thrust blocking between solid ground and the fitting to be anchored.

2. Unless otherwise shown or directed by the Engineer, place the base thrust bearing sides of thrust blocking directly against undisturbed earth.

3. Sides of thrust blocking not subject to thrust may be placed against form.

4. Place thrust blocking so the fitting joints will be accessible for repair. At no time shall the joints be covered with concrete.

3.11 TESTING AND INSPECTING

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Engineer.

B. Hydrostatic tests:

1. Where any section of a water line is provided with concrete thrust blocking for fittings, blocking, unless otherwise directed by the Engineer.

2. Devise a method for disposal of wastewater from hydrostatic test, and for disinfection, as approved in advance by the Engineer.

C. Pressure tests:

1. After the pipe is laid, the joints complete, and the trench partially backfill leaving joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 200 PSI.

2. Open and close each valve several times during the test.

3. Carefully examine exposed pipe, joints, fittings, and valves.

4. Replace or remake joints showing visible leakage.

    a. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results conform to the requirements stated herein.

    b. Make repair and replacement without additional cost to Owner.

D. Leakage test:

1. Conduct leakage test after the pressure test has been completed satisfactorily.

2. Duration of each leakage test: At least two hours.

3. During the test, subject water lines to a pressure of 200 PSI.

4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled.

a No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

L = 0.00304 ND x square root of P

a. (L = 0.00054 ND x square root of P): where

b. L = allowable leakage in gallons per hour;

c. N = number of joints in length of pipe under test;

d. D = nominal diameter of pipe in inches; and

e. P = average test pressure in lbs per square inch.

f. The allowable leakage in gallons per hour, per joint, at 200psi average test pressure shall be in accordance with Table II.

g. Should any test of pipe disclose leakage greater than that specified in Table II, locate and repair the defective joint or joints until the leakage is within the specified limit at no additional cost to the Owner.

5. Table

Duration Test	2	3	4	6	8	10	12	14
1 hour	0.18	0.28	0.37	0.55	0.74	0.92	1.10	1.29
2 hour	0.39	0.56	0.74	1.10	1.48	1.84	12.20	2.58

E. Time for making test:

1. Except for joints material setting, where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.

2. Cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

F. Disinfection:

1. Before acceptance of the potable water system, by the Owner, disinfect each unit of completed water supply, distribution, and service line in accordance with AWWA C601-68.

2. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.

3. Furnish two copies of a Certificate of Disinfection to the Engineer.

END OF SECTION 02713

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of providing storm sewerage system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Documents:

The General Provisions of the contract, including the General and Supplementary Conditions, and Division 1, apply to the work specified in this section.

The following related work is specified in another section:

1. Trenching, Backfilling, and Compaction Section 02221.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer's recommended installation procedures which, when approved by the Owner, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

2.1 PIPE MATERIAL

A. Reinforced concrete pipe and fittings; ASTM C76-07, Wall 'B'. Basis of acceptance shall be ASTM C76-07, Article 4.1.1. Excepting closure piece, pipe lengths shall be shorter than eight feet.

1. Reinforcement arrangement circular.

2. Portland Cement: ASTM C150-07, Type I.

3. Joints: Bell-and-spigot type and designed in a manner which will prevent external loads and pipe weight from bearing on gasket.

a. Joint sealer: Rubber "O-ring" gasket conforming to ASTM C443-05a and capable of maintaining water tightness of pipe when pipe is in normal position, and when one side of pipe joint is opened 1/2" wider than normal.

b. Gasket lubricant: Non-injurious to pipe and gasket.

4. Stamp each pipe length at pipe manufacturer's plant; stamp shall show pipe strength or reinforcement class, wall thickness designation, manufacturing date and manufacturer's symbol.

5. Grout for plugging lift holes Epoxy type.

6. This specification applies to high density polyethylene corrugated pipe with an integrally formed smooth waterway. Nominal sizes for which this specification Is acceptable are (4 - 60 inch) diameters. Sizes (4 - 60 inch) shall be either AASHTO Type 'S' or Type 'D' as follows. Sizes 1500 (4 - 60 inch) designated as AASHTO Type 'S' (N-12) shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations for Type'S' sizes (4 - 60 inch) shall be annular (N-12). Sizes (42 thru 60 inch) designated as AASHTO Type 'D' (N-12HC) shall consist of an essentially smooth waterway braced circumferentially with circular ribs which are formed simultaneously with an essentially smooth outer wall. The (42 thru 60 inch) (N-12HC) sizes shall conform to AASHTO Type 'D' (which describes dual wall pipe with a smooth waterway).

   Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, M294 and MP7. Pipe and fittings shall be made from virgin PE compounds which conform with the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D3350.

The minimum parallel plate stiffness values when tested in accordance with ASTM D2412 shall be as follows:

Diameter (nominal)	Pipe Stiffness (minimum)	Diameter (nominal)	Pipe Stiffness (minimum)
{4")	(50 pii)	(24")	(34 pii)
(6")	(50 pii)	(30")	(28 pii)
(8")	(50 pii)	(36")	(22 pii)
(10")	(50 pii)	(42")	(20 pii)
(12'}	(50 pii)	(48")	(18 pii)
(15'}	(42 pii)	(60")	(14 pii)
(18')	(40 pii)		

The fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes and end caps. These fittings may be installed by various methods such as snap-on, bell and spigot, bell - bell and wrap around couplers. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the manufacturer shall be used. Where designated on the plans or project specifications, an elastomeric gasket meeting the requirements of ASTM F477 shall be supplied.

Installation of the pipe specified above shall be in accordance with either AASHTO Section 30 or ASTM Recommended Practice D2321 as described elsewhere in these specifications and as recommended by the manufacturer.

2.2 DRAINAGE STRUCTURES

A. General:

1. Construct manholes, inlets, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings, and with fixed ladder rungs where indicated on the Drawings or required by codes.

2. Individual wall-mounted aluminum, plastic-covered steel, or galvanized steel rungs are acceptable.

B. Materials:

1. Concrete: Concrete to be 3000 psi concrete.

2. Mortar for pipe joints and connections to other drainage structures, and manhole construction:

a. Comply with requirements of ASTM C270-07, type M, except the maximum placement time shall be one hour.

b. Hydrate lime complying with ASTM C141-97(2005), type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.

b. Provide quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.

3. Precast reinforced concrete manholes:

a. Comply with ASTM C478-07, precast rings and cone sections.

b. Fully bed the joints between precast concrete risers and tops in mortar, and smooth both interior and exterior surfaces uniformly.

4. Reinforcement: Provide intermediate grade billet steel comply with ASTM A615-07, grade 40.

5. Frames and covers or gratings:

a. Provide all gratings or covers from the same manufacturer.

b. Provide standard black finish, supplied as a total unit, sized as shown on the Drawings or larger sizes except where in a pavement area, and with the wording "STORM DRAIN" cast into the cover.

6. Drain Inlet:

a. Drain inlet to be as specified on the drawings.

7. Filter media for Detention Basin: Florida D.O.T. Specifications Section 902-4-91.

8. PVC Pipe - 948-1-91.

9. KM Pipe - 943-86.

10. Rip Rap - Rubble, PHD 530-86.

11. Pipe for detention basin underdrain - 440-2-91.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 02221, and the following.

B. Movement of construction machinery:

1. Use means necessary to avoid displacement of, and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.

2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.

C. Bedding:

1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.

2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower perimeter of circular pipe as shown on Drawings.

3. Tamp bedding as required.

4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.

3.3 INSTALLING PIPE

A. General:

1. Carefully examine each pipe prior to placing.

a. Promptly set aside defective pipe and damaged pipe.

b. Clearly identify defects.

c. Do not install defective pipe or damaged pipe.

2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Owner.

3. Provide adequate facilities for lowering pipe safely into the trenches.

4. Do not place pipe in water, nor place pipe when trench or weather is unsuitable for such work.

B. Place pipe by proceeding upgrade with the spigot ends of bell and spigot pipe, pointing in the direction of flow.

3.4 JOINTS

A. Joining pipe:

1. Flexible watertight joints:

a. Use the specified materials. Equal materials may be used when specifically approved in advance by the Engineer/Architect.

b. Install gaskets and joint materials in accordance with the manufacturers' recommendations as approved by the Engineer/Architect.

c. Protect from sun, blowing dust, and other deleterious agents at all times.

d. Align the pipe with previously installed pipe, manufacturers mark indicating top and bottom will be seen through exterior joint recess when joint is pulled within 1" of closure if not aligned properly remove pipe and remake the joint.

e. Inspect gaskets, and replace loose and improperly affixed gaskets and jointing materials.

3.5 DRAINAGE STRUCTURES

A. Install drainage structures in accordance with the Drawings and with manufacturers' recommendations as approved by the Engineer.

3.6 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 02221.

3.7 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with specified requirements.

B. Hydrostatic test on watertight joints:

1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.

2. Demonstrate that joints in reinforced concrete pipe comply with ASTM C443-07.

3. Make tests at an internal hydrostatic pressure of 10 PSI for 24 hours.

4. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

END OF SECTION 02721

PART 1 GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of providing sanitary sewer system, lift station and force main as shown on the Drawings, specified herein, and as required for a complete and proper installation.

B. Related Documents:

The General Provisions of the contract including the General and Supplementary Conditions, and Division 1, apply to the work specified in this section.

The following related work is specified in another section:

1. Trenching, Backfilling and Compacting - BORE AND JACKING Section 02221.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer's recommended installation procedures which, when reviewed by the Engineer, shall become the basis for accepting or rejecting the actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1.

PART 2 PRODUCTS

A. Pipe:

1. Cast Iron Pipe (C.I.P), 5 year Old or Wrought Clay pipe and fittings (VCP) use extra strength, bell and spigot, complying with ASTM C700-78a.

2. Use compression joints complying with ASTM C425-77, Type II.

3. Crushed stone, Florida DOT Specification 901 No. 67.

4. Filter cloth, manufacturer's standard non-woven geotextile fabric of polypropylene or polyester fibers or a combination thereof.

5. Polyvinyl chloride pipe shall conform to the requirements of ASTM D1785 for Schedule pipe, and pipe material shall be Type 1, Grade 1, in accordance with the requirements of ASTM D1784. Pipe and fittings shall be produced from a basic resil of virgin PVC. Piping, where so indicated, shall be flanged and provided with full faced viton or natural rubber gaskets and stainless steel bolts and nuts. Flanges shall be rated for 150 pound service, and shall be installed with an approved solvent cement.

6. Unless otherwise indicated, polyvinyl chloride pipe and fittings shall have socket conforming to ASTM D2467 and D2564.

7. Each length of PVC pipe and each fitting shall have the following data clearly marked on each piece:

    1. Normal size
    2. Type and grade of material and ASTM standard.
    3. Class or schedule rating.
    4. Manufacturer.
    5. National Sanitation Foundation's seal of approval.

2.2 MANHOLES

A. Precast:

1. Provide reinforced precast concrete manhole sections complying with ASTM C478-84, except use portland cement as specified below.

2. Provide joints of mortar, with approved mastic or rubber gasket, or an approved combination of those types.

3. Provide precast units of concrete rings and eccentric cone section, with ladder rungs cast into the units.

B. Portland cement:

1. For concrete in manholes, comply with ASTM C150-85, type II.

2. For concrete in cradle and encasement: Type optional with the Contractor.

C. Concrete:

1. Provide 3000 PSI concrete.

D. Mortar:

1. Comply with ASTM C270-84, Type M.

2.3 FRAMES AND COVERS

A. Use cast iron frames and covers, with work "SEWER" cast into the covers in letters 2" high and plainly visible.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but are required for a complete and proper installation as selected by the Contractor subject to review by the Engineer.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section is to be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until all unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Make all necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 INSTALLATION

A. Trench excavation, backfilling, and compaction for the work of this Section shall be in strict accordance with the pertinent provisions of Section 02221 of this Specifications.

B. Pipe laying:

1. Protect pipe against shocks and free fall during handling. Remove extraneous material from the pipe interior.

2. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.

3. Lay each pipe accurately to the indicated line and grade in order to maintain a uniform invert along the sewer lines.

4. Continually clean interior of the pipe free of foreign material.

5. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.

6. Use lubricants, primers, and adhesives recommended for the purpose by the pipe manufacturer.

7. Place, fit, join, and adjust the joints to obtain the degree of water tightness required.

C. Provide concrete required resulting from faulty construction methods or negligence, at no additional cost to the Owner.

3.4 MANHOLES

A. General:

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.

2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.

3. Make changes in size and grade of channels smoothly and evenly.

4. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened.

5. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1 inch per foot nor more than 2 inches per foot.

6. Prevent free drop inside the manholes exceeding 18 inches as measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels.

7. Construct drop manholes whenever the free drop otherwise would be greater than 27 inches.

B. Manhole rungs:

1. Provide each manhole with individual wall mounted rungs fabricated of plastic-covered steel.

2. Comply with the requirements of governmental agencies having jurisdiction.

D. Jointing and plastering:

1. Completely fill mortar joints, and leave smooth and free from excess mortar on the inside of the manhole.

E. Frames and covers: Unless otherwise shown on the Drawings, set frames and covers as follows:

1. In paved areas, so that the top of the cover shall be flush with the finished pavement.

2. In unpaved areas, the top of cover shall be 3 inches higher than finished grade.

3.6 TESTING AND INSPECTING FOR GRAVITY SEWER PIPE

A. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been inspected, tested and approved by the Engineer.

B. Leakage tests:

1. Test lines for leakage by exfiltration tests.

a. Prior to testing for leakage, backfill the trench to at least the lower half of the pipe.

b. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.

2. Water exfiltration tests:

a. Test each section of sewer line between successive manholes by closing the downstream end of the sewer to be tested, and the inlet sewer of the upstream manhole, using stoppers.

b. Fill the manhole and pipe with water to a point four feet above the invert of the sewer at the center of the upstream manhole: or, if groundwater is present, level.

c. Allowable leakage will be computed by the formula:

1. (1) For Mortared Joints: E=0.0001 LD H;
2. (2) For all Other Joints: E=0.0002 LD H;
3. "L" is the length of sewer tested, in feet.

4. "E" is the allowable leakage in gallons per minute of sewer tested;
5. "D" is the internal pipe diameter in inches:
6. "H" is the difference in elevation between the water surface in the upstream manhole and the invert of the pipe at the downstream manhole; or, if groundwater is present above the invert of the pipe in the downstream manhole, the difference in elevation between water surface in the upstream manhole and the groundwater at the downstream manhole.
7. The maximum allowable leakage shall not exceed 2000GPD per inch of pipe diameter per mile.

3. Water infiltration test:

   a. If, in the opinion of the Engineer, excessive groundwater encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
   b. Close the end of the sewer at the upstream structure sufficiently to prevent the entrance of water.
   c. Discontinue pumping of groundwater for at least three days, then test for infiltration.
   d. Infiltration into each individual reach of sewer of between adjoining manholes shall not exceed that allowed in the formula given for the exfiltration test, except that "H" in the formula shall be the difference between the groundwater surface and the invert of the sewer at the downstream manhole.

4. Provide and use measuring devices approved by the Engineer.

5. Provide water, materials, and labor for making required tests.

6. Make tests in the presence of the Engineer, giving the Engineer at least three days advance notice of being ready for test observation.

C. Submit test data to the Engineer for review and approval.

END OF SECTION 02722

PART I – GENERAL

1.1 SUMMARY OF WORK

Work of this section includes a complete and operating irrigation system, and shall include the following:

Connection to water supply
Irrigation piping, valves, and auxiliary equipment
Sprinkler heads
Controller and power connections

1.2 RELATED WORK SPECIFIED ELSEWHERE

Landscaping – 02900
See Division 2 Section "Water Distribution" for water supply piping, water meters, and backflow presenters

1.3 APPLICABLE CODES AND ORDINANCES

SECTION 02900 –LANDSCAPE

PART 1 – GENERAL

1.1 SCOPE

A. Extent of Landscape Development Work is shown on drawings and in schedules on sheet L1.0.
B. Sub-grade Elevations: Excavation, filling and grading required to establish elevations shown on drawings are not specified in this section. Refer to earthwork sections.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
B. Related Sections include the following:

1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earthwork" for excavation, filling,, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
3. Division 2 Section "Subdrainage" for below-grade drainage of landscaped areas, paved areas, and wall perimeters.

1.3 DEFINITIONS

A. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken in a container. Ball size is not less than 24 diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.
B. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z 60.1 for kind and size of exterior plant required.
C. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
D. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted, exterior plants established and grown in-ground in a porous fabric bag with well established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
E. Finish Grade: Elevation of finished surface of planting soil.
F. Manufactured Topsoil: Soil purchased off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil, mixed with soil amendments.
H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or topsoil surface of a fill or backfill, before placing planting soil.

1.4 QUALITY ASSURANCE

A. Subcontract landscape work to a single firm specializing in landscape work.
B. Labor crews shall be directed by a Landscape Foreman experienced in plant materials, planting, reading blueprints, and coordination between job and nursery. All planting shall be accepted horticultural practice.
C. Source Quality Control: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.

D. Substitutions: If specified landscape material is not obtainable, submit proof of non-availability to Landscape Architect, together with proposal for use of equivalent material.
E. Analysis and Standards: Package standard products with manufacturer have 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.
F. Trees, Shrubs, and Plants: Provide trees and shrubs grown in recognized nursery in accordance with good horticultural practice. Provide healthy, vigorous stock free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries; abrasions or disfigurement.
G. Sizes: Provide trees and shrubs of sizes shown or specified. Trees and shrubs of larger size may be used if acceptable to Landscape Architect.
H. Inspection: The Landscape Architect reserves right to inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for name, variety, size and quality. All plants are to be of Florida #1 Grade as specified in Grades & Standards for Nursery Plants; Florida Department of Agricultural & Consumer Services.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official analytical Chemists, where applicable.

C. Qualification Data: For landscape installer
D. Material Test Reports: For existing surface soil and imported topsoil.
E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

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 sold shall be placed within 24 hours after stripping. Protect sod against drying and braking of rolled strips.
C. Trees and Shrubs: Do not prune prior to delivery unless otherwise approved by the Landscape Architect. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches or destroy natural shape. Provided protective covering during delivery.

D. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage and keep roots moist.
E. Do not remove container-grown stock from containers until planting time.
F. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

1.7 SPECIAL PROJECT WARRANTY

A. Warranty lawns through specified lawn maintenance period, and until final acceptance.
B. Warranty trees and shrubs, for a period of one year after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect of Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.

C. Remove and replace trees, shrubs, or other plants found to be dead or more than 25% dead, or in an unhealthy condition during warranty period. Make replacements during growth season following end warranty period. Replace trees and shrubs, which are in doubtful condition at end of warranty period; unless in opinion of Landscape Architect, it is advisable to extend warranty period for a full growing season.
D. Another inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection. Only one replacement (per tree, shrub, or plant) will be required at end of failure to comply with specified requirements.

1.8 JOB CONDITIONS

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.
B. 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.
C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.
D. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.
E. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Landscape Architect. If planting of trees and shrubs occurs after lawn work, protect lawn from areas and promptly repair damage to lawns resulting from planting operations.

PART 2 – PRODUCTS

2.1 SOIL AMENDMENTS

A. Lime: Natural dolomitic limestone containing not less than 85% of total carbonate with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sleeve.
B. Peat Humus: FS Q-P-166 decomposed peat with no identifiable fibers with pH range suitable for intended use.
C. Bonemeal: Commercial raw, finely ground; 4% nitrogen and 20% phosphoric acid.
D. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.
E. Commercial Fertilizer: Shall be Agriform 21 green tablets slow release 20-10-5. Application rates for plant types shall comply with manufacturer's direction.
F. Sand: Clean, washed builders sand, free of salt, weeds, sticks, and other debris.
G. Pine Bark: Aged chunks no greater than ¼" diameter.
H. Planting Soil Mixture shall consist of mixture equivalent to specifications noted in the Landscape/Maintenance specifications on Landscape Detail Sheet.

2.2 PLANT MATERIALS

A. Quality: Provide material complying with Florida #1 classification in Grades and Standards for Nursery Plants, Second Edition, purchased by the Florida Department of Agriculture, Division of Plant Industry, and Gainesville, Florida. All plant material be sound, healthy, vigorous and free from insect pests, plant disease and injuries. Trees shall be heavily branched, or in palms, heavily leafed.

   Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations of ANSI Z60.1 for container shock.
B. Deciduous Shrubs: Provide shrubs of the height shown on the plan or listed and with not less than minimum width as required by Grades & Standards for Nursery Plants for type and height of shrub required.

C. Coniferous and Broad-Leaved Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicated minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad up right, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements specified by Grades & Standards for Nursery Plants. Container grown evergreens will be acceptable subject to specified limitations for container grown stock.
D. Sod: Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses and machine cut to pad thickness of ¾" (+/-1/4'), excluding tip growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant). Sod shall be Centipede grass (Eremochloa ophiuroides)

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

A. Groundcover: Mulch shall consist of pine straw mulch unless otherwise noted.
B. Staking: Provide stakes and deadmen if sound of new hardwood, treated softwood, or redwood, free of holes an defects as indicated on Landscape Details.

2.4 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Contractor to provide all top soil needed for landscape planting. Verify suitability of any available topsoil within the site. Topsoil must be clean surface soil, clear of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Supplement with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced form naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
3. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deeply, do not obtain from agricultural land, bogs or marshes.

2.5 LANDSCAPE EDGINGS

A. Aluminum Edging: Standard-profile extruded-aluminum edging. ASTM B 221, alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

1. Edging Size: 3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep
2. Stakes: Aluminum, ASTM B 221, alloy 6061-T6, approximately 1-1/2 inches (38 mm) wide by 12 inches (300 mm) long.
3. Finish: Standard paint

4. Paint Color: Green

B. 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:
C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aluminum Edging;
    a. Cur-Rite Aluminum Edgings;
    b. Permaloc Aluminum Edging;
    c. Russell J. D. Company (The)
    d. Sure-loc Aluminum Edging Corporation

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before planting. Make minor adjustments as required.
D. Lay out exterior plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Soil Preparation: All planting areas shall be treated with "Elanco Trelan" weed killer, according to the manufacturer's specifications.
G. Container Grown Plants: Container Grown Plants shall, when delivered, have sufficient root growth to hold earth intact when removed from container. They shall not be root bound or contain root circling. Containers shall be removed to prevent damage to plant or root system.
H. Pit Sizes: Minimum diameter (width) and depth of all planting pits for balled burlapped, and container grown plants shall be as follows:

1. Diameter (Trees): 2 feet greater than diameter of all spread or roots.
2. Diameter (Shrubs): 1 foot greater than diameter of ball or spread or roots.
3. Depth of Trees and Shrubs: 12 inches greater than depth of ball or roots to provide 12 inches of backfill under the root ball.
4. Dept of Vine and Groundcover: Pits shall be 8 inches greater in depth and width than diameter of root ball.

3.2 PLANTING

A. Loosen subgrade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil mix off-site before spreading.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil mix to a depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil mix.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plant with loose, uniformly fine texture. Roll and rake, remove ridges, land fill depressions to meet finish grades.
C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.
D. Planting Trees and Shrubs: Set container grown stock as specified for balled and burlapped stock, except cut cans on 2 sides with an approved can cutter, remove bottoms of wooden boxes after partial backfilling so as not to damage root balls. Dish top of backfill to allow for mulching.
E. Mulch pits, trenches and planted areas provide not less than following thickness of mulch and work into top of backfill and finish level with adjacent finish grades.
F. Provide 2-inch thickness of mulch.
G. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage. If deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.
H. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character.
I. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
J. Stake trees per plans immediately after planting.
K. Planting Ground cover: Space plants as shown or scheduled. Dig twigs large enough to allow spreading of roots and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
L. Mulch areas between ground cover plants; place not less than 2 inches thick after totally completed.

3.3 EDGING AND INSTALLATION

A. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately 36 inches apart, driven below top elevation of edging.

3.4 MAINTENANCE

A. Begin maintenance immediately after planting. Maintain trees, shrubs, and other plants until final acceptance but in no case less than following period:

30 days after substantial completion of planting (this date must be submitted in writing and approved by the Landscape Architect)

B. Maintain trees, shrubs, and other plants by pruning, cultivating and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damage wrappings. Spray as required keeping trees and shrubs free of insects and disease.

3.5 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, operation by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.5 INSPECTION AND ACCEPTANCE

A. When landscaped work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine acceptability.
B. Landscape work may be inspected for acceptance in parts agreeable to Landscape Architect, provided work offered for inspection is complete, including maintenance.
C. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 02900

SECTION 03100 -CONCRETE FORMWORK

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, but is not limited to, the design, engineering, construction and removal of formwork required for cast-in-place concrete as shown on the drawings and specified herein.

B. Related Sections include, but are not limited to, the following:

1. Division 3 Section "Cast-In-Place Concrete" for finishes.

C. Work Installed and Furnished by Others:

1. Install built-in anchors, inserts, and bolts for connection of other materials; dovetail anchor slots, plates, frames, seats and all other embedded items including Owner furnished items.
2. Coating of forms and other surfaces as required by this Section.

1.3 SUBMITTALS

A. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including others as requested by Architect. Substitutions for specified items or manufacturers are to be submitted in accordance with Division 1 and will be subject to approval, rejection or other appropriate action.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete 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. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:

1. Florida Building Code, 2010 Edition with 2012 Supplement

2. ACI 301, "Specification for Structural Concrete for Buildings."
3. ACI-318, "Building Code Requirements for Reinforced Concrete."
4. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
5. ACI 347, "Recommended Practice for Concrete Formwork."
6. ACI SP-4, "Formwork for Concrete."
7. National Forest Products Association (NFPA), "National Design Specifications for Stress Grade Lumber and its Fastenings."
8. American Plywood Association (APA): "Plywood Design Specification" (Form Y-510); "Concrete Forming: (Form V345) and " Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood" (Form V995).

1.5 JOB CONDITIONS AND COORDINATION OF TRADES

A. General: It is the Contractor's sole responsibility to coordinate with all trades for the setting of sleeves, anchor bolts, dovetail slots, inserts, frames, flashing, pipes, ducts and other embedded items and provide all openings required for installation of other work in accordance with the Contractor's shop drawings and the Contract Documents.

B. Structural Integrity: Provide no sleeves or openings in structural members unless shown on the structural drawings or approved by the Architect.

C. Inspection: Architect may inspect formwork at any time and may reject formwork if forms do not conform to the lines, levels, and tolerances as required in this Section, the shop drawings or the Design Drawings. If formwork is rejected, the Contractor must repair or replace the rejected portion with no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS

A. 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.

B. 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, minimum 5/8" thickness, suitable for concrete forms, complying with VPS PS 1 (Form V995), and as follows:

    a. High-density overlay, Class 1, or better for concrete columns
    b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed. For other exposed concrete.

c. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed. For concealed concrete.

C. Stable Soil: In the event stable soil is encountered and straight-line embankments can be maintained, concrete foundations may be placed into accurately excavated earth trenches, free from water, debris, or loose dirt. Excavations shall be minimum 2" wider and longer than specified.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch.

E. 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. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 1/2 inches to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 1/4 inches in diameter in concrete surface.

G. Accessories: Provide necessary anchors, form ties, shores, construction joints, scaffolds, and bracing as required to install forms. Provide construction joints, control joints, and expansion joints where indicated on the drawings.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 347, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch: Surfaces prominently exposed to public view.
2. Class B, 1/4 inch: Coarse-textured concrete intended to receive plaster.
3. Class C, 1/2 inch: Other permanently exposed surfaces.
4. Class D, 1 inch: Permanently concealed 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. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal. 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. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Set anchor rods to required tolerance.

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 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil and rocks and compact to specified density prior to placing reinforcing or concrete. Moisten sides and bottom immediately prior to concrete placement. Comply with OSHA's "Trench Safety Act".

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 degrees F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the strength and age listed in the Structural Notes.

C. 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. The Architect's approval is required for reusing forms for exposed surfaces. Apply new form-release agent.

D. Reuse forms to greatest extent possible without damaging structural integrity of concrete and without damaging aesthetics of exposed concrete. 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.

END OF SECTION 03100

SECTION 03200 – CONCRETE REINFORCEMENT

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, but is not limited to, concrete reinforcement, and necessary accessories.

1.3 SUBMITTALS

A. Do not reproduce Structural Drawings for use as shop or placement drawings without prior approval of the Architect.

B. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including others as requested by Architect. Indicate manufacturing process used for steel reinforcing. Substitutions for specified items or manufacturers are to be submitted in accordance with Division 1 and will be subject to approval, rejection or other appropriate action.

C. Steel Reinforcement Shop Drawings: Complete details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement" and ACI SP-66 "Detailing Manual". Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement.

D. Material Certificates: Signed by manufacturers and contractor certifying that the steel reinforcement and reinforcement accessories comply with requirements of the Contract Documents. Unidentifiable steel is prohibited.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete 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. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:

1. Florida Building Code, 2010 Edition with 2012 Supplement.
2. ACI 301, "Specification for Structural Concrete for Buildings."
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
4. ACI 315, "Details and Detailing of Concrete Reinforcement."
5. ACI-318, "Building Code Requirements for Reinforced Concrete."
6. "CRSI Manual of Standard Practice."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Deliver reinforcement to the job site bundled, tagged and marked. Use durable metal or embossed plastic tags indicating bar size, lengths, and reference information corresponding to markings shown on placement drawings.

1.6 ENVIRONMENTAL OBJECTIVES

A. Manufacturer/Fabricator to supply documentation of level of compliance or non-compliance with the following requirements before consideration as an "Acceptable Manufacturer".

1. All steel reinforcing shall use steel made in an electric arc furnace (EAF).

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets. Rolls are not acceptable.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
2. For welded wire fabric in slabs on grade use precast slab bolsters, concrete brick or sand plate chairs spaced no farther than 3'-0" c/c.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

B. Shop bend and fabricate reinforcing bars to conform with shapes and dimensions indicated on drawings. In case of errors, do not bend or straighten reinforcement without prior approval of Architect. Make all bends cold.

PART 3 - EXECUTION

3.1 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.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover specified on the drawings. Tie bars and bar supports together with 16 gauge wire and set wire ties with ends directed into concrete, not toward exposed concrete surfaces. Do not tack weld crossing reinforcing bars.

D. Splices: Locate only where indicated on the drawings or approved shop drawings except with prior approval of Architect.

1. For standard splices, lap ends, placing bars in contact, and tightly wire tie. See drawings for lap lengths.
2. Do not weld splices.

E. Provide template for all column dowels.

F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging (3'-0"o.c. max.). Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with 16 gauge wire.

G. Do not bend bars embedded in hardened or partially hardened concrete without approval from the Architect.

H. Do not weld reinforcing bars unless specifically shown. Where shown comply with AWS D1.4. Bars to be welded shall conform to ASTM A706.

END OF SECTION 03200

SECTION 03300 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not necessarily limited to, concrete, concrete materials, mix design, placement procedures, curing and finishes.

B. Related Sections include, but are not necessarily limited to, the following:

1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
2. Division 3 Section “Concrete Formwork”.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

A. Product Data: Submit, for record only, not for approval, data for each type of product and material indicated including admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by Architect. Substitutions for specified items or manufacturers are to be submitted in accordance with Division 1 and will be subject to approval, rejection or other appropriate action.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Substantiating data to be no older than one year from date of submittal for each mix design.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Material Certificates: Signed by manufacturers and contractor certifying that each of the following items complies with requirements of the Contract Documents:

1. Cementitious materials and aggregates.

2. Admixtures.
3. Floor and slab treatments.
4. Curing materials.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Repair materials.
9. Epoxy joint filler.
10. Joint filler strips.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete 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. Submit written evidence of at least ten such projects.

1. Submit written evidence that flatwork placer/finisher has not less than (3) years continuous experience and a minimum of (5) projects in the successful placement and finishing of concrete slabs with flatness and levelness requirements equal to or higher than those specified for this project. Submit evidence that flat work finishers are ACI certified.

B. Manufacturer Qualifications: A firm experienced in the successful manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production and delivery, facilities and equipment.

C. Source Limitations: For each placement, obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

D. Codes and Standards: Comply with the following, unless more stringent provisions are indicated:

1. Florida Building Code, 2010 Edition with 2012 Supplement.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
4. ACI 211.2 "Standard Practice for Selecting Proportions for Structural Lightweight Concrete."
5. ACI 301, "Specification for Structural Concrete for Buildings."
6. ACI-304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
7. ACI-305, "Hot Weather Concreting."
8. ACI-306, "Recommended Practice for Cold Weather Concreting."
9. ACI-308, "Recommended Practice for Curing Concrete."

10. ACI-309, "Recommended Practice for Consolidation."
11. ACI-311, "Guide for Concrete Inspection."
12. ACI-318, "Building Code Requirements for Reinforced Concrete."

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement:

1. General: ASTM C 150, Type I.
2. Slabs on Grade: Type I or Type II with a C3A content less than 8%.

B. Other Cementitious Materials: Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Pozzolans:

1. Fly Ash: ASTM C 618, Class C or F.

D. Normal-Weight Aggregate:

1. Fine Aggregate: Natural quartz sand or manufactured sand from local stone aggregates conforming to ASTM C33, produced from FDOT approved sources, with fineness modulus not less than 2.4, and having a proven service record.
2. Coarse Aggregate: Clean, washed, sound, crushed natural stone products produced from FDOT approved sources. Free from salt, clay, mud, loam or other foreign matter. Conform to ASTM C33; sizes No. 67 (3/4 inch) or No. 57 (1 inch), No. 8 or No. 89 (3/8 inch), and No. 467 (1 1/2 inch). Use largest size practical for members being cast..
3. Class: Negligible weathering region, class per ASTM C33.

E. Water: Potable and complying with ASTM C 94.

2.2 CONCRETE ADMIXTURES

A. General: Provide admixtures produced by acceptable manufacturers and used in compliance with the manufacturer's printed directions. Use only admixtures which have been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by the Architect. Do not use admixtures which increase the shrinkage properties of concrete. Submit substantiating data, if requested.

B. Air-entraining admixture: Conform to ASTM C260. Use air-entraining admixture in all concrete except in concrete having a design strength greater than 4000 psi.

C. Water-reducing admixture: Conform to ASTM C494, Type A, D or E free of chlorides, fluorides, or nitrates, except for those attributable to the water used in manufacturing. Use in all structural concrete.

D. High Range Water Reducing Admixture: Conform to ASTM C494, Type F or Type G and ASTM C1017. Formulate HRWR from sulfonated melamine formaldehyde condensates or sulfonated naphthalene formaldehyde condensate or carboxylated polyether. The admixture is to be added to the concrete mix after initial mixing has taken place. If added at the batch plant HRWR to have an effective life without redosing (third generation HRWR) of at least 2 Hours. If added at the jobsite, the addition shall be by certified technicians employed by the concrete supplier or an authorized representative of the admixture manufacturer. This admixture is in addition to and not a substitute for any other admixtures specified elsewhere.

E. Calcium Chloride: Do not use calcium chloride in concrete. Do not use any admixtures which contribute free chloride ions to the concrete mix.

2.3 VAPOR RETARDERS

A. Vapor Retarder: Polyethylene sheet, ASTM E 1745, Class B, not less than 10 mils thick.

2.4 CURING MATERIALS

A. Liquid Membrane Curing Compound: A dissipating resin type compound, conforming to ASTM C309, Type 1 or 2. The film must chemically break down in a 4 to 6 week period after application.

B. Liquid Membrane-Forming Cure and Seal Compound: VOC Compliant, conforming to ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Class A or B. The compound shall be a clear styrene acrylate type, 25% solids content minimum, and have test data from an independent testing laboratory indicating to a maximum moisture loss of .040 grams per square cm. When applied at a coverage rate of 200 sq. ft. per gallon.

C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Liquid Membrane Curing Compounds Dissipating Type:
   a. Aqua Kure-Clear; Lambert Corp.
   b. Resin Cure-E; Nox-crete, Inc.
   c. Kurez D.R. V ox; Euclid Chemical Company
   d. Res X-Cure WB; Burke
   e. 1100 Clear; W.R. Meadows, Inc.
   f. Day Chem Rez Cure (J-11-W) ; Dayton Superior Corporation
   g. L&M Cure R ; L&M Construction Chemicals, Inc.
2. Liquid Membrane-Forming Cure and Seal Compound:

a. Kure 1315; Sonneborn Building Products
b. Day-Chem Cure & Seal 1315; Dayton Superior Corporation
c. Super Aqua-Cure VOX or Super Diamond Clear VOX; Euclid Chemical Company
d. Crystal Gard 0800; Lambert Corp.
e. Cure & Seal 250E; Nox-crete, Inc.
f. Spartan Cote 30%; Burke
g. Dress & Seal 25; L&M Construction Chemicals
h. CS 309-25 or VOCOMP-25; W.R. Meadows, Inc.

2.5 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to the following:

1. Acrylbond; Lambert Corp.
2. J-40 Bonding Agent; Dayton Superior Corp.
3. Admix 101; Larsen Products
4. Acryl-60; Std. Drywall
5. AcrylSet; Master Builders
6. Sonocrete; Sonneborn-Contech
7. SBR Latex; Euclid Chemical Co.
8. Sika Latex; Sika Corp.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component, 100% solid, epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements. Use Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to the following:

1. Epiweld 58; Lambert Corp.
2. Epoxtite; A.C. Horn
3. Sikadur Hi-Mod; Sika Chemical Corp.
4. Euco Epoxy 452; Euclid Chemical Co.
5. Concresive LPL; Master Builders
6. Nitrobond Epoxy; Fosroc

2.6 CEMENT GROUT AND DRYPACK

A. Prepackaged Non-Shrink Non-Metallic Non-Gaseous Grout: ASTM C 1107, Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds. Grout shall be bleed free and attain 7500 psi compressive strength in 28 days at fluid consistency. Use for structural repairs.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Masterflow 928; Master Builders
   b. Crystex; L & M Construction Chemicals
   c. Five Star Fluid Grout 100; U.S. Grout
   d. Euco N-S; Euclid Chemical Co.
   e. Sikagrout; Sika Corp.
   f. Conbextra HF; Fosroc
   g. Vibropruf #20; Lambert Corp.

B. Cement Grout: Mix one part Portland cement, 2-1/2 parts fine aggregate, and enough water and liquid bonding agent in a 50/50 mix for required consistency depending on use. Consistency may range from mortar consistency to a mixture that will flow under its own weight. Use for leveling, preparing setting pads of beds, for filling non-structural voids, and similar uses. Do not use for grouting under bearing plates or structural members in place.

C. Drypack: Mix one part Portland cement, 2 parts fine aggregate, and enough water and liquid bonding agent in a 50/50 mix to hydrate cement and provide a mixture that can be molded with hands into a stable ball (a stiff mix). Do not mix more than can be used in 30 minutes. Use for patching tie holes and large surface defects in concrete.

2.7 SLAB 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. For use on slabs not receiving finishes.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch. For use on slabs not receiving finishes.

1. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
   a. Levelayer III; Daytonn Superior
   b. Levelex HS ; L&M Construction
   c. Certi-Vex SLU TC ; Vexcon.
   d. Mastertop 112 Topping; Master Builders.
   e. Quikrete Self-Leveling Floor Resurfacer Fast-Set; Quikcrete.

2.8 CONCRETE MIXES

A. Concrete for all parts of the concrete work shall be homogenous and, when hardened, possess the required strength, durability, watertightness, appearance, resistance to deterioration and abrasion, and other qualities as specified or required.

B. Mix proportioning: Proportion concrete according to ACI 211.1. Trial mixes shall be designed by the testing laboratory approved by Architect or designed by the producer and witnessed and tested by the testing laboratory, in accordance with ACI 318 Chapter 5.3. Proportioning on the basis of field experience with complete statistical data, not more than one year old from date of submittal, to confirm mixes is acceptable.

C. Provide concrete which will develop ultimate compressive strength at 28 days equal to that noted on drawings and listed below.

D. Concrete Grades:

Mix No.	Strength	Air Yes/No	Max. Aggregate Size	W/C or W/C&P*
1	3000	Y	1"	0.64
2	3000	N	1"	0.64
3	4000	N	1"	0.54
4	4000	N	3/8"	0.52

E. Concrete Use:

Element	Mix No.
1. Footings and Pile Caps	2
2. Grade Beams / Wall Footings	2
3. Slab on Grade	1
4. Columns and Poured Walls	3
5. Pumped Elements, Tie Beams, Tie Columns	4
6. Slabs on Steel Deck	3

F. Design Slump:

1. General: 4 inches.
2. Concrete Containing High Range Water Reducer: 2 to 3 inches before addition of HRWR, 8 inches after.
3. Slump Tolerance: Plus/minus 1 inch.
4. Slump Of Corrosion Inhibited Concrete: 7 ±2, inch with the use of HRWR.

G. Chloride Ion Content for Corrosion Protection: Determine the chloride content of the component concrete materials, excluding admixtures, and provide this information to the Architect when submitting mix design. Design mixes will not be approved when the sum of chloride content of component materials indicates that the concrete mix

derived from those materials will have a water soluble chloride ion content exceeding 0.1% for concrete exposed to the elements and 0.2% for concrete protected from the elements, when percent is determined by weight of cement. When the source of any component material for the concrete is changed or when the design mix is altered, a chloride content determination test shall be made immediately. Resubmit the altered design mix for approval by the Architect.

H. Cementitious Materials: Minimum Portland cement content of any concrete mix is 423 lbs.

1. Provide concrete mixes having a fly ash content of 15% to 20%, by weight, of cementitious material.

I. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 3 to 5 percent. Except for concrete exposed to freezing temperatures, do not use air-entraining admixture for interior slabs to receive a hard trowel finish, unless otherwise indicated.

J. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.. Concrete shall meet the toughness requirements of ASTM 1018.

K. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in all structural concrete.
2. Use high range water-reducing admixture in pumped concrete, walls 8" thick and less, at areas of reinforcing steel congestion, and as required for placement and workability, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.40.

L. Adjustment to Concrete Mixes: Mix design adjustments may be requested by contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94.

B. Mixing and Delivery Time: When air temperature is between 95 and 100 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 100 degrees F, reduce mixing and delivery time to 60 minutes.

1. Concrete Containing Corrosion Inhibitor: Reduce mixing and delivery time to one hour.

C. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type and number, batch time, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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 bolts, accurately located, to elevations required.
2. Install dovetail anchor slots in concrete structures as indicated.
3. Do not provide sleeves or openings in structural members unless shown on the structural drawings or approved by the Architect.

3.2 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to manufacturer's written instructions. Use below interior floor slabs only.

3.3 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. Provide dowels as shown on drawings or as required by Architect. Do not continue reinforcement through sides of strip placements of slabs.
2. For members 5" thick or more, form keys from preformed galvanized steel, plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete. Submit detail to Architect for review.
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. Allow 4 hours (minimum)

between when column or wall is cast and when concrete supported by column or wall is cast.

5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces. In beams and girders use epoxy-bonding adhesive at locations when 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 on drawings. If requested, the contractor shall prepare and submit to the Architect a joint layout. Construct contraction joints as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades using the "Soff-Cut" early entry dry-cut saws. Cut 1/8 inch wide and 1 inch deep joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. This is usually within 2 hours of final finish at each control joint but not more than 8 hours after completion of concrete pour.

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. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Coordinate construction and control joints with requirements of finish material joints.

3.4 CONCRETE PLACEMENT

A. Complete the following before placing concrete:

1. Excavate and compact subgrade, arrange for compaction testing, place vapor barrier and remove excess water.
2. Secure all formwork. Verify that shoring and reshoring has been inspected and accepted by Delegated Engineer. Moisten wood forms except where form coatings are used.
3. Accurately locate all steel reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, expansion joint materials and other embedded items and secure against shifting during concrete placement or consolidation.
4. Cooperate with other trades and verify that their work is installed.
5. Notify testing agency to test concrete.
6. Ensure that all required inspections are performed.

B. Comply with ACI 301, ACI 304, ACI 308 and ACI 318.

C. Jobsite Tempering: Place concrete within 1-1/2 hours after introduction of water to mix. Submit time stamped batching tickets upon delivery of concrete to job site.

1. Do not add water to ready-mix concrete except as provided in ASTM C 94, Paragraph 11.7. When so allowed, limit addition of water to maximum of one (1) gallon per cubic yard. Addition of water may only be authorized by Architect, the concrete producer's quality control representative, a preapproved representative of Contractor, or the Special Inspector.
2. Concrete produced with high range water reducer may only be tempered with additional high range water reducer.

D. Deposit concrete continuously or in 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 specified. Deposit concrete to avoid segregation.

1. Maximum height of concrete free fall is 4 feet. Columns up to 8 feet in height may be poured in one lift. Concrete in columns and walls over 8 feet may be poured full height with the use of drop chutes or tremies or up to a maximum of 16 feet if HRWR admix concrete is used.

E. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators 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 mix constituents to segregate.
3. Concrete in columns and walls shall be cast at least twenty four (24) hours before horizontal members they support are cast. Exception: Tie columns concrete and grout in masonry cells shall be cast at least four (4) hours before beams cast on top of masonry.

F. Deposit and consolidate concrete for 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, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Pumping: Slumps in excess of six (6) inches at the pump will not be permitted except for concrete produced with HRWR. If placing by means of pump, a specifically designed concrete mix shall be submitted to the Architect for review. No pumps smaller than 4 inches will be permitted. Exception: A 3" pump may be used for 8" wide beams and columns cast on top of or between masonry walls or for filling masonry cells.

H. 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. Cold weather is defined as a period when, for more than three (3) consecutive days, the average daily air temperature is less than 40 degrees F and the air temperature is not greater than 50 degrees F for more than 1/2 of any 24-hour period. The average daily air temperature is the average of the highest and lowest temperatures occurring during the period from Midnight to Midnight.

1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F at point of placement.
2. Provide protected and heated environments for onsite storage of test cylinders.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.
5. Temporary heat devices shall be operated with special care to protect against concentrations of heat, or direct contact with combustion gases. All surfaces within the enclosure shall be kept wet for curing.

I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, except concrete temperature shall not exceed 100 degrees F:

1. Cool ingredients before mixing to maintain concrete temperature below 100 degrees F at time of placement.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
4. Use Type D water reducing admixtures when ambient temperature exceeds 90 degrees F or other adverse placing conditions exist.

J. Do not place concrete in exposed conditions when it is raining unless adequate protection is provided.

3.5 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/4" rubbed down or chipped off. Use for concrete surfaces not exposed to view in the finished work.

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 defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or staining.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete:

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.

3.6 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Slope surfaces to drains.

B. Trowel Finish: After applying float finish, apply first trowel finish 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 to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system

C. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and 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.

E. Floor Flatness and Levelness: Finish surfaces to the following tolerances according to ASTM E 1155 for a randomly trafficked floor surface and measured within 72 hours and before supporting formwork or shoring is removed:

1. Carpeted Slabs: Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.
2. Thin or No Floor Covering: Specified overall values of flatness, F(F) 30; and levelness, F(L) 20; with minimum local values of flatness, F(F) 20; and levelness, F(L) 17; for suspended slabs.
3. Specified overall values of flatness, F(F) 40; and levelness, F(L) 30; with minimum local values of flatness, F(F) 25; and levelness, F(L) 22.

F. Floor Flatness and Levelness Acceptance: The Architect may authorize the testing agency to verify that the specified F(F) and F(L) numbers have been achieved for any slab pours except for unshored or sloped construction. Slabs that do not meet the specified F(F) or F(L) numbers shall be removed and replaced. Alternatively, the Contractor may propose repairs to the slab or a credit to the Project.

3.7 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete 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 of manufacturer furnishing machines and equipment.

D. Base Plates and Foundations: Grout using specified non-shrink, non-metallic grout. Where applicable, grout at least 3 days prior to casting concrete on supported structure.

3.8 CONCRETE PROTECTION AND CURING

A. General: Comply with ACI 308 "Recommended Practice for Curing Concrete" and ACI 301. Protect freshly placed concrete from premature drying and excessive cold or

hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the methods listed under C. Unformed Surfaces:

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Curing Compound: Apply to all concrete surfaces that are not permanently exposed. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Provide a second coat applied at 90 degrees to initial application within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Curing and Sealing Compound: Apply to permanently exposed concrete surfaces. Apply uniformly 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.

3.9 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. 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 but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. If reinforcing steel is exposed, remove concrete to provide a minimum of 3/4" clearance all around. Prior to patching allow the Architect and Threshold Inspector adequate time to review prepared areas. Clean, dampen with water, and brush-coat prepared surfaces with bonding agent or slurry coat. Fill and compact with dry pack grout or non-shrink non-metallic grout before bonding agent has dried. Fill form-tie voids with cement grout, dry pack grout 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.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as 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 square cuts and expose steel reinforcement with at least 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 mix 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 dry pack grout or non-shrink non-metallic grout. 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.

D. Perform structural repairs of concrete, not covered herein, only with Architect's and Structural Engineer's approval, using repair procedures they recommend.

E. Other repair materials and installation not specified above may be used, subject to Architect's approval.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Sample concrete after all water and admixtures have been added. Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day. For slabs 6" or thinner, increase frequency to each 50 cu. yd. or fraction thereof of each concrete mix placed each day.
2. Slump: ASTM C 143; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below and when 85 degrees F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample. For pumped concrete, take sample at point of placement.
   a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one specimen at 7 days for information and three at 28 days for acceptance. If one of the first two 28 day tests fall below specified strength, test the remaining specimen at 56 days.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests (3 sets of 2 cylinders each) equals or exceeds specified compressive strength and no compressive-strength test (1 set of 2 cylinders) value falls below specified compressive strength by 10% or 500 psi, whichever is less.

E. Strength tests that are not satisfactory indicate questionable concrete. The testing agency and Contractor shall submit to the Architect a report of the questionable concrete plus the two test reports immediately prior to and after (5 reports total) for evaluation.

1. If the questionable concrete is not accepted by the Architect, the testing agency shall take core tests per ACI 301 and ASTM C42 minimum diameter of cores -4 inches. Concrete will be considered structurally adequate if average of 3 cores is at least 85% f'c and no single core is less than 75% f'c.

2. Concrete not considered adequate by core testing shall be removed and replaced or load tested per ACI 318, Chapter 20.

F. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for each test.

G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

H. The contractor may be required to pay all costs of additional testing or evaluation of questionable concrete and provide a credit to the Owner for acceptance of questionable concrete.

END OF SECTION 03300

SECTION 042000 - UNIT 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. Concrete masonry units.
2. Clay face brick.
3. Building (common) brick.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry-joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Masonry-cell fill.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Steel shelf angles for supporting unit masonry.
4. Cavity wall insulation.

C. Related Requirements:

1. Section 047200 “Cast Stone Masonry” for stone trim units.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 071113 "Bituminous Dampproofing" for water dampproofinmg applied to unit masonry assemblies.
4. Section 072100 "Thermal Insulation" for cavity wall insulation.
5. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
6. Section 097523 "Stone Window Stools" for stone window stools.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection:

1. Clay face brick[, in the form of straps of five or more bricks].

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   b. For exposed brick, include test report for efflorescence according to ASTM C 67.
   c. 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. Joint reinforcement.
7. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar[and grout]. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

D. Cold-Weather[and Hot-Weather] Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects.

1. Build sample panels for typical exterior and interior walls in sizes approximately [60 inches (1500 mm)] long by [48 inches (1200 mm)] high[by full thickness].
2. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
3. Clean[one-half of] exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

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 (600 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 (600 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/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and 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/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, 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.

2.3 CONCRETE MASONRY UNITS

A. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.

2.4 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 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 shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Basis of Design – ACME "Cloister" modular brick
2. Grade: SW.
3. Type: FBS.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20.6 MPa).
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
7. 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.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, 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 shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91/C 91M.

E. Mortar Cement: ASTM C 1329/C 1329M.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

G. Aggregate for Grout: ASTM C 404.

H. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus two side rods at each wythe of masonry 4 inches (100 mm) wide or less.
2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, Type 316.
3. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
   1. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated bent to configuration indicated.

   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

F. Adjustable Masonry-Veneer Anchors:
   1. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel] and stainless-steel wire unless otherwise indicated.
   2. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.

   3. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a gasketed sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch (16 mm) wide by 6 inches (152 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie. Self-adhering, modified bituminous gasket fits behind anchor plate and extends beyond pronged legs.
   4. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) 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.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:
   1. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.

2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
4. Where flashing is fully concealed, use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
1. Solder for Copper: ASTM B 32, Grade Sn50 with maximum lead content of 0.2 percent.
2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8 inch (10-mm) sealant flange at top

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 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 D 226/D 226M, Type I (No. 15 asphalt felt).

D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth

1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Configuration: Provide one of the following:
      a. Strips, not less than 3/4 inch (19 mm) 1-1/2 inches (38 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

2.11 MASONRY-CELL FILL

A. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.13 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.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

   1. For masonry below grade or in contact with earth, use Type M.
   2. For reinforced masonry, use Type M.

3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) 10 to 11 inches (250 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build 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. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. 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 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet ((6 mm in 3 m),) or 1/2-inch (12-mm) maximum.

7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 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 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 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 (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and 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. Set 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.
4. Rake out mortar joints for pointing with sealant.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive dampproofing and cavity wall insulation.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together as follows:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.

3.7 CAVITY WALLS

A. Bond wythes of cavity walls together as follows:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties 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. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire 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 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. (0.25 sq. m) 3.5 sq. ft. (0.33 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

B. Provide not less than 1 inch (25 mm) of airspace between back of masonry veneer and face of sheathing.

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.

3.9 MASONRY-CELL FILL

A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet (6 m).

3.10 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[corners,] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.11 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 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.12 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 using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. 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 (10 mm).

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.13 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.14 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. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to within 1/2 inch (13 mm) of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under water-resistive barrier, lapping at least 4 inches (100 mm). Fasten upper edge of flexible flashing to sheathing through termination bar.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown 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/cavity vent 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 24 inches (600 mm) o.c. unless otherwise indicated.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material.

F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.15 REINFORCED UNIT MASONRY INSTALLATION

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/ACI 530.1/ASCE 6.

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/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.16 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 stone trim to comply with stone supplier's written instructions.

3.17 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 04230 - REINFORCED 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 grouted reinforced masonry consisting of grout and reinforcing steel.

B. Related Sections include the following:

1. Division 3 Section "Concrete Reinforcement" for reinforcing steel.
2. Division 3 Section "Cast-In-Place Concrete" for concrete.
3. Division 4 Section "Unit Masonry Assemblies" for all other elements of masonry construction.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details Reinforcing Steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show bar schedules, bent bar diagrams and other arrangements as required for fabrication and placement. Show elevations of reinforced walls.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

1. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients and design slump.

1.5 QUALITY ASSURANCE

A. Comply with the provisions of the following codes, specifications and standards, unless more stringent requirements are specified or shown on the Drawings. Reference is made to the edition in force at the time these specifications are issued.

1. Florida Building Code, 2010 Edition with 2012 Supplement.
2. ACI 530/ASCE 5 "Building Code Requirements for Concrete Masonry Structures"
3. ACI 530.1/ASCE 6 "Specifications for the Design and Construction of Load Bearing Concrete Masonry"

1.6 PROJECT CONDITIONS

A. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Refer to Division 4 Section "Unit Masonry Assemblies" for masonry materials and accessories and grout materials not included in this section.

B. Concrete Masonry Units: Use special shapes where shown and as required for corners, jambs, sashes, control joints, lintels, bond beams and other special conditions.

2.2 GROUT MATERIALS

A. Aggregate for Grout: ASTM C 404 for fine grout.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60. Shop fabricate bent bars. Joint reinforcing and anchors: ASTM A 153 Class B2, with a coating thickness of 1.50 oz/sf in exterior walls, ASTM A 641 in interior walls. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.

1. Provide units with either two loops or four loops as needed for number of bars indicated.

2.4 GROUT MIXES

A. Grout for Unit Masonry: Comply with ASTM C 476 with a minimum compressive strength of 2500 psi in 28 days.

1. Use fine grout with a slump of 8 to 10 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Refer to Division 4 Section "Unit Masonry Assemblies" for general installation requirements of unit masonry.

B. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction, including the first course of walls where required. Cut units which are not in multiples of 8". Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Allow wet masonry units to dry prior to placement.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602.

3.4 LAYING MASONRY WALLS

A. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern: Lay masonry in one-half running bond with vertical joint in each course centered on units in courses above and below, unless otherwise indicated on Drawings. Interlock each course at corners.

C. Place clean units while the mortar is soft and plastic. Remove and relay in fresh mortar any unit disturbed to the extent that initial bond is broken after initial positioning.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond; do not tooth.

E. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

F. Design, provide and install bracing that will assure stability of masonry during construction. Include provisions to project against wind or other natural or construction forces that might collapse or otherwise damage a partially or completely built masonry wall in a partially completed structure.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course at base of wall and in all courses of piers, columns, and pilasters, and where adjacent to cells to be filled with grout.
3. For starting course at base of wall where cells are not grouted, spread out full mortar bed, including areas under cells.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch. Lap reinforcement 6 inches.

B. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 LINTELS

A. Provide masonry lintels where shown and where openings of more than 24 inches are shown. Reinforce and grout lintels as shown on the Drawings.

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

3. Provide either of above at Contractor's option or provide precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."

B. Install steel lintels where indicated.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Laying Masonry Walls: Construct masonry walls as follows:

1. Lay masonry units to top of grout pour prior to placing grout. Maximum grout pour height is 24' or top of bond beam, whichever is lower.
2. Construct wall such that vertical cells to be grouted are aligned and unobstructed openings for grout are 3"x4" (minimum). Construct grout spaces free of mortar droppings, debris, loose aggregates, and any material deleterious to grout; or, clean the cells prior to grouting. Remove masonry protrusions extending 1/2" or more into cells to be grouted.
3. Do not lay masonry until grouted masonry below is cured.
4. In bond beams, use special units or modify regular units to allow placement of horizontal bars. Place small mesh, expanded metal lath or wire screening in mortar joints under bond beam courses over cells of non-reinforced vertical cells.

B. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make it 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 other temporary loads that may be placed on them during construction.

C. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and as follows:

1. Place reinforcement and accessories as indicated.
2. Support and fasten reinforcement together to prevent displacement by construction loads or by placement of grout.
3. Clean reinforcement by removing mud, oil, or other materials that will reduce the bond at the time grout is placed. Reinforcement with tightly bound rust and/or mill scale is acceptable without cleaning provided the dimensions and weights, including heights of deformations, of the cleaned sample are not reduced.
4. Place all reinforcement prior to grouting. Tie vertical reinforcement to dowels at base of masonry with tie wire and thread masonry units over or around

reinforcement. Support vertical reinforcement at 10'-0" o.c. Extend vertical bars the specified lap length above top of pour and support bar in proper position at top of grout pour. Where vertical bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of bar, pull loops and bar to proper position and tie free ends.

5. Do not bend reinforcement after it is embedded in grout.
6. Splice bars only where indicated. Provide 48 bar diameter lap splices, U.O.N. Place bars in contact and wire tie. Bars spliced by noncontact lap splices shall be spaced 6" apart (maximum).
7. Bar placement tolerance is ±1/2" perpendicular to wall and 2" along wall. The clear distance between parallel bars that are not contact lap spliced shall be not less than 1" in walls and 1 1/2" in columns and pilasters. Maintain 1/4" clear between bars and any face of masonry.

D. Cleanouts: Provide cleanout openings at each vertical bar at the base of walls in which one of the following applies:

1. Grout pour height exceeds 5'.
2. Vertical bars are not otherwise fastened to prevent displacement. In this case, use cleanout to securely tie bar in position.
3. To remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from cell and top of support in cells to be grouted.

Construct cleanout by cutting opening in face shell. Construct cleanouts with openings of sufficient size to permit removal of debris and tying of bars. Minimum size is 3"x3". After cleaning and inspection, close cleanout opening and brace closure to resist grout pressure.

E. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
2. Place grout within 1 1/2 hours from introducing water in the mixture and prior to initial set.
3. Confine grout to the areas indicated.
4. Place grout by pumping into grout spaces unless alternate methods arc acceptable to the Architect.
5. Place grout continuously in lintels and bond beams. Grout walls in lifts not exceeding 5' or the elevation of top of bond beam, whichever is lower.
6. If grout pour during one day exceeds 5', grout in lifts 5' each or less, with not less than 30 minutes and not more than one hour between lifts.
7. Terminate grout 1 1/2" below bond beam course or where cell above is to be grouted.
8. Place grout in bond beam course before filling vertical cores above bond beam.
9. Consolidate grout with mechanical vibrators having a 3/4" diameter head. Grout pours 12" high or less may be puddled in lieu of mechanical vibration.

3.9 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Four grout cubes will be sampled and tested for compressive strength per ASTM C 1019 for each 5000 $ft.^2$ of wall surface.

END OF SECTION

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. Window sills.
b. Belt courses.

B. Related Sections:
1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.

D. Full-Size Samples: For each shape of cast-stone unit required.

1. Make available for Architect's review at Project site.
2. Approved Samples may be installed in the Work.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by **[the Cast Stone Institute] [the Architectural Precast Association] [or] [the Precast/Prestressed Concrete Institute for Group A, Category AT]**.

1.5 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.

1.6 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

A. General: Comply with ASTM C 1364.

B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.

E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.

G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.

1. Epoxy Coating: ASTM A 775/A 775M.
2. Galvanized Coating: ASTM A 767/A 767M.

H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.3 CAST-STONE UNITS

A. Cast-Stone Units: Comply with ASTM C 1364.

1. Units shall be manufactured using the vibrant dry tamp method.
2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. 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 mm).
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

    a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: Match existing units.

2.4 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

2.5 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M.

B. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 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 the 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 3/8 inch (10 mm) 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.
6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
7. Keep joints at shelf angles open to receive sealant.

E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.

I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."

1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

J. Provide sealant joints at head joints of copings and other horizontal surfaces; at pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8 inch (10 mm).
4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

END OF SECTION 047200

SECTION 05120 - STRUCTURAL STEEL

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. The work specified in this section includes all labor, materials, equipment, permits, and services necessary for the fabrication and erection of structural steel and related work, complete, in accordance with the Drawings and as specified herein, including the detailing of all connections.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on Drawings.

1.3 RELATED SECTIONS SPECIFIED ELSEWHERE

A. Division 3 Section "Cast-In-Place Concrete" for Grouting Base Plates.

B. Division 3 Section "Concrete Formwork" for Placing Anchor Rods.

C. Division 5 Section "Steel Deck."

D. Division 5 Section "Miscellaneous Metal Fabrication."

1.4 RESPONSIBILITIES

A. The Engineer of Record is responsible for the design of the steel framing and connections as presented in the Contract Documents. No changes to the requirements of the Contract Documents will be considered without complying with the applicable requirements for substitutions. This includes, but is not limited to, connection details, member sizes or steel grades.

B. The fabricator is responsible for the preparation of Shop and Erection Drawings pursuant to the requirements of the Contract Documents. The fabricator shall, where necessary, complete the details presented on the Contract Documents and adapt those details to accommodate the atypical conditions. These drawings do not require his signature and seal. Acceptance of the Shop and Erection Drawings by the Architect/Engineer does not relieve the fabricator of the responsibility for accuracy of

detail dimensions on the shop drawings and the general fit-up of parts to be assembled in the field.

C. The fabricator is responsible for the design and detailing of all substitutions, which shall be prepared by or under the direct supervision and control of a Delegated Engineer as defined in the Contract Documents.

D. The fabricator is responsible for the coordination of all surveyed field conditions and field measurements necessary for the detailing, fabrication and erection of their work. All field measurements shall be provided on the shop drawings prior to submittal.

E. The Engineer of Record is responsible for the structural adequacy of the structure in the completed project. The erector is responsible for the means, methods and safety of the erection, including all temporary guys, beams, falsework, cribbing or other elements required for the erection operation. If the erector is unsure of these requirements, he shall retain a Florida Licensed Engineer to determine and design all temporary requirements.

1.5 SUBMITTALS

A. Submit in accordance with conditions of Contract and Division 1 Specification Sections.

B. Qualifications: Include lists of Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Product Data for each type of product specified, including the following:

1. Bolts, nuts, and washers, including mechanical properties.
2. Direct-tension indicators.
3. Shear stud connectors.
4. Structural steel coatings.

D. Fabricator's certification that the chemical and physical properties of the following materials comply with the Project requirements:

1. Structural steel
2. Bolts, nuts and washers.
3. Direct-tension indicators.
4. Shear studs.
5. Welding electrodes.

E. Welder's certification. Submit to Owner's inspection agency.

F. The fabricator shall submit details and complete calculations that clearly identify proposed substitutions for Engineer's review prior to preparation of detailed shop

drawings. Proposed variations to details shown on the Contract Drawings will be considered and such variations must have preliminary acceptance prior to the preparation of detailed shop drawings. The details and calculations shall clearly show the capacity of the connections designed by the fabricator. The calculations shall show details of the assembled joint with all bolts and welds required. All design calculations, drawings and details shall be signed, sealed and dated by the Delegated Engineer.

G. Submit to the Architect for acceptance shop and erection drawings. See "Shop Drawings and Other Submittals" notes regarding the possible reproduction of Structural Drawings for use as shop or erection drawings. Drawings shall include complete details, dimensions, schedules and procedures for the fabrication, assembly, and sequence of erection.

1. Include details of cuts, connections, camber, holes, threaded fasteners and other pertinent data. Indicate welds by standard AWS A2.4 symbols and show size, length, and type of each weld. Show shop welds on shop drawings and field welds on erection drawings.
2. Provide setting drawings, templates, and directions for installation of anchor rods, embeds and other anchorages to be installed by others.
3. Indicate surface preparation, such as primed, galvanized, etc., of each surface of each piece.

H. Fabricator's shop inspection and test reports.

1.6 CODES AND STANDARDS

A. Florida Building Code, 2010 Edition with 2012 Supplement.

B. AISC "Code of Standard Practice for Steel Buildings and Bridges".

1. Paragraph 4.4. "Approval" is modified such that the Structural Engineer will return submittals to the Architect within ten working days from time of receipt.

C. AISC "Specifications for Structural Steel Buildings", including Commentary and Supplements thereto as issued.

D. AISC "Specifications for Structural Joints using ASTM A 325 or A490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

E. AWS D1.1 "Structural Welding Code".

F. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

G. S.S.P.C. Society for Protective Coatings.

H. Occupational Safety and Health Act (OSHA), as amended to date.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator shall have a minimum five years of documented successful experience on equivalent projects. Submit copy of résumé demonstrating equivalent project experience.

B. Erector Qualifications: Erector shall have a minimum five years of documented successful experience on equivalent projects. Submit copy of résumé demonstrating equivalent project experience.

C. Qualifications for welding work: Qualify welding procedures and operators in accordance with AWS "Standard Qualification Procedure".

1. The Fabricator for shop welds and the Erector for field welds shall retain a _____ Licensed Engineer, who specializes in the design of weldments to prepare a written welding program pursuant to the requirements of ANSI/AWS D1.1. The program shall include all necessary Welding Procedure Specifications (WPS), all necessary requirements for qualification testing of WPS and welding personnel. The WPS shall include the welding process, sequence of assembly, preheat, interpass and postheat requirements. Welded joints of heavy sections and plates 2 inch thick and greater shall be detailed to limit the amount of weld metal. Double bevels shall be used in lieu of single bevels. Welding shall start at the most restrained part of the weldment and proceed to the least restrained.
2. The Fabricator and Erector, as applicable, shall conduct all necessary tests required by ANSI/AWS D1.1 to qualify the WPS.
3. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests for the welding process and position used and have been continuously employed as a welder since certification. If recertification of welders is required, retesting will be Contractor's responsibility.

D. The Fabricator shall ultrasonically inspect for laminations all joints where material is subjected to tension in the though thickness direction. Ultrasonic inspection shall extend for a distance of six times the material thickness subject to the through thickness tension, either side of the element delivering the tension.

E. Stud Application Qualification Test:

1. Prior to erection, conduct stud application qualification tests in accordance with AWS D1.1 Chapter 7.6 and Annex IX. The tests are the responsibility of the Contractor or stud applicator.
2. Prepare specimen plates of A992 steel, minimum 1/2 inch thick, with an SP-6 surface preparation.
3. Weld a minimum of ten (10) studs through steel deck to the prepared plate(s). The studs and steel deck shall be of the same type as specified for use in the project. Test the studs by the bend test specified in AWS 7.6.6 or Annex IX.
4. If the tests are conducted by other than the Owner's testing agency, that agency shall be properly notified so that they may be present to witness the entire test procedure.

F. The Fabricator shall provide a system of quality control, including shop welding inspections and testing, to ensure that the minimum standards specified herein are attained. Submit to Owner, Architect, Engineer and Owner's Testing and Inspection Agency complete details of the quality control program to be used and all testing and inspection reports. Visually inspect 100% of shop welds. Also, as a minimum, perform non-destructive tests of welds in conformance with AWS D1.1 as follows:

1. Splices: 100%.
2. Full penetration welds: 100% of cantilevered members, 50% for all others.
3. Partial penetration welds: 25%.
4. Fillet welds: 10%.

G. The fabricator may use the following examination methods, in descending order of importance. When a particular examination method for a joint is unfeasible, the highest order method that is practicable shall be used. Standard of acceptance shall be in accordance with AWS D1.1.

1. Ultrasonic Method: In accordance with AWS D1.1.
2. Radiographic Method: In accordance with ASTM E 94 and ASTM E 142, with a minimum quality level of "2-2T". This procedure is limited to the inspection of groove welds in butt joints only and is not to be used for fillet welds.
3. Magnetic Particle Method: In accordance with ASTM E109. Use for examining partial penetration welds. Percentage of examinations is defined elsewhere in these specifications. The Yoke method may be used only for supplementary surface examination.
4. Dye Penetrant Examination Method: In accordance with ASTM E165.

H. Cleaning and lubrication of ASTM F1852 twist-off-type tension-control bolt assemblies is not permitted.

I. Turn-of-nut method of bolt tightening is not acceptable.

J. Preconstruction Meeting: There shall be a Preconstruction Meeting with the Owner, Architect, Structural Engineer, Contractor, Fabricator, Erector, Testing Laboratory and Special Inspector to clarify responsibilities and requirements as set forth in the Contract Documents.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work

B. Deliver anchor rods and anchorage devices which are to be embedded in cast-in-place concrete or masonry in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using plates, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store fasteners components in sealed containers until ready to use. Reseal open containers to prevent contamination by moisture or other deleterious substances. Store closed containers in a protective shelter to protect fasteners from dirt and moisture. Only as many fastener components as are anticipated to be installed during the work shift shall be taken from protective storage. Fastener components that are not incorporated into the work shall be returned to protective storage at the end of the work shift. Fasteners from open containers and fasteners that accumulate rust or dirt shall not be used and shall be immediately and permanently removed from the project site.

E. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural steel rolled M, S, C and MC shapes and Angles: ASTM A 36, Fy=36 ksi.

B. Structural steel plates and bars: ASTM A 36, Fy=36 ksi.

1. All steel plates exceeding 2" in thickness shall conform to the requirements of ASTM A435, "Straight-Beam Ultrasonic Examination of Steel Plates", to assure delivery of steel plates free of gross internal discontinuities such as pipe, ruptures, or laminations. Plates shall be identified by stamping or stenciling "UT 435" adjacent to marking required by the material specification. The Fabricator shall submit to the Architect evidence of compliance by the mill with this requirement.

C. Unfinished threaded fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.

1. Provide square head and nuts.

D. High-strength threaded fasteners: Heavy-hex structural bolts, heavy-hex nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325 or A490.

E. Bolt Lubrication: All bolts shall be well lubricated at time of installation, dry, rusty bolts will not be allowed. Bolts or nuts shall be wax dipped by the bolt supplier or "Johnson's Stick Wax 140" shall be used with all bolts in the shop or field. Cleaning and lubrication of ASTM 1852 twist-off type tension-control bolts is not permitted.

F. Electrodes for welding: Comply with AWS D1.1-98, Table 3.1.

1. For complete-joint penetration groove welds, weld metal shall have a charpy V-notch impact strength of 20 ft./lbs. –20°F.

G. Structural steel primer paint: SSPC – Paint 11 lead and chromate free, V.O.C. complaint, minimum solids 55% by volume. Use for steel not receiving special coatings or fireproofing. Refer to Architectural Drawings and Division 9.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Steel spec Heavy Duty Primer; Sherwin Williams.
   b. Tnemec – Series 10; Tnemec.
   c. Primatite; Devoe.
2. Provide shop primer and shop applied top coat paint in accordance with Division 9 Section "Special Coatings" where shown on the Architectural Drawings.
3. Steel permanently exposed to the elements that does not receive a coating, such as cooling tower supports, shall be hot dip galvanized.

H. Non-metallic shrinkage-resistant grout: Provide in accordance with Section 03300.

2.2 FABRICATION

A. Shop fabrication and assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

C. Where finishing is required, complete the assembly, including welding before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

D. Camber: Camber of structural steel members is indicated on the drawings.

1. Where possible, camber of beams shall be applied by a cold bend process. The local application of heat may be used to introduce or correct camber, curvature, or straightness, provided the temperature of the heated area, as measured by temperature crayons or other approved means, does not exceed 1200 F.
2. Where indicated on the Drawings in a camber diagram, cantilever or double cantilever beams shall be cambered for the main span and cantilever end separately, either by a staged cold bending process or by the application of heat.
3. Cambers indicated on the drawings are intended to be final cambers at time of erection. The fabricator shall account for camber loss in the initial camber operations and during transportation of material to the site.
4. Beams and trusses detailed without specified camber shall be fabricated so that after erection any natural camber due to rolling or shop fabrication is upward.
5. Specified camber for beams at time of erection shall be within a tolerance of minus zero to plus one-eighth inch for each ten feet of member length.
6. Specified camber for trusses shall be built into the fabrication process with a tolerance of minus zero to plus 10% of the specified camber.

E. Splices in Structural Steel: Splicing of structural steel members in the shop or the field is prohibited without prior approval of the Architect. Any member having a splice not shown and detailed on approved shop drawings will be rejected.

F. Connections:

1. Weld shop connections, as indicated.
2. Bolt field connections, except where welded connections are indicated.
3. Provide high-strength, threaded fasteners except for temporary bracing to facilitate erection or otherwise indicated.

G. High-strength bolted construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCSC June 30, 2004).

H. Welded construction: Comply with AWS D1.1 for procedures, appearance and quality of welds, and method used in correcting welding work.

I. Holes for other work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

J. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

K. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes, or enlarge holes by burning. Drill holes in bearing plates.

L. Provide weep hole in any confined steel surface capable of retaining water during erection or service. Seal weld as required to prevent migration of water into confined region.

2.3 SHOP PAINTING

A. Surface preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with SSPC: the Society for Protective Coatings. Use SSPC-SP 6, "Commercial Blast Cleaning" for steel to be painted or receive a coating and SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning" for all other conditions.

B. Priming: Unless specified otherwise in Division 9 "Special Coatings" comply with the following: Immediately after surface preparation, apply VOC compliant structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 2.5 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces. Refer to Division 9 Section "Special Coatings" for priming and painting of members to receive coatings.

Shop prime structural steel, except do not prime:

1. Members or portions of members to be embedded in concrete or mortar. Prime embedded steel that is partially exposed on exposed portions and initial 2" of embedded areas only.
2. Surfaces that are scheduled to receive sprayed-on fireproofing.
3. Members that are to be hot dip galvanized.
4. Surfaces within 2" of welds.
5. The faying surfaces of slip-critical bolted connections. The exception is for members that receive a coating system. There the faying surfaces should receive a primer providing a Class A surface, with a slip coefficient of 0.33. Submit substantiating data in conformance with Appendix A of the AISC "Specification for Structural Joints".
6. Mask off and do not prime a strip 2" wide on any surfaces to receive a row of headed studs or puddle welds.

C. Steel members that cannot be readily painted after fabrication, such as back-to-back angles and tees, shall be primed and finish coated prior to fabrication.

D. Hot dip galvanize members permanently exposed to the elements, such as cooling tower support steel or enclosed in masonry spaces.

E. Do not print or emboss the name of the fabricator on exposed steel unless it is completely concealed by the finish painting.

PART 3 - EXECUTION

3.1 ERECTION

A. Surveys: Employ a Florida Licensed Engineer or Land Surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary shoring and bracing: Provide temporary shoring and bracing members and connections of sufficient strength to bear imposed loads from steel self weight and erection procedures or any other loads created by other contractors on a temporary basis. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guidelines to achieve proper alignment of structures as erection proceeds.

C. Temporary planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor rods and bolts: Furnish anchor rods, bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary for pre-setting rods, bolts and other anchors to accurate locations.
2. Refer to Division 3 of these specifications for anchor rod installation requirements in concrete, and Division 4 for masonry installation.

E. Setting bases and bearing plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and clean bottom of base and bearing plate.

1. Set base or bearing plate wedge or other adjusting devices.
2. Tighten anchor rods after structural steel frame has been plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack or pour non-shrink grout solidly between bearing surface and base or plate. Ensure that no voids remain. Finish exposed surfaces, protect grout and allow to cure.
4. For proprietary grout materials, comply with manufacturer's instructions.
5. Base plates must be grouted a minimum of 72 hours prior to placing concrete slabs on supporting steel structure.

F. Field assembly: Set structural members accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Comply with AISC Code of Standard Practice except where more stringent requirements are contained herein.

1. Level and plumb individual members of structure within specified AISC tolerances.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

G. Splice members only where indicated and accepted on shop drawings.

H. Erection bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

I. Comply with AISC Specification for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

J. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts as permitted by Architect.

K. Tighten bearing-type bolts (A-325N, A-325X, A-490N, and A-490X) to the snug tight condition as follows:

1. Bolts shall be placed in all holes, with washers positioned as required and nuts threaded to complete the assembly.
2. Compacting the joint to the snug-tight condition shall progress systematically from the most rigid part of the joint.
3. The snug-tightened condition is the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench.
4. More than one cycle through the bolt pattern may be required to achieve the snug-tightened joint.

L. Tighten slip-critical bolts (A-325SC and A-490SC) to the minimum fastener tension indicated in Table 8.1 of the "Specification for Structural Joints using ASTM A-325 or ASTM A-490 Bolts" as follows:

1. Begin final tightening of slip-critical bolts only after a snug-tight joint as described above is achieved. Progress systematically from the most rigid part of the joint.
2. If splined end of tension-control bolts is severed prior to achieving snug-tight joint, remove and replace the fastener assembly.
3. Progress systematically from the most rigid part of the joint.
4. Determine tension using either load indicator washers or tension-control bolts.

At the Contractor's option, slip-critical bolts may be installed in either standard, oversize, or short slotted holes. Design of connections using slip-critical bolts is based on a Class A faying surface and oversized holes.

M. Provide hardened washers conforming to ASTM F436 and place under the part being turned.

N. Do not reuse or retighten bolts which have been fully tightened. Use only non-galvanized nuts and bolts that are clean, rust-free, and well lubricated. Bolts and nuts shall be wax dipped by the bolt supplier or lubricated with Johnson's Stick Wax 140. Cleaning and lubrication of ASTM F1852 twist-off-type tension-control bolts is not permitted.

O. Where slotted holes are used to accommodate thermal movement, notify the Architect if bolt is expected to hit the end of slot, based on temperature at time of installation.

P. Store fastener components in sealed containers until ready for use. Reseal open containers to prevent contamination by moisture or other deleterious substances. Store closed containers from dirt and moisture in a protective shelter. Take from protective storage only as many fastener components as are anticipated to be installed during the work shift. Fastener components that are not incorporated into the work shall be returned to protective storage at the end of the work shift. Fasteners from open containers and fasteners that accumulate rust or dirt shall not be used and shall be immediately and permanently removed from the project site.

Q. Headed shear studs: All welding ferrules for shear connectors shall be removed prior to placement of concrete.

R. Gas cutting: Do not use gas-cutting torches in field for correcting fabrication errors in primary structural framing. When permitted, finish gas-cut sections equal to a sheared appearance by grinding or reaming. Do not use gas cutting to fabricate bolt holes.

S. Touch-up painting: Immediately after erection, slag field welds and clean bolted connections and abraded areas of shop paint. Apply paint to exposed areas using original shop primer or cold galvanizing compound. For exposed steel having special coatings system, reapply both primer and top coat per Division 9 Section, "Special Coatings". For galvanized steel, apply Zinc Clad Cold Galvanizing by Sherwin-Williams or Cold Galvanizing by ZRC Chemical by brush or spray to provide a minimum dry film thickness of 3 mils.

3.2 QUALITY CONTROL

A. Shop testing and inspection by the Owner is to evaluate the effectiveness of the Fabricator's required Quality Control and Assurance Program.

B. Owner will engage a Structural Inspector to perform field inspections pursuant to the Structural Inspection Plan presented on the Drawings.

C. Owner will engage a testing agency to perform shop inspections, shop testing, field-testing, and to prepare test and inspection reports.

D. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

E. Provide access for testing agency to places where structural steel work is being fabricated or produced and unobstructed views to all members in nearby storage so that required inspection and testing can be accomplished.

F. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirement.

G. Correct deficiencies in structural steel work which inspections or laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work.

H. Shop Inspection and Tests: Testing Agency is to inspect and test during fabrication of structural steel assemblies, as follows:

1. Review shop drawings and shop procedures with Fabricator's supervisory personnel.

2. Request and obtain necessary mill certifications of steel and verify proper material throughout the duration of the job.
3. Verify welding procedure qualifications, either by prequalifications or by witnessing qualification tests.
4. Verify welder qualifications, either by certification and/or by retesting. Obtain welder certificates.
5. Spot check layout and dimensions of jigs and fixtures for joint preparation, and fit up of members.
6. Verify welding electrodes to be used and other welding consumables as the job progresses.
7. Check preheating procedures for conformance to AWS D1.1.
8. Verify procedures for welding in accordance with applicable portions of section 4, "Technique", AWS D1.1.
9. Verify that quality of welds meet the requirements of Paragraph B.15, "Quality of Welds", AWS D1.1.
10. Provide inspection of surface preparation for coating and coating operations in accordance with SSPC VIS 1 and 2.
11. Perform visual inspection of all welds for compliance with Contract Documents. Provide random non-destructive tests of welds in conformance with Section 6 of AWS D1.1, as may be required by Architect, but not less than:
    a. Full penetration welds: 25%.
    b. Partial penetration welds: 15%.
    c. Fillet Welds: 10%.
12. Testing laboratory may use the following examination methods, in descending order of importance. When a particular examination method for a joint is unfeasible, the highest order method that is practicable shall be used. Standard of acceptance shall be in accordance with AWS D1.1.
    a. Ultrasonic Method: In accordance with AWS D1.1.
    b. Radiographic Method: In accordance with ASTM E 94 and ASTM E 142, with a minimum quality level of "2-2T". This procedure is limited to the inspection of groove welds in butt joints only and is not to be used for fillet welds.
    c. Magnetic Particle Method: In accordance with ASTM E109. Use for examining partial penetration welds. Percentage of examinations is defined elsewhere in these specifications. The Yoke method may be used only for supplementary surface examination.
    d. Dye Penetrant Examination Method: In accordance with ASTM E165.
13. Ultrasonically inspect for laminations after welding all joints with Group 4 and 5 rolled shapes and plates greater than 1 1/2" thick, where material is subjected to tension in the through thickness direction. The ultrasonic inspection shall extend for a distance of six times the thickness of the plate receiving the through thickness tension, either side of the plate delivering the tension.
14. Interpret, record, and report all results of the non-destructive tests.
15. Mark for repair, any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with Paragraph 3.7, "Corrections", AWS D1.1

16. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.

I. Field Inspection and Tests: Inspect and Test during the erection of structural steel assemblies as directed by the Engineer of Record, but not less than the following

1. Verify field welding procedures and obtain welder certificates.
2. Check joint preparation and fit up, backing strips, and runout plates.
3. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
4. Review welding sequence.
5. Perform visual inspection of all welds for compliance with Contract Documents. Perform non-destructive tests of welds in conformance with Section 6 of AWS D1.1 as may be required by Architect, but not less than:
   a. Splices: 100%.
   b. Fillet Welds: 10%.
6. Check 100% of bolted connections according to inspection procedures outlined in the "Specification for Structural Joints using ASTM A325 or A490 Bolts" and as required elsewhere in these specifications.
7. Production Stud Application Testing: Test the first two studs per welder per day for each set-up and size and type of stud. Test by bending studs 30 degrees using a 4 lb. hammer per AWS D1.1 Section 7.7. Use a 4 lb. hammer to sound 100% of studs. A pinging sound usually represents a sound weld. Studs that produce a "thud" should be bend tested. Passing studs may remain bent while failing studs must be replaced.
8. Interpret, record, and report all results of the non-destructive tests.
9. Mark for repair any area not meeting Specification requirements. Correction of rejected welds shall be made in accordance with Paragraph 3.7, "Corrections", AWS D1.1.
10. Re-examine all repair areas and interpret, record, and report the results of examinations of repair welds.

END OF SECTION 05120

SECTION 05300 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
2. Division 5 Section "Structural Steel" for shop-welded shear connectors.
3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated, or requested by the Architect.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel. Submit to general contractor.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Mechanical fasteners.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Member of the Steel Deck Institute.

B. Installer Qualifications: An experienced installer who has completed steel deck installations 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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Fabrication and Erection: Fabricate and erect deck per the Steel Deck Institute's "Design Manual for Composite Decks, Form Decks and Roof Decks".

E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.

1. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

G. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

H. Governing Building Code: Comply with Florida Building Code, 2010 Edition with 2012 Supplement.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Deck:

a. Consolidated Systems, Inc.
b. Epic Metals Corp.
c. Marlyn Steel Products, Inc.
d. Nucor Corp.; Vulcraft Div.
e. Roof Deck, Inc.
f. United Steel Deck, Inc.
g. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and the following:

1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Deck Profile; Depth and Design Uncoated-Steel Thickness: As indicated on Drawings.
3. Span Condition: Triple span typical, Double span minimum, U.O.N. on Drawings.
4. Side Laps: Interlocking seam.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth unless otherwise indicated.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

J. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

K. Galvanizing Repair Paint: Provide "Galvacon", " ZRC Cold Galvanizing" or Architect accepted alternate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Deck has been designed to span unshored, U.O.N. on Drawings.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Provide mechanical fasteners according to deck manufacturer's written instructions and per the Structural Notes on the Drawings.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds or mechanical fasteners. Welds of the surface diameter indicated or seam welds with an equal perimeter, but not less than 1-1/2 inches long, screws of diameter indicated and as follows:

1. Weld Diameter: 5/8 inch nominal.
2. Weld Spacing: Weld deck units as indicated on the Drawings.
3. Mechanical Fasteners: Install #12 TEK Screws
4. Mechanical Fastener Spacing: Fasten to light gage trusses as indicated on Drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated on the Drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and/or inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 05300

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes, but is not limited to the following:

1. Exterior -wall framing.
2. Roof trusses.
3. Roof soffit framing.

1.3 RELATED WORK SPECIFIED ELSEWHERE

1. Division 3 Section "Cast-In-Place Concrete".
2. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
3. Division 6 Section "sheathing" wall sheathing.
4. Division 7 Section Standing Seam Metal Roof Panels".
5. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding specified design loads within limits and under conditions indicated.

1. Design Loads: As indicated on drawings or required by Code.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Interior Non-Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
   b. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height.
   c. Roof Trusses: Vertical deflection of 1/360 of the span.
   d. Roof Rafter Framing: Horizontal deflection of 1/360 of the horizontally projected span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch.

B. Design exterior wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Design roof trusses according to AISI's "Design Guide for Cold-Formed Steel Trusses."

1.5 SUBMITTALS

A. Product Data and installation instructions for each type of cold-formed metal framing product and accessories, including fasteners, materials and finishes.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

1. For cold-formed metal framing indicated to comply with design loads, include shop drawings and calculations signed and sealed by the delegated (specialty) engineer responsible for their preparation.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Miscellaneous structural clips and accessories.

1.6 QUALITY ASSURANCE

A. Reference specifications and standards: Comply with the provisions of the following Codes and Standards. (Reference is to edition in force at the time these specifications are issued.)

1. Florida Building Code, 2010 Edition with 2012 revision.
2. ASCE 7-10"Minimum Design Loads for Buildings and Other Structures".
3. AISI: "Specification for the Design of Cold-Formed Steel Structural Members".
4. AISI: "Design Guide for Cold-Formed Steel Structural Members".
5. AISI: "Specification Provision for Screw Connections", CCFSS Technical Bulletin.
6. AWS: D1.1 Structural Welding Code – Steel.
7. AWS: D1.3 "Specification for Welding Sheet Steel in Structures".

B. Qualifications:

1. Fabricator Qualifications: Company with not less than five (5) documented satisfactory experiences designing and fabricating cold-formed steel framing systems equal in material, design and extent to the systems required for this Project.
2. Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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. Engineering Responsibility: Engage a delegated licensed engineer to prepare design calculations, Shop Drawings, and other structural data.

D. Delegated Engineer Qualifications: A licensed engineer who is legally qualified to practice in State of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 FIELD MEASUREMENTS

A. Verify all dimensions and conditions by field measurement. Indicate and flag on shop drawings all discrepancies between actual conditions and contract documents.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by manufacturer's name, job number, and member number. Exercise care to avoid damage during unloading, storing and erection.

B. Store framing members on blocking, pallets, platforms or other supports off the ground, sufficiently braced to avoid damage from excessive bending.

C. Protect members and accessories from corrosion, deformation, damage and deterioration when stored at job site; keep free of dirt and other foreign matter.

1.9 PROJECT CONDITIONS

A. During construction, adequately distribute all loads applied to member so as not to exceed the carrying capacity of any framing member.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Clark Steel Framing Industries.
2. Consolidated Systems, Inc.
3. Dale Industries, Inc.
4. Dietrich Industries, Inc.
5. MarinoWare; Div. of Ware Industries, Inc.
6. Steel Construction Systems.
7. Super Stud Building Products, Inc.
8. Unimast, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33 for minimum uncoated steel thickness of 0.0428 inch.

2. Coating: G60.

B. Structural Framing Members: ASTM C955.

2.3 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 Uncoated-Steel Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
2. Flange Width: 1-1/4 inches.

2.4 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.5 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

B. As a minimum provide accessories of manufacturer's standard thickness and configuration as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Joist hangers and end closures.
9. Hole reinforcing plates.
10. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel with encased end threaded, bolts and carbon-steel nuts each end; and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B 695, Class 50.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

1. Use low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

2.9 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. 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.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches apart. Fasten at each stud intersection.

1. 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.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.5 TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.

B. Truss Spacing: as shown on drawings.

C. Do not alter, cut, or remove framing members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging framing members or connections.

F. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings.

3.6 FIELD QUALITY CONTROL

A. Inspection: Owner will engage a qualified inspection agency to perform field inspections.

B. Field and shop welds will be subject to inspection.

C. Remove and replace Work that does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

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. Loose steel lintels.
2. Shelf angles.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications 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.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

C. Slotted Channel Framing: Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- (14.3-mm-) wide slotted holes in webs at 2 inches (51 mm) o.c.

1. Width of Channels: 1-5/8 inches (41 mm).
2. Depth of Channels: 1-5/8 inches (41 mm).
3. Metal and Thickness: Galvanized steel complying with ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.

D. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

E. Gray-Iron Castings: ASTM A 48, Class 30 (ASTM A 48M, Class 200), unless another class is indicated or required by structural loads.

F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. 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 and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. 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.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.7 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

C. Galvanize shelf angles to be installed in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. General: Provide steel framing and supports indicated and as necessary to complete the Work.

C. Fabricate units from structural-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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
3. Furnish inserts if units must be installed after concrete is placed.

D. Galvanize miscellaneous framing and supports where indicated.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded

fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. 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.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. 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.

E. 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.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

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, if any.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.

1. Do not grout baseplates of columns supporting steel girders until girders are installed and leveled.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed 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. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

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. Aluminum pipe and tube handrails and railings. (Exterior locations for pedestrian control)

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:

1. Aluminum: AA 30, "Specifications for Aluminum Structures."

B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:

1. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
b. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

D. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures

by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected handrails and railings.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.

1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for handrails and 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.

1.8 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Aluminum Pipe and Tube Railings:

a. Blum: Julius Blum & Co., Inc.
b. Braun: J.G. Braun Co.

2.2 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

1. Extruded Bar and Tube: ASTM B 221 (ASTM B 221M), alloy 6063-T5/T52.
2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.
3. Drawn Seamless Tube: ASTM B 210 (ASTM B 210M), alloy 6063-T832.
4. Plate and Sheet: ASTM B 209 (ASTM B 209M), alloy 6061-T6.

C. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M

D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed tamper proof fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.

C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place anchors.

2.4 GROUT AND ANCHORING CEMENT

A. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:

1. By inserting prefabricated flush-elbow fittings. (Aluminum railings)

D. Nonwelded Connections (Aluminum railings): Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.

E. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

F. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

G. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.

H. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

I. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

J. Fabricate joints that will be exposed to weather in a watertight manner.

K. Close exposed ends of handrail and railing members with prefabricated end fittings.

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.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails and railings.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with 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 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.

3.3 ANCHORING POSTS

A. Use steel pipe sleeves (Contractor's option) preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

B. Form or core-drill holes (Contractor's option) not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

1. Nonshrink, nonmetallic grout or anchoring cement.

C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) build-up, sloped away from post.

3.4 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

3.5 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

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. Wood furring, grounds, nailers, and blocking.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fire-Retardant-Treated Materials, Interior Type A:

a. Baxter: J. H. Baxter Co.
b. Chemical Specialties, Inc.
c. Continental Wood Preservers, Inc.
d. Hickson Corp.
e. Hoover Treated Wood Products, Inc.

2.2 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.

D. 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.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m).

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated wood is indicated or required, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.

B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:

1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
3. Contact with treated wood does not promote corrosion of metal fasteners.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.5 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.6 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).

1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

2.7 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO 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 A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.9 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction."
4. "Table 23-I-Q--Nailing Schedule" of the Uniform Building Code.
5. "Table 2305.2--Fastening Schedule" of the BOCA National Building Code.
6. "Table 1705.1--Fastening Schedule," of the Standard Building Code.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. 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; predrill as required.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring at 24 inches (610 mm) o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.

3.4 INSTALLATION OF STRUCTURAL-USE PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:

1. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 06100

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 072713 "Modified Bituminous Sheet Air Barrier" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory".

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Manufacturers: Subject to compliance with requirements, (available products that may be incorporated into the Work include, but are not limited to, the following:

   a. CertainTeed Corporation.
   b. Georgia-Pacific Building Products.
   c. National Gypsum Company.
   d. United States Gypsum Company.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. 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 B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion

sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table R602.3(1), "Fastener Schedule for Structural Memebers," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two- Family Dwellings."

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products high-pressure decorative laminate and cabinet hardware and accessories.

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 plastic-laminate cabinets.

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.
2. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

~~B. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.~~

Addendum 2

1.6 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 and whose Shop is a participant in AWI's Quality Certification Program.

1.7 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.

1.8 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.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

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: Premium.

C. Regional Materials: Plastic-laminate cabinets shall be manufactured within 500 miles (800 km) of Project site.

D. Type of Construction: Face frame.

E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Wilsonart International; Div. of Premark International, Inc.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: Grade HGS.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

L. 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 laminate manufacturer's full range in the following categories:

    a. Solid colors, gloss or matte finish.
    b. Solid colors with core same color as surface, gloss or matte finish.
    c. Wood grains, gloss or matte finish.
    d. Patterns, gloss or matte finish.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1,Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm high and not more than 24 inches (600 mm) wide, provide Grade 1.
4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

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.

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 in 96 inches (3 mm in 2400 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. 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 in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

SECTION 071113 - BITUMINOUS DAMPPROOFING

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. Cold-applied, emulsified-asphalt dampproofing.

B. Related Requirements:

   1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders.
   2. Section 042000 "Unit Masonry" for mortar parge coat on masonry surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Trowel Coats: ASTM D 1227, Type II, Class 1.

B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

1. Test for surface moisture according to ASTM D 4263.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.

1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Polyisocyanurate foam-plastic board.
   2. Glass-fiber blanket.
   3. Glass-fiber board.
   4. Loose-fill insulation.

B. Related Requirements:

   1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
   2. Section 074113.16 "Standing Seam Metal Roof Panels".
   3. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced: ASTM C 1289, foil faced, Type I, Class 1 or 2.

B. <Double click here to find, evaluate, and insert list of manufacturers and products.>

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

C. Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, glass-fiber-mat faced, Type II, Class 2.

D. <Double click here to find, evaluate, and insert list of manufacturers and products.>

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced <**Insert drawing designation**>: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

B. Glass-Fiber Blanket, Reinforced-Foil Faced <**Insert drawing designation**>: ASTM C 665, 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.

2.3 GLASS-FIBER BOARD

A. Glass-Fiber Board, Unfaced <**Insert drawing designation**>: ASTM C 612, Type IA; unfaced, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics. Nominal density of 4.25 lb/cu. ft. (68 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).

B. Glass-Fiber Board, Faced <**Insert drawing designation**>: ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84. Nominal density of 4.25 lb/cu. ft. (68 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C).

2.4 LOOSE-FILL INSULATION

A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.6 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

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. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. 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 (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. 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 (76-mm) 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 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 exterior of construction.
    b. Interior Walls: Set units with facing placed toward areas of high humidity.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. 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 072713 - MODIFIED BITUMINOUS SHEET 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 self-adhering, vapor-retarding, modified bituminous sheet air barriers.

B. Related Requirements:

1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

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 accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.

1.5 QUALITY ASSURANCE

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

1.6 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.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier. 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.

2.3 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick, cross-laminated polyethylene film with release liner on adhesive side.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Carlisle Coatings & Waterproofing Inc.

b. Grace Construction Products; W.R. Grace & Co. -- Conn.
c. Meadows, W.R., Inc.

2. Physical and Performance Properties:

a. Tensile Strength: Minimum 400 psi (2.8 MPa); ASTM D 412, Die C.
b. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
c. Puncture Resistance: Minimum 40 lbf (180 N); ASTM E 154/E 154M.
d. Water Absorption: Maximum 0.10 percent weight gain after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
e. Vapor Permeance: Maximum 0.05 perm (2.9 ng/Pa x s x sq. m); ASTM E 96/
E 96M, Desiccant Method.
f. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested according to ASTM D 4541 as modified by ABAA.
g. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
h. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

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 substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. 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.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. 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.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another.

G. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details and according to recommendations in ASTM D 6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F (16 deg C).
2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water.
2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

G. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

H. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

I. 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.

J. Wall Openings: Prime concealed, perimeter frame surfaces of windows and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

K. Fill gaps in perimeter frame surfaces of windows, curtains, doors, and misc. penetrations of air-barrier material with foam sealant.

L. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.

M. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 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 recommended in writing by manufacturer. If exposed to these conditions for

longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials 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 in writing by manufacturer of affected construction.

END OF SECTION 072713

SECTION 074113.16 - STANDING-SEAM METAL ROOF 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 standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck purlins and rafters during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of 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 the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

1.8 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.

1.9 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.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. 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 D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. 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 E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. 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 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

e. Drexel Metals
f. Architectural Metal Systems (A Nucor Company)

a. AEP Span; a BlueScope Steel company.
b. Berridge Manufacturing Company.
c. CENTRIA Architectural Systems.
d. MBCI; a division of NCI Building Systems, L.P. Addendum 2

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.034 inch (0.86 mm).
b. Exterior Finish: ~~Three~~-coat fluoropolymer. two coat
c. Color: Match Architect's samples. Addendum 3

3. Clips: One-piece fixed to accommodate thermal movement.

a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

4. Joint Type: As standard with manufacturer.
5. Panel Coverage: 16 inches (406 mm).
6. Panel Height: 2.0 inches (51 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant,

polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, provide one of the following :

    a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT Ultra.
    c. Henry Company; Blueskin PE200 HT.
    d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
    e. Metal-Fab Manufacturing, LLC; MetShield.
    f. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) 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, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. 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. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

END OF SECTION 074113.16

SECTION 074213.13 - FORMED METAL WALL 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:
   1. Concealed-fastener, lap-seam metal wall panels.

B. Related Sections:
   1. Section 074213.53 "Metal Soffit Panels" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
   7. Review temporary protection requirements for metal panel assembly during and after installation.
   8. Review of procedures for repair of metal panels damaged after installation.
   9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of 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 the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly , including corner, soffits, supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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.

1.9 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.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. 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 D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. 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 E 1592:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: [**2.86 lbf/sq. ft.** (137 Pa)] [**6.24 lbf/sq. ft.** (300 Pa)].

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled 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. V-Groove-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges, to match existing wall panels of existing buildings.

1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Nominal Thickness: 0.028 inch (0.71 mm).
    b. Exterior Finish: Three-coat fluoropolymer.
    c. Color: Match Architect's samples as required to match existing wall panels of existing buildings.

    d. .

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, 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, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. 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. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers.

E. Panel Sealants: Provide sealant type 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 (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; 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 C 1311.

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, including major ribs and intermediate stiffening ribs, if any, for full length of panel, to match existing.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. 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 for Other Than Aluminum: 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 wall 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. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. 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 (0.013 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 wall 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 wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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 C 754 and metal panel manufacturer's written recommendations.

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. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. 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. Lap ribbed or fluted sheets one full rib. 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.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

F. 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, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. 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 achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 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 074213.13

SECTION 074213.53 - 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.

B. Related Sections:
   1. Section 074213.13 "Formed Metal Wall Panels" for lap-seam metal wall panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of 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 per 12 inches (1:10).

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 (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof eave, including fascia, and soffit as shown on Drawings; approximately four panels wide by full eave width, including attachments and accessories.
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. 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.

1.9 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.

1.10 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.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. 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 D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. 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 E 1592:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: [**2.86 lbf/sq. ft. (137 Pa)**] [**6.24 lbf/sq. ft. (300 Pa)**].

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (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. Metal Soffit Panels: Match profile and material of metal wall panels.

1. Finish: Match finish and color of metal wall panels.
2. Sealant: Factory applied within interlocking joint.

C. V-Groove-Profile Metal Soffit Panels Solid and Perforated panels formed with vertical panel edges and [intermediate stiffening ribs symmetrically spaced between panel edges; with a V-groove joint between panels.
1. Material: Same material, finish, and color as metal wall panels.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, 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 fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers.

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 (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; 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 C 1311.

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, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. 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 for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. 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. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. 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 (0.013 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.
2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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 C 754 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 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. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. 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.

G. 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 (3 m) with no joints allowed within 24 inches (610 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 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 074213.53

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Formed roof-drainage sheet metal fabrications.
   2. Formed equipment support flashing.
   3. Formed overhead-piping safety pans.

B. Related Requirements:

   1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Section 074113.16 "Standing Seam Metal Roof Panels" for materials and installation of sheet metal flashing and trim integral with roofing.
   3. Section 074213.13 "Formed Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review requirements for insurance and certificates if applicable.

4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 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 manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include identification of material, thickness, weight, and finish for each item and location in Project.
3. Include details for forming, including profiles, shapes, seams, and dimensions.
4. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
5. Include details of termination points and assemblies.
6. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Include details of special conditions.
8. Include details of connections to adjoining work.
9. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.
1. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows 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 D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation [or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:
   a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: Match Architect's sample.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Not Allowed.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric [polyurethane] [polysulfide] [silicone] polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Gutter Profile: Style A according to cited sheet metal standard.
2. Expansion Joints: Butt type with cover plate.
3. Gutters with Girth 21 to 25 Inches (530 to 640 mm): Fabricate from the following materials:
   a. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig 1-35H according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:
   a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Overhead-Piping Safety Pans: Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
4. Anchor gutter with gutter brackets spaced not more than 24 inches (600 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. 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 to install manufacturer's products per specified requirements. 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 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."
        2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
        3) FM Global in its "Building Materials Approval Guide."

1.6 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.

1.7 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Grace Construction Products.
2. Hilti, Inc.
3. Johns Manville.

4. 3M Fire Protection Products.
5. Tremco, Inc.; Tremco Fire Protection Systems Group.
6. USG Corporation.

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 E 814 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. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

F. 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. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

D. 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.

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.

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. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Owner of Any Damage."

3.5 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.

3.6 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 FSO:

1. UL-Classified Systems: C-AJ-0001-0999 and W-L0001-0999.

C. Firestopping for Metallic Pipes, Conduit, or Tubing FS1:

1. UL-Classified Systems: C-AJ-1001-1999 and W-L-1001-1999.

D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS2:

1. UL-Classified Systems: C-AJ-2001-2999 and W-L-2001-2999.

E. Firestopping for Electrical Cables FS3:

1. UL-Classified Systems: C-AJ-3001-3999 and W-L-3001-3999.

F. Firestopping for Cable Trays with Electric Cables FS4:

1. UL-Classified Systems: C-AJ-4001-4999 and W-L-4001-4999.

G. Firestopping for Insulated Pipes FS5:

1. UL-Classified Systems: C-AJ-5001-5999 and W-L-5001-5999.

H. Firestopping for Miscellaneous Electrical Penetrants FS6:

1. UL-Classified Systems: C-AJ-5001-5999 and W-L-5001-5999.

I. Firestopping for Miscellaneous Mechanical Penetrants FS7:

1. UL-Classified Systems: C-AJ-7001-7999 and W-L-7001-7999.

J. Firestopping for Groupings of Penetrants FS8:

1. UL-Classified Systems: C-AJ-8001-8999 and W-L-8001-8999.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 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: Two 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: Twenty years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

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 C 920, 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; 895NST.
   c. Tremco Incorporated; Spectrem 2.

2.3 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, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, 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. GE Construction Sealants; SCS1700 Sanitary.
   c. Tremco Incorporated; Tremsil 200.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.

b. Pecora Corporation; AC-20.
c. Sherwin-Williams Company (The); 850A.
d. Tremco Incorporated; Tremflex 834.

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at veneer stone applications according to Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces (JS-1).

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 dimension stone cladding.
    e. Perimeter joints between materials listed above and frames of doors windows and louvers.
    f. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement (JS-2).

1. Joint Locations:

    a. Control joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints between interior wall surfaces and frames of interior doors windows and fiber cement siding.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-3).

1. Joint Locations:

   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .

END OF SECTION 079200

SECTION 08110 - STEEL 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. Steel doors.
2. Steel door frames.
3. Fire-rated door and frame assemblies.
4. Louvers in doors.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for installing anchors and grouting frames in masonry construction.
2. Division 8 Section "Flush Wood Doors" for wood doors installed in steel frames.
3. Division 8 Section "Door Hardware (Scheduled by Naming Products)" for door hardware and weather stripping.
4. Division 8 Section "Glazing" for glass in glazed openings in doors and frames.
5. Division 9 Section "Gypsum Board Assemblies" for spot-grouting frames installed in steel-framed gypsum board partitions.
6. Division 9 Section "Painting" for field painting factory-primed doors and frames.

1.3 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

B. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

1.5 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are 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 252.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-(100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors 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. Steel Doors and Frames:

a. Amweld Building Products, Inc.
b. Ceco Door Products; a United Dominion Company.
c. Curries Company.
d. Republic Builders Products.
e. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

A. General: Provide doors of sizes, thicknesses, and designs indicated.

B. Exterior Doors: Face sheets fabricated from metallic coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

A. General: All frames fabricated from metallic coated steel sheet. Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Frames of 0.053-inch- (1.3-mm-) thick steel sheet for:

1. Door openings wider than 48 inches (1220 mm).
2. Wood doors. (Interior applications)

C. Frames of 0.067-inch- (1.7-mm-) thick steel sheet for:

1. Level 3 steel doors.

D. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

E. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

F. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.

1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.

G. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-)

thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

C. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:

1. Resin-impregnated kraft/paper honeycomb.
2. Vertical steel stiffeners.

D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

E. Clearances for Fire-Rated Doors: As required by NFPA 80.

F. Single-Acting, Door-Edge Profile: Square edge.

G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

J. Thermal-Rated (Insulating) Assemblies: At exterior locations, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

K. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

L. Frame Construction: Fabricate frames to shape shown.

1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints for masonry applications.
2. Fabricate knock-down frames with mitered or coped corners, for field assembly for metal stud gypsum board partitions.
3. Provide welded frames with temporary spreader bars.

M. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

N. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

O. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

P. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
3. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.

4. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
5. Install fire-rated frames according to NFPA 80.
6. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08211 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer, faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.
3. Louvers for flush wood doors.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.
2. Division 9 Section “Painting” for field finishing of solid core doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate fire ratings for fire doors.

C. Samples for Verification:

1. Finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.
3. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
4. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors 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 NFPA 252.

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 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm)

in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

    a. 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. Flush Wood Doors:

    a. Algoma Hardwoods Inc.
    b. Eggers Industries; Architectural Door Division.
    c. Weyerhaeuser Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Painted and Transparent Finish:

1. Grade: Premium, with Grade A faces.
2. Species and Cut: White birch, rotary cut.
3. Match between Veneer Leaves: Pleasing match.
4. Assembly of Veneer Leaves on Door Faces: Center balance match.
5. Stiles: Same species as faces.

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-1.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

B. Interior Veneer-Faced Doors:

1. Core: Particleboard.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.4 LOUVERS AND LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.5 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.6 SHOP PRIMING

A. Doors for Transparent Finish: Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in Division 9 Section "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with 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 Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Field-Finished Doors: Refer to the following for finishing requirements:

1. Division 9 Section "Painting."

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 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 08211

SECTION 085113 - ALUMINUM WINDOWS

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 aluminum windows for exterior locations, impact resistant glass and framing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches (50 by 100 mm) in size.

D. Samples for Initial Selection: For units with factory-applied finishes.

1. Include Samples of hardware and accessories involving color selection.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.
c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AAMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: 80.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.46 Btu/sq. ft. x h x deg F.

D. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 54.

E. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: [120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces>.

F. Windborne-Debris-Impact Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 ALUMINUM WINDOWS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. EFCO Corporation.
   2. Kawneer North America; an Alcoa company.
   3. Winco Manufacturing Co. – (Basis of Design: Series 1150)
   4. YKK AP America Inc.

B. Operating Types: Provide the following operating types in locations indicated on Drawings:
   1. Hopper: Project in.

C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/ I.S.2/A440.

   1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

D. Windborne-Debris-Impact-Resistant Insulating-Glass Units: ASTM E 2190 with two lites and complying with impact-resistance requirements in "Window Performance Requirements" Article.

   1. Exterior Lite: ASTM C 1036, Type 1, Class 1, q3.

      a. Tint: Clear.
      b. Kind: Fully tempered.

   2. Interior Lite: ASTM C 1172 clear laminated glass with two plies of float glass.

      a. Float Glass: Annealed or Fully tempered, as required by performance requirements indicated.
      b. Interlayer Thickness: 0.090 inch (2.29 mm).

   3. Filling: Fill space between glass lites with air.
   4. Total Thickness: 1.31 inch (33 mm).

E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

   1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

F. Projected Window Hardware:

1. Hinges: Non-friction type, not less than two per sash.
2. Lock: Lever handle and cam-action lock with keeper.
3. Limit Devices: Concealed friction adjustor, adjustable stay bar limit devices designed to restrict sash opening.

    a. Limit clear opening to 4 inches (100 mm) for ventilation; with custodial key release.

4. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.

2.4 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

D. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, outside for project-in sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.6 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" 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 not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than [50] [70] percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: Match existing frame colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

SECTION 08711 - 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 the following:

1. Commercial door hardware for the following:

a. Swinging doors.

B. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" for astragals provided as part of the assembly and for door silencers provided as part of the frame.
2. Division 8 Section "Flush Wood Doors" for astragals provided as part of a fire-rated labeled assembly.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.

C. 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.

    a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
    b. Submit one schedule that combines all doors and frames.

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 each 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. Room name and number on both sides of door.

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.

D. Keying Schedule: Prepared by or under the supervision of manufacturer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed 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.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available

during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

D. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with the Florida Accessibility Code for Building Construction, Oct. '97 Ed., and the Americans with Disabilities Act (ADA), as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch (13 mm) high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
b. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
c. Thresholds: Not more than 1/2 inch (13 mm) high.

E. Fire-Rated Door Assemblies: Provide door hardware for 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 NFPA 252.

F. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.
5. Quantities of keys as requested by Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

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 keys to manufacturer of key control system.

D. Deliver keys to Owner by registered mail or overnight package service.

1. Russ Waters,
   Leon County Schools, Facilities Department,
   3397 W. Tharpe St., Tallahassee, FL 32303.

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products and complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES AND PIVOTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hinges:

a. Hager Companies (HAG).
b. Stanley Commercial Hardware; Div. of The Stanley Works (STH); basis of design.

B. Standards: Comply with the following:

1. Butts and Hinges: BHMA A156.1.
2. Template Hinge Dimensions: BHMA A156.7.
3. Self-Closing Hinges and Pivots: BHMA A156.17.
4. Pivots: BHMA A156.4.

C. Quantity: Provide the following, unless otherwise indicated:

1. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).

D. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

		Metal Thickness (inches)	
Maximum Door Size (inches)	Hinge Height (inches)	Standard Weight	Heavy Weight
36 by 84 by 1-3/4	4-1/2	0.134	0.180

E. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

F. Hinge Weight: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

G. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges 3 per door. Stainless steel, with stainless-steel pin.
3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

H. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:

   a. Outswinging exterior doors.

2. Corners: 1/4-inch (6-mm) radius

I. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors and frames; wood screws for wood doors. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mechanical Locks and Latches:

   a. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR); basis of design.
   b. Schlage Lock Company; an Ingersoll-Rand Company (SCH).
   c. Yale Security Inc.; Div. of Williams Holdings (YAL).

B. Standards: Comply with the following:

1. Mortise Locks and Latches: BHMA A156.13.

C. Mortise Locks: Stamped steel case with steel or brass parts; BHMA [Grade 1, unless Grade 2 is indicated]; Series 1000.

D. Certified Products: Provide door hardware listed in the following BHMA directories:

1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."

E. Lock Trim: Comply with the following:

1. Lever: cast.
2. Escutcheon (Rose): cast.
3. Lockset Designs: Provide the lockset design designated below:
   a. Corbin Russwin, Newport design, NSB.

F. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:

1. Mortise Locks: BHMA A156.13.

G. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.

H. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

2.4 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Bolts:

   a. Glynn-Johnson; an Ingersoll-Rand Company (GJ); **basis of design**.
   b. Hager Companies (HAG).
   c. Ives: H. B. Ives (IVS).
   d. Rockwood Manufacturing Company (RM).

e. Stanley (STNLY)

B. Standards: Comply with the following:

1. Manual Flush Bolts: BHMA A156.16.

C. Flush Bolts: BHMA Grade 1, unless Grade 2 is indicated, designed for mortising into door edge.

D. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.

2.5 EXIT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
2. Dorma Architectural Hardware (DAH).
3. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
4. Von Duprin; an Ingersoll-Rand Company (VD); basis of design.

B. Standard: BHMA A156.3.

1. BHMA Grade: Grade 1, unless Grade 2 is indicated.

C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Outside Trim: Lever with cylinder; material and finish to match locksets, unless otherwise indicated.

1. Match design for locksets and latchsets, unless otherwise indicated.

2.6 CYLINDERS AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cylinders: Same manufacturer as for locks and latches.
   a. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).

2. Key Control Systems:

   a. Key Control Systems, Inc. (KCS).
   b. Major Metalfab Co. (MM).
   c. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
   d. Sunroc Corporation (SUN).
   e. Approved Equal.

B. Standards: Comply with the following:

1. Cylinders: BHMA A156.5.
2. Key Control System: BHMA A156.5.

C. Cylinder Grade: BHMA Grade 1, unless Grade 2 is indicated.

D. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Seven.
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.

   a. High-Security Grade: BHMA Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements of UL 437 (Suffix A).

E. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

F. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

   a. The Hardware Manufacturer shall meet with the Owner to finalize keying requirements and to obtain keying instructions in writing.
   b. Replace construction cores with permanent cores, as directed by Owner.

G. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:

1. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
2. Provide a bitting list to the Owner, direct from factory, showing all the bittings of keys used, and one additional masterkey (not used) for future use with ten change keys under that master and two additional change keys (not used) under each established master key.

    a. Cylinders shall be master keyed.

H. Keys: Provide nickel-silver keys complying with the following:

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

    a. Notation: "Do Not Duplicate"

2. Quantity: In addition to one extra blank key for each lock, provide the following:

    a. Cylinder Change Keys: Three.
    b. Master Keys: Five.
    c. Grand Master Keys: Five.
    d. Control Keys: Five.

I. Key Control System: BHMA Grade 1 system, including key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish.

1. Multiple-Drawer Cabinet: Cabinet with drawers equipped with key-holding panels and key envelope storage, and progressive-type ball-bearing suspension slides. Include single cylinder lock to lock all drawers.
2. Capacity: Able to hold keys for 150 percent of the number of locks.
3. Cross-Index System: Set up by key control manufacturer, complying with either or both of the following, at the Owner's discretion:

    a. Card Index: Furnish four sets of index cards for recording key information. Include three receipt forms for each key-holding hook.
    b. Computer Software: Furnish cross-index software for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.

2.7 STRIKES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Dustproof Strikes: BHMA A156.16.

C. 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. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

D. Dustproof Strikes: BHMA Grade 1.

2.8 SILENCERS

A. Manufacturers:

a. Glynn-Johnson, BHMA L03011; basis of design.

2.9 ACCESSORIES FOR PAIRS OF DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flush Bolts:

a. Adams Rite Manufacturing Co. (ARM).
b. Architectural Builders Hardware Mfg., Inc. (ABH).
c. Arrow Architectural Hardware; Div. of ESSEX Industries, Inc. (AAH).
d. Dorma Architectural Hardware (DAH); **basis of design**.
e. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
f. Hager Companies (HAG).
g. Ives: H. B. Ives (IVS).
h. NT Monarch Hardware; an Ingersoll-Rand Company (NTM).
i. Precision Hardware, Inc. (PH).
j. Rockwood Manufacturing Company (RM).

2. Astragals:

a. Hager Companies (HAG).
b. National Guard Products, Inc. (NGP).
c. Pemko Manufacturing Co., Inc. (PEM).

B. Standards: Comply with the following:

2.10 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Surface-Mounted Closers:

a. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR); basis of design.
b. DORMA Door Controls Inc.; Member of The DORMA Group (DC).
c. LCN Closers; an Ingersoll-Rand Company (LCN).
d. Norton Door Controls; Div. of Yale Security Inc. (NDC).
e. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).

B. Standards: Comply with the following:

1. Closers: BHMA A156.4.

C. Surface Closers: BHMA Grade 1, unless Grade 2 is indicated.

D. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.11 PROTECTIVE TRIM UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Protective Trim Units:

a. American Floor Products Co., Inc. (AFP).
b. Arden Architectural Specialties, Inc. (AAS).

c. Baldwin Hardware Corporation (BH).
d. Hager Companies (HAG).
e. IPC Door and Wall Protection Systems, Inc. (IPC).
f. Ives: H. B. Ives (IVS).
g. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
h. Pawling Corporation (PAW).
i. Rockwood Manufacturing Company (RM).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate protection plates from the following:

1. Stainless Steel: 0.050 inch (1.3 mm) thick; beveled top and 2 sides.

D. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.

E. Furnish protection plates sized 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in Door Hardware Schedule.

2.12 STOPS AND HOLDERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. DORMA Door Controls Inc.; Member of The DORMA Group (DC).
2. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
3. Hager Companies (HAG).
4. Ives: H. B. Ives (IVS); basis of design.
5. Rockwood Manufacturing Company (RM).
6. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).

B. Standards: Comply with the following:

1. Stops and Bumpers: BHMA A156.16.
2. Combination Overhead Holders and Stops: BHMA A156.8.
3. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Grade 1, unless Grade 2 is indicated.

D. Combination Overhead Stops and Holders: BHMA Grade 1, unless Grade 2 is indicated.

E. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.

1. Where floor or wall stops are not appropriate, provide overhead holders.

F. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.13 DOOR GASKETING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Door Gasketing:

a. Hager Companies (HAG).
b. National Guard Products, Inc. (NGP); basis of design.
c. Pemko Manufacturing Co., Inc. (PEM).

2. Door Bottoms:

a. Hager Companies (HAG).
b. National Guard Products, Inc. (NGP).
c. Pemko Manufacturing Co., Inc. (PEM).

B. Standard: Comply with BHMA A156.22.

C. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

D. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

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. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

2.14 THRESHOLDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hager Companies (HAG).
2. Pemko Manufacturing Co., Inc. (PEM).
3. Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
4. Ultra Industries; a Macklanburg-Duncan Company (ULT).

B. Standard: Comply with BHMA A156.21.

2.15 FABRICATION

A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.
b. Strike plates to frames.

c. Closers to doors and frames.

3. Spacers or Sex Bolts: For through bolting of hollow metal doors.

4. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.16 FINISHES

A. Standard: Comply with BHMA A156.18.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, 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. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's 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.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

D. Closures: Do not attach closures to the exterior side of exterior doors. Utilize parallel arm application at outswinging exterior doors.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 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.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

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

3.7 DOOR HARDWARE SCHEDULE

Door Hardware Set No. 1 (Typical at Exterior Classroom Doors)

3/2	**Pair Butts**	**FBB 191**	**Stanley**	**630/US32D satin stainless steel**
1	**Lockset**	**ML2052**	**Corbin Russwin**	**626/US26D satin chrome plated**
1	**Closer**	**CD6210 x A11**	**Corbin Russwin**	**689/SBL painted alum.**
1	**Weather Strip Set**	**152VA**	**NGP**	**628**
1	**Threshold**	**896**	**NGP**	**628**
1	**Door Bottom (Shoe)**	**154P**	**NGP**	**628**

1	**Kick Down Door Holder**	**GJ 444**	**Glynn-Johnson**	**S3 (alum.)**

Door Hardware Set No. 2 (Typical from Classroom into Teacher Planning)

3/2	**Pair Butts**	**F 179**	**Stanley**	**626**
1	**Latchset**	**ML2010**	**Corbin Russwin**	**626**
1	**Overhead Stop**	**7025**	**Dorma**	**628**
3	**Silencers**	**GJ64**	**Glynn-Johnson**	

Door Hardware Set No. 3 (Typical from Classroom into Storage Rooms, etc.)

3/2	**Pair Butts**	**F 179**	**Stanley**	**626**
1	**Lockset**	**ML 2052**	**Corbin Russwin**	**626**
1	**Stop**	**436**	**Ives**	**628**
3	**Silencers**	**GJ64**	**Glynn-Johnson**	

Door Hardware Set No. 4 (Typical Student Bathrooms)

3/2	**Pair Butts**	**F 179**	**Stanley**	**626**
1	**Lockset**	**ML2060**	**Corbin Russwin**	**626**
1	**Stop**	**436 (floor stop)**	**Ives**	**628**
3	**Silencers**	**GJ64**	**Glynn-Johns.**	

Door Hardware Set No. 5

3	**Pair Butts**	**FBB191**	**Stanley**	**626**
2	**Flush Bolts w/Dust Proof Strike 489**	**458 ½**	**Ives**	**626**
1	**Lockset**	**ML2057** storeroom function, at active leaf	**Corbin Russwin**	**626/US26D**
1	**Closer**	**DC6210 x A11**	**Corbin Russwin**	**628**

1	Weather Strip Set	152VA	NGP	628
1	Threshold	896	NGP	628
2	Door Bottom	154P	NGP	628
1	Kick Down Holder	GV444	Glyn-Johnson	S3 (Alum.)

Door Hardware Set No. 6

3/2	Pair Butts	FBB191	Stanley	626
1	Lockset	ML2057	Corbin Russwin	626
1	Closer	DC6210 x A11	Corbin Russwin	628
1	Weather Strip Set	152VA	NGP	628
1	Threshold	896	NGP	628
1	Door Bottom	154P	NGP	628
1	Kick Down Holder	GV444	Glyn-Johnson	S3 (Alum.)

Door Hardware Set No. 7 (Assembly Exit Doors)

3/2	Pair Butts	FBB 191	Stanley	630
1	Exit Device	99EO	Van Duprin	626
1	Closer	DC6210	Corbin Russwin	628
1	Stop	436	Ives	628
1	Weather Strip Set	152VA	NGP	628
1	Door Bottom (Shoe)	154P	NGP	628

Door Hardware Set No. 8 (Assembly Exit Doors)

3/2	Pair Butts	FBB 191	Stanley	630
1	Exit Device	99L	Van Duprin	626
1	Closer	DC6210	Corbin Russwin	628
1	Stop	436	Ives	628
1	Weather Strip Set	152VA	NGP	628

1	Door Bottom (Shoe)	154P	NGP	628

Door Hardware Set No. 9

3	Pair Butts	FBB179	Stanley	626
2	Exit Devices	9927L	Van Duprin	626/US26D
2	Closers	DC6210xA11	Corbin Russwin	628
1	Weatherstrip Sets	152VA	NGP	628
1	Threshold	896	NGP	628
2	Door Bottoms	154P	NGP	628
1	Astragal	600DKB	NGP	628

END OF SECTION 08711

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Glass for doors.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Section 085113 "Aluminum Windows" for impact resistant glazing in aluminum windows.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.

1. Laminated glass.
2. Insulating glass.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 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 (4.4 deg C).

1.8 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 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 the 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AGC Glass Company North America, Inc.
2. Guardian Industries Corp.; SunGuard.
3. JE Berkowitz, LP.
4. Oldcastle BuildingEnvelope™.
5. PPG Industries, Inc.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.
2. Obtain reflective-coated glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.

a. Wind Design Data: As indicated on Drawings.

C. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with basic-protection testing requirements in ASTM E 1996 for Wind Zone 1 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.

1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. 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 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

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. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. 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 IgCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear).

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:

1. Polyvinyl butyral interlayer.
2. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
3. Ionomeric polymer interlayer.
4. Cast-in-place and cured-transparent-resin interlayer.
5. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction Nonmetallic tube.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dow Corning Corporation.
    b. GE Construction Sealants; Momentive Performance Materials Inc.
    c. Tremco Incorporated.

2.8 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 C 1281 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 the 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.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

    a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. 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 (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

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. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 LAMINATED GLASS SCHEDULE

A. Glass Type: Clear laminated glass with two plies of fully tempered float glass.

1. Basis-of-Design Product: Oldcastle laminated glass.
2. Minimum Thickness of Each Glass Ply: 4 mm.
3. Interlayer Thickness: 0.030 inch (0.76 mm).
4. Safety glazing required.

3.9 INSULATING-LAMINATED-GLASS SCHEDULE

A. Glass Type: Clear insulating laminated glass.

1. Basis-of-Design Product: Oldcastle Building Envelope.
2. Overall Unit Thickness: 1-3/16 inch (30 mm).
3. Minimum Thickness of Outdoor Lite: 6 mm>.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Clear laminated glass with two plies of float glass.

    a. Minimum Thickness of Each Glass Ply: 6 mm.
    b. Interlayer Thickness: ~~0.030 inch (0.76 mm).~~ 0.090 inch 2.28mm
7. Safety glazing required.
8. Addendum 2

END OF SECTION 088000

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

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. Interior gypsum wallboard.
2. Non-load-bearing steel framing.

B. Related Sections include the following:

1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing..

1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:

1. Trim Accessories: Full-size sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Framing and Furring:

   a. Clark Steel Framing Systems.
   b. Consolidated Systems, Inc.
   c. Dale Industries, Inc. - Dale/Incor.
   d. Dietrich Industries, Inc.
   e. MarinoWare; Division of Ware Ind.
   f. National Gypsum Company.
   g. Scafco Corporation.
   h. Unimast, Inc.
   i. Western Metal Lath & Steel Framing Systems.

2. Gypsum Board and Related Products:

   a. American Gypsum Co.
   b. G-P Gypsum Corp.
   c. National Gypsum Company.

d. United States Gypsum Co.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

C. Hanger Attachments to Concrete: As follows:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

   a. Type: Postinstalled, expansion anchor.

D. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
2. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.

   a. Diameter: 7/32-inch (5.56-mm).
   b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.

3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized.
   a. Size: 1 by 3/16 inch (25.4 by 4.76 mm) by length required.

4. Angle Hangers: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized commercial-steel sheet.

   a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
   b. Size: 7/8 by 1-3/8 inches (22.2 by 34.9 mm).

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

1. Depth: 1-1/2 inches (38.1 mm).

F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
2. Steel Studs: ASTM C 645.

    a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
    b. Depth: As indicated.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

    a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).

G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
    b. Chicago Metallic Corporation.; Furring Systems/Drywall
    c. USG Interiors, Inc.; Drywall Suspension System.

2.3 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.
2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
2. Depth: 3-5/8 inches (92.1 mm) or 6 inches (152.4 mm), unless otherwise indicated.

C. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).

b. Metal-Lite, Inc.; Slotted Track.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
2. Depth: 7/8 inch (22.2 mm).

F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
c. Location: As indicated.

2. Type X:

a. Thickness: 5/8 inch (15.9 mm).
b. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
c. Location: Where required for fire-resistance-rated assembly.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joint, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by manufacturer.

2.6 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

    a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
    b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.

2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

   a. Use proprietary deflection track.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling 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 ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, 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 deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

C. Sway-brace suspended steel framing with hangers used for support.

D. Wire-tie furring channels to supports, as required to comply with requirements for assemblies indicated.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two studs at each jamb, unless otherwise indicated.

2. 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.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. 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.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. 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.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

I. Isolate perimeter of non-load-bearing gypsum board 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 U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the 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 board.
b. At high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.8 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.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

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, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

END OF SECTION 09260

SECTION 09310 - CERAMIC TILE

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. Glazed floor tile.
2. Glazed wall tile.
3. Stone thresholds installed as part of tile installations.\

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

1.5 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:

1. Tile patterns and locations.
2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

D. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

E. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:

1. Stone thresholds.
2. Joint sealants.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Tile Products:

a. American Olean Tile Company.
b. Dal-Tile Corporation.
c. Florida Tile Industries, Inc.
d. Crossville, Inc.

2. Tile-Setting and Grouting Materials:

a. American Olean Tile Company.
b. Bonsal: W.R. Bonsal Company.
c. Bostik..
d. Dal-Tile Corporation.
e. DAP, Inc.
f. Laticrete International, Inc.
g. Mapei Corporation.
h. Southern Grouts & Mortars, Inc.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. CT-1- Glazed Ceramic Tile: (Floors) Provide tile complying with the following requirements:

1. Basis of Design: Crossville Argent
2. Composition: Porcelain.
3. Module Size: 6 by 6 inches (147 by 147 mm).
4. Nominal Thickness: 3/8 inch (9.5 mm).
5. Finish: Unpolished

B. CT-2- Glazed Ceramic Tile: (Floors and Walls) Provide tile complying with the following requirements:

1. Basis of Design: Crossville Argent
2. Composition: Porcelain.
3. Module Size: 12 by 12 inches (299 by 299 mm).
4. Thickness: 3/8 inch (9.5 mm).
5. Finish: Unpolished

C. Glazed Ceramic Accent Tile: (Walls) Provide tile complying with the following requirements:

1. Basis of Design: Crossville Argent
2. Composition: Porcelain.
3. Module Size: 6 by 6 inches (147 by 147 mm)
4. Thickness: 3/8 inch (9.5 mm)
5. Finish: Unpolished

D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:

1. Basis of Design: Crossville Argent A1420 On the Rocks
2. Shape: 4 x 12 Single Bullnose

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.

1. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.

1. Provide white, honed marble complying with the Marble Institute of America's Group A requirements for soundness.

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:

1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

a. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:

a. Latex Additive: Styrene butadiene rubber.
b. Latex Additive: Acrylic resin.
c. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

B. Medium-Bed, Latex-Portland Cement Mortar: Provide materials composed as follows, with physical properties equaling or exceeding those required for thin-set mortars based on testing of medium-bed specimens according to ANSI A118.4:

1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
2. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:

a. Latex Additive: Styrene butadiene rubber.
b. Latex Additive: Acrylic resin.

2.6 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:

1. Factory-Prepared, Dry-Grout Mixture: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to produce the following:

a. Unsanded grout mixture for joints 1/8 inch (3.2 mm) and narrower.

2. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:

a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for materials described in Section H-2.3, for joints 1/8 inch (3.2 mm) and narrower.

b. Latex Additive: Styrene butadiene rubber.
c. Latex Additive: Acrylic resin.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:

1. One-Part, Mildew-Resistant Silicone Sealants:

a. Dow Corning 786; Dow Corning Corporation.
b. Sanitary 1700; GE Silicones.
c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
e. Tremsil 600 White; Tremco, Inc.

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.

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 installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. 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 before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken

from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

   1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Grout tile to comply with the requirements of the following tile installation standards:

   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.5 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Install metal lath and scratch coat to walls to comply with ANSI A108.1A, Section 4.1.

C. Joint Widths: Install tile on walls with the following joint widths:

1. Wall Tile: 1/8 inch (3.2 mm).

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 CERAMIC TILE FLOOR INSTALLATION SCHEDULE

A. Ceramic Tile Floor Installation (Toilet rooms): Where interior floor installations of this designation are indicated, comply with the following:

1. Tile Type: Unglazed ceramic mosaic tile.
2. Installation Method: TCA F113 (thin-set mortar bonded to concrete subfloor).
3. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:

    a. Latex-portland cement mortar.
    b. Unsanded latex-portland cement grout.

3.8 CERAMIC TILE WALL INSTALLATION SCHEDULE

A. Ceramic Tile Wall Installation (Tile in metal stud applications): Where interior wall installations of this designation are indicated, comply with the following:

1. Tile Type: Glazed ceramic mosaic tile.
2. Installation Method: TCA W211 (cement mortar bed bonded to clean, sound, dimensionally stable masonry or concrete).
3. Setting Bed and Grout: ANSI A108.1B with the following mortar and grout:

    a. Latex-portland cement mortar.
    b. Unsanded latex-portland cement grout.

END OF SECTION 09310

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.

1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.

C. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.

D. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1. Obtain both acoustical ceiling panels and suspension system from the same manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Antimicrobial Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial solution consisting of a synergistic blend of substituted ammonium salts of alkylated phosphoric acids admixed with free alkylated phosphoric acid that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.

D. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

H. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, 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.

2. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.

   a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).
   b. Color: As selected by Architect from manufacturer's standard colors.

3. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

   a. Armstrong World Industries, Inc.
   b. Celotex Corporation (The); Building Products Division; Architectural Ceilings Marketing Dept.
   c. Chicago Metallic Corporation.
   d. USG Interiors, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.

   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

   1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. 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 structure to which hangers are attached and 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, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

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. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. Install panels with pattern running in one direction parallel to short axis of space.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

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.

3.5 ACOUSTICAL PANEL CEILING SCHEDULE

A. Water-Felted, Mineral-Base Acoustical Panels for Acoustical Panel Ceiling. Provide acoustical panels, treated with antimicrobial solution, and complying with the following:

1. Products: Available products include the following:

a. "School Zone Fire Fissured"; Armstrong World Industries, Inc.

2. Classification: Panels fitting ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted.
3. Pattern: Panels fitting ASTM E 1264 pattern designation C (perforated, small holes), E (lightly textured).
4. Color: White.
5. Light Reflectance Coefficient: LR 0.85.
6. Noise Reduction Coefficient: NRC 0.70.
7. Ceiling Attenuation Class: Not less than CAC 35.
8. Edge Detail: Square sized to fit flange of exposed suspension system members.
9. Thickness: 3/4 inch (19 mm).
10. Size: 24 by 24 inches (610 by 610 mm).
11. Designation: ACT-1

B. Gypsum Panels with Scrubbable Vinyl Finish for Acoustical Panel Ceiling: Where this designation is indicated, in wet areas and other high humidity spaces provide gypsum lay-in panels, treated with antimicrobial solution, and complying with the following:

1. Products: Available products include the following:

a. "Sheetrock Brand Lay-In Ceiling Tile ElimaPlus, Vinyl, USG Interiors, Inc.

2. Classification: Panels fitting ASTM E 1264 for Type XX, other types; described as high-density panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
3. Pattern: Panels fitting ASTM E 1264 pattern designation (description) G (smooth
4. Color: White.
5. Light Reflectance Coefficient: Not less than LR 0.75.
6. Edge Detail: Square.
7. Thickness: 1/2 inch (13 mm).
8. Size: 24 by 24 inches (610 by 610 mm).
9. Designation: ACT-2

C. Suspension System for Acoustical Panel Ceiling APC-[1]: Where this designation is indicated, provide acoustical panel ceiling suspension system complying with the following:

1. Products: Available products include the following:

a. "Prelude ML"; Armstrong World Industries, Inc.

2. 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 A 653/A 653M, G01 (Z001) coating

designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:

a. Structural Classification: Intermediate-duty system.
b. End Condition of Cross Runners: Override (stepped) type.
c. Face Design: Flush face.
d. Cap Material: Steel sheet.
e. Cap Finish: Painted to match color indicated by manufacturer's standard color designations.
f. Use: All general use areas where acoustical panels are specified.

3. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized-Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation, with prefinished, 15/16-inch- (24-mm-) wide, aluminum caps on flanges; other characteristics as follows:

a. Structural Classification: Intermediate-duty system.
b. Aluminum Cap Finish: Painted white.
c. Use: All high humidity areas where Vinyl Faced Sheetrock panels are specified.

END OF SECTION 09511

SECTION 09651 - 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. This Section includes the following:

1. Vinyl composition floor tile.
2. Resilient wall base and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors and patterns available for each type of product indicated.

C. Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.

D. Maintenance Data: For resilient floor tile to include in the maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Store tiles on flat surfaces.

D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

D. Install tiles and accessories after other finishing operations, including painting, have been completed.

E. Where casework and other items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.

F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Furnish not less than one box for each 50 boxes or fraction thereof, of each type, color, pattern, class, wearing surface, and size of resilient tile flooring installed.
2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Tile Flooring Schedule at the end of Part 3.

2.2 RESILIENT TILE

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066 and with requirements specified in the Resilient Tile Flooring Schedule.

2.3 RESILIENT ACCESSORIES

A. Rubber Wall Base: Products complying with FS SS-W-40, Type I and with requirements specified in the Resilient Tile Flooring Schedule.

B. Vinyl Accessory Moldings: Products complying with requirements specified in the Resilient Tile Flooring Schedule.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring 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, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 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 flooring manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. General: Comply with tile manufacturer's written installation instructions.

B. Lay out 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 of a tile at perimeter.

1. Lay tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, 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 chalk or other nonpermanent, nonstaining marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Hand roll tiles according to tile manufacturer's written instructions.

3.4 RESILIENT ACCESSORY INSTALLATION

A. General: Install resilient accessories according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
3. Do not stretch base during installation.
4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
5. Install premolded outside corners before installing straight pieces.
6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

D. Apply resilient products to stairs as indicated and according to manufacturer's written installation instructions.

3.5 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by flooring manufacturer.
4. Damp-mop floor to remove marks and soil.

B. Protect flooring against mars, marks, indentations, and other 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 flooring manufacturer.

1. Apply protective floor polish to floor surfaces that are free from soil, visible adhesive, and surface blemishes, if recommended in writing by manufacturer.

    a. Use commercially available product acceptable to flooring manufacturer.
    b. Coordinate selection of floor polish with Owner's maintenance service.
    c. Provide a minimum of 8-10 coats of floor polish in the classroom building and 12-15 coats of floor polish in the multi-purpose addition.

2. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.

3. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

1. Before cleaning, strip protective floor polish that was applied after completing installation only if required to restore polish finish and if recommended by flooring manufacturer.
2. After cleaning, reapply polish to floor surfaces to restore protective floor finish according to flooring manufacturer's written recommendations. Coordinate with Owner's maintenance program.

3.6 RESILIENT TILE FLOORING SCHEDULE

A. Vinyl Composition Tile VCT-[1]: Where this designation is indicated, provide vinyl composition floor tile complying with the following:

1. Available Products: As follows:

   a. "Imperial Texture"; Armstrong World Industries, Inc.

2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for tile complying with requirements indicated
3. Class: Class 2 (through-pattern tile).
4. Wearing Surface: Smooth.
5. Thickness: 1/8 inch (3.2 mm).
6. Size: 12 by 12 inches (304.8 by 304.8 mm).

B. Rubber Wall Base RWB-[1]: Where this designation is indicated, provide rubber wall base complying with the following:

1. Available Products: As follows:

   a. Armstrong World Industries
   b. BURKEBASE
   c. Mercer

2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for rubber wall base complying with requirements indicated.
3. Style: Cove with top-set toe.
4. Minimum Thickness: 1/8 inch (3.2 mm).
5. Height: 4 inches (101.6 mm).

6. Lengths: Cut lengths 48 inches (1219.2 mm) long or coils in lengths standard with manufacturer, but not less than 96 feet (29.26 m).
7. Outside Corners: Premolded.
8. Inside Corners: Premolded or formed on job.
9. Ends: Premolded.
10. Surface: Smooth.

C. Rubber Accessory Molding: Where this designation is indicated, provide rubber accessory molding complying with the following:

1. Available Products: As follows:

   a. BURKBASE
   b. Johnsonite
   c. Mercer

2. Color: As selected by Architect from manufacturer's full range of colors produced for rubber accessory molding complying with requirements indicated.
3. Product Description: Carpet edge for glue-down applications; Reducer strip for resilient flooring; Tile and carpet joiner.
4. Profile and Dimensions: As required at all exposed edges of carpet and resilient flooring

END OF SECTION 09651

SECTION 096813 - TILE CARPETING

Addendum 2

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 modular, tufted carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.
d. Follow manufacturer's modular carpet installation guidelines and/or "CRI Carpet Installation Standard" where applicable.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written specifications and lab documents for any physical testing.
2. Include manufacturer's written installation recommendations for each type of substrate as specified in carpet manufacturer's installation guidelines and/or "CRI Carpet Installation Standard", where applicable.
3. Include carpet maintenance recommendations as outlined by carpet manufacturer.

4. Carpet manufacturer shall also submit a plan for recycling the specified carpet at the end of the useful life of the carpet.

B. Sustainable Design Submittals:
   1. For carpet tile, documentation with testing and product requirements of CRI's "Green Label Plus" program.
   2. For installation adhesive, documentation including printed statement of VOC content.
   3. For carpet tile, documentation indicating, pre-consumer, post-consumer, and total recycled content.

C. Shop Drawings: For carpet tile installation, plans showing the following:

   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Installation method (monolithic, quarter turn, ashlar, brick random, interactive patterning).
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.

D. 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. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

F. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 IINFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, 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 carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Carpet Manufacturer shall have no less than 5 years experience of producing recyclable carpet tile and shall have published product literature clearly indicating compliance with requirements of this section.

1. Certification: ISO 9001 and ISO 14001 certified manufacturer
2. Commitment to Sustainability: Carpet manufacturer must practice environmental responsibility through programs of recycling, reuse, conservation, and source reduction. Manufacturer should have a public demonstration of such efforts through reporting documents such as an annual sustainability report that contains third party verification and confirmation.
3. Carpet manufacturer must take back carpet to be recycled free of charge for quantities of 500 sq. yards (418 sq. m) or more.

B. Fire Test Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Local Carpet Vendor shall have no less than 5 years of Governmental commercial contractual agreement experience.

D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with carpet manufacturer's installation recommendations and the "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. HVAC system should be operational and running prior to carpet installation and remain running after carpet installation.

D. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

E. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

    a. More than 10 percent edge raveling, snags, and runs
    b. Edge raveling
    c. Dimensional instability.
    d. Excess static discharge.
    e. Loss of tuft-bind strength.
    f. Loss of face fiber.

g. Delamination.
h. Where face fiber is 100 percent solution dyed, inability to remove acid based stains, lack of color fastness to light, and lack of colorfastness to atmospheric contaminants.

3. Carpet and fiber must be manufacturer and warrantied by same manufacturer.
4. Warranty Period: Lifetime Commercial Limited Warranty

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Shaw Contract Group- Virtual Spaces- Hype Tile or comparable product by one of the following:

1. Mannington Commercial.
2. Mohawk Group.
3. Shaw Contract Group.
4. Patcraft

B. Color: As selected by Architect from manufacturer's full range- Architect reserves the right to make final adjustments in carpet colors after the award of bid upon reviewing samples.

C. Source Limitations:

1. Single Source Responsibility: Provide products that have components manufactured by a single source. Fiber and backing, as well as final carpet product, should be manufactured and warranted by the same company.
2. Commitment to sustainability: Carpet manufacturer must practice environmental responsibility through programs of source reduction, recycling, reuse, and conservation.

D. Fiber Type: Solution Q Extreme Nylon, Antron Lumena SDN with Duracolor, Antron Lumena SDN with Colorsafe and XGuard, or Antron Lumena SDN with Ensure.

E. Pile Characteristic: Multi-Level Pattern Loop pile.

F. Density: minimum 7,200 oz./cu. yd. (g/cu. cm).

G. Pile Thickness: minimum .079" for finished carpet tile according to ASTM D 6859.

H. Stitches: minimum 10 stitches per inch (mm).

I. Surface Pile Weight: minimum 16 oz./sq.yd.

J. Total Weight: minimum 88 oz./sq.yd. for finished carpet tile.

K. Primary Backing/Backcoating: Nonwoven synthetic, woven polypropylene, or equal; consult manufacturers.

L. Secondary Backing: High performance precoat laminated to a proprietary thermoplastic polyolefin compound with a fiberglass reinforced layer. Backing should be recyclable, PVC free, free of 4-PCH, brominated flame retardants, and phthalate plastizers.

1. Total Backing Weight: Not to exceed 80 oz./sq. yd. (339.1g/sq.m)

M. Size: 24 by 24 inches (610 by 610 mm).

N. Recycling Requirements:

1. Total Carpet Product Recycled Content:

a. Pre-Consumer Recycled Content: minimum 29.7 percent
b. Post-Consumer Recycled Content: minimum 6.6 percent
c. Total Recycled Content: minimum 36.3 percent

2. Recycled Content: Preference will be given to manufacturer's recycling 100 percent of reclaimed carpet tile back into carpet tile with recycled content.
3. Carpet Disassembly and Recycling: Carpet capable of disassembly and recycling, with nylon being recycled into nylon and backing being recycled into backing.
4. Carpet product must meet guidelines of Presidential Executive Order 13101, and must meet the spirit of section 6002 of the Resource and Recovery Act (RCRA).

O. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

P. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.

3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 8 lbf (36 N) according to ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Noise Reduction Coefficient (NRC): Minimum .20 according to ASTM C 423.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesives shall comply with the testing and product requirements of the Carpet and Rug Institute Green Label Plus Program.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

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 carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

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 moisture and pH tests as recommended by carpet tile manufacturer.
2. Where previous surface treatments are unknown, or where other concerns exist as to the ability of the adhesion to bond to the substrate, a 24 hour bond test is recommended.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.

1. Perform bond test recommended in writing by adhesive manufacturer.

G. For raised access flooring systems, verify the following:

1. Access floor substrate is compatible with carpet tile and adhesives.
2. Underlayment surface is flat, smooth, evenly planed, tightly jointed and free of irregularities, gaps greater than 1/8 inch (3mm) , protrusions more than 1/32 inch (0.8 mm), and substances that may interfere with adhesive bond or show through surface.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

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 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: 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 adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area unless the specific carpet style is manufactured as a merge-able dye lot product.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile 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 carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile 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 carpet tile manufacturer.

END OF SECTION 096813

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the 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 work, and primed metal surfaces of mechanical and electrical equipment.

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 and casework.
b. Acoustical wall panels.
c. Metal lockers.
d. Finished mechanical and electrical equipment.
e. Light fixtures.
f. Distribution cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Furred areas.
b. Ceiling plenums.
c. Duct shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper.
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.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
3. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
4. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
5. Division 9 Section "Special Coatings" for industrial paints and maintenance and special coatings.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.

4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.

1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.

a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
b. Small Areas and Items: The Architect will designate an item or area as required.

2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.

a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Devoe & Raynolds Co. (Devoe).
2. Fuller-O'Brien Paints (Fuller).
3. Glidden Co. (The) (Glidden).
4. Benjamin Moore & Co. (Moore).
5. PPG Industries, Inc. (PPG).
6. Pratt & Lambert, Inc. (P & L).
7. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and 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. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. 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 the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    c. When transparent finish is required, backprime with spar varnish.
    d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use

solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
8. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

a. Quantitative material analysis.

3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall

remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
2) Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
5) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.

6) P & L: S 4551 Tech-Gard High Performance Rust-Inhibitor Primer.
7) S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).

1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
2) Fuller: 312-XX Heavy-Duty Industrial Maintenance Enamel.
3) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
4) Moore: Impervo Enamel #133.
5) PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.
6) P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.
7) S-W: Industrial Enamel B-54 Series.

2. Deep-Color, Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

1) Devoe: 41820 Bar-Ox Alkyd Shop/Field Primer.
2) Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
5) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Primer, Red.
6) P & L: S 4551 Tech-Gard High Performance Rust Inhibitive Primer.
7) S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. First and Second Coats: Deep-color, full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.7 mils (0.094 mm).

1) Devoe: 155 All-Weather Exterior Alkyd Gloss House and Trim Paint, Ultra Deep Base.
2) Fuller: 660-XX Weather King Alkyd House & Trim Paint.
3) Glidden: 1901 Series Spred House Dura-Gloss Oil House & Trim Paint.
4) Moore: Moore's House Paint #110.
5) PPG: 1 Line Sun-Proof Exterior Gloss Oil House & Trim Paints, Deeptone or Rustic Tinting Base.
6) P & L: S/D 1100 Series Effecto Enamel.
7) S-W: SWP Exterior Gloss Paint A-2 Series.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Low-Luster Finish: 2 finish coats over a galvanized metal primer.

   a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

      1) Devoe: 8502/8520 Mirrolac Interior/Exterior Waterborne Flat DTM Primer and Finish.
      2) Fuller: 621-05 Blox-Rust Latex Metal Primer.
      3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
      4) Moore: IronClad Galvanized Metal Latex Primer #155.
      5) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
      6) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

   b. First and Second Coat: Low-luster (eggshell of satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

      1) Devoe: 16XX Wonder-Shield Exterior Acrylic Latex Satin House and Trim Paint.
      2) Fuller: 261-XX Eggshell Sheen Latex House and Trim Paint.
      3) Glidden: 6700 Series Spred Ultra Exterior Satin Latex House and Trim Paint.
      4) Moore: MoorGard Latex House Paint #103.
      5) PPG: 76 Line Sun-Proof Exterior House & Trim Acrylic Satin Latex.
      6) P & L: Z/F 4200 Series Accolade Exterior Eggshell.

2. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.

   a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

      1) Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
      2) Fuller: 621-05 Blox-Rust Latex Metal Primer.
      3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
      4) Moore: IronClad Galvanized Metal Latex Primer #155.
      5) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
      6) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.
      7) S-W: Galvite Paint B50W3.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
2) Fuller: 312-XX EPA Compliant Heavy-Duty Enamel.
3) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
4) Moore: Impervo Enamel #133.
5) PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.
6) P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.
7) S-W: Industrial Enamel B-54 Series.

C. Aluminum: Provide the following finish systems over exterior aluminum surfaces:

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a primer.

a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

1) Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
2) Fuller: 621-05 Blox-Rust Latex Metal Primer.
3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
5) PPG: 90-709 Pitt-Tech Primer.
6) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.
7) S-W: Zinc Chromate Primer B50Y1.

b. First and Second Coats: Full-gloss, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
2) Fuller: 312-XX EPA Compliant Heavy-Duty Enamel.
3) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
4) Moore: Impervo Enamel #133.
5) PPG: 6-282 Speedhide Interior/Exterior Gloss Oil Enamel.
6) P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.
7) S-W: Industrial Enamel B-54 Series.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Floors: Provide the following system for floors to receive a concrete sealer:

1. Basis of Design: Vulkem 2102 Silicate Sealer, Hardner and Dustproofer

B. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a block filler.

a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).

1) Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler.
2) Fuller: 280-00 Interior/Exterior Latex Block Filler.
3) Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
4) Moore: Moorcraft Interior & Exterior Block Filler #173.
5) PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
6) P & L: Z 98 Pro-Hide Plus Latex Block Filler.

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
2) Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
3) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
4) Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
5) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
6) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
2) Fuller: 220-20 Pro-Tech Interior Latex Wall Primer and Sealer.
3) Glidden: 5111 Spred Ultra Latex Primer-Sealer.
4) Moore: Regal First Coat Interior Latex Primer & Underbody #216.
5) PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
6) P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

1) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
2) Fuller: 212-XX AA Enamel Acrylic Latex Eggshell Enamel.
3) Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
4) Moore: Moore's Regal AquaVelvet #319.
5) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
6) P & L: Z/F 4000 Series Accolade Interior Velvet.

2. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
2) Fuller: 220-20 Pro-Tech Latex Wall Primer Sealer, White.
3) Glidden: 5111 Spred Ultra Latex Primer-Sealer.
4) Moore: Regal First Coat Interior Latex Primer & Underbody #216.
5) PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
6) P & L: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
2) Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
3) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
4) Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
5) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
6) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

D. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:

1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.

a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.1 mils (0.028 mm).

1) Devoe: 51701 Wonder-Prime Interior All-Purpose Latex Primer Sealer & Vapor Barrier.
2) Fuller: 220-07 Interior Alkyd Enamel Undercoat.
3) Glidden: 310 Glidden Wood Undercoater.
4) Moore: Moore's Latex Enamel Underbody #345.
5) PPG: 17-255 Quick-Drying Enamel Undercoater.
6) P & L: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.
7) S-W: ProMar 200 Alkyd Enamel Undercoater B21W201.

b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

1) Devoe: 84XX Mirrolac-WB Interior-Exterior Waterborne High Gloss Enamel.
2) Fuller: 213-XX AA Enamel Interior Acrylic Latex High-Gloss Enamel.
3) Glidden: 6900 Series Lifemaster Pro Hi-Performance Acrylic Coating.
4) Moore: Impervex Enamel #309.
5) PPG: 51 Line Brilliant Reflections Interior/Exterior Latex Gloss Enamel.
6) P & L: Z/F 4400 Series Accolade Interior High Gloss.
7) S-W: ProMar 200 Interior Latex Gloss Enamel B21W201.

E. Natural-Finish Woodwork: Provide the following natural finishes over new, interior woodwork:

1. Water-Based, Full-Gloss, Varnish Finish: 2 finish coats of a waterborne, clear, full-gloss varnish over a sealer coat. Wipe filler before applying stain.

a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.

1) Devoe: None required.
2) Moore: Benwood Paste Wood Filler #238.
3) PPG: None required.
4) P & L: None required.

b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

1) Devoe: 4200 WoodWorks Waterborne Quick-Dry Clear Sealer.
2) Moore: None recommended.
3) PPG: 77-30 Rez Interior Quick-Drying Sealer and Finish.
4) P & L: Z 7520 Latex Sanding Sealer.

c. First and Second Finish Coats: Waterborne finish applied at spreading rate recommended by the manufacturer.

1) Devoe: 4400 WoodWorks Waterborne Crystal Clear Finish, Gloss.
2) Moore: Stays Clear Acrylic Polyurethane #422, Gloss.
3) PPG: 77-45 Rez High Gloss Acrylic Clear Polyurethane.
4) P & L: Z 24 Acrylic Latex Varnish, Gloss.

F. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over an enamel undercoater and a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
2) Fuller: 621-04 Blox-Rust Alkyd & Structural Metal Primer.
3) Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
5) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
6) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.
7) S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. Undercoat: Alkyd, interior enamel undercoat or full-gloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
2) Fuller: 220-07 Interior Alkyd Enamel Undercoat.
3) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
4) Moore: Moore's Alkyd Enamel Underbody #217.
5) PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
6) P & L: S/D 1001 Suprime "11" Interior Alkyd Wood Primer.
7) S-W: Industrial Enamel B-54 Series.

c. Finish Coat: Full-gloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
2) Fuller: 312-XX EPA Compliant Heavy-Duty Enamel.

3) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
4) Moore: Impervo Enamel #133.
5) PPG: 54 Line Pittsburgh Paints Gloss-Oil Interior/Exterior Enamels.
6) P & L: S/D 1100 Series Effecto Enamel.
7) S-W: Industrial Enamel B-54 Series.

END OF SECTION 09900

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Porcelain enamel markerboards.
2. Plastic-impregnated cork tackboards.
3. Vinyl-fabric-faced cork tackboards.
4. Tackboard material for direct, frameless application to wall substrate.

B. Related Sections include the following:

1. Division 10 Section "Directories and Bulletin Boards" for individually framed, wall-mounted bulletin boards.

1.3 SUBMITTALS

A. Product Data: For each type of visual display board indicated.

B. Shop Drawings: For each type of visual display board required.

1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
2. Include sections of typical trim members.
3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:

1. Markerboards: Actual sections of porcelain enamel finish for each type of chalkboard and markerboard required.
2. Vinyl-Fabric-Faced Cork Tackboards: Fabric swatches for each type of vinyl-fabric-faced cork tackboard indicated.

D. Product Certificates: Signed by manufacturers of tackboards certifying that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame-spread ratings.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of chalkboard manufacturer for both installation and maintenance of the type of sliding chalkboard units required for this Project.

B. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Test-Response Characteristics: Provide vinyl-fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl-fabric-faced tackboards with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating markerboards

without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.6 WARRANTY

A. General Warranty: The special porcelain enamel chalkboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Porcelain Enamel Markerboards:

a. Carolina Chalkboard Co.
b. Claridge Products and Equipment, Inc.
c. Greensteel, Inc.

2. Tackboards:

a. Carolina Chalkboard Co.
b. Claridge Products and Equipment, Inc.
c. Greensteel, Inc.

2.2 MATERIALS

A. Porcelain Enamel Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024-inch- (0.61-mm-), "Vitracite," porcelain enamel clad, Type 1, stretcher-leveled aluminized-steel face sheet, as manufactured by Claridge Products and Equipment. Fuse porcelain enamel coating to steel at approximately 1000 deg F (540 deg C).

    a. Cover Coat: Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.

2. Core: 3/8-inch- (9.5-mm-) thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
3. Backing Sheet: 0.005-inch- (0.127-mm-) thick, aluminum-foil sheet backing.
4. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.

B. Plastic-Impregnated Cork Tackboards: Seamless sheet, 1/4-inch- (6.4-mm-) thick, ground natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as scheduled or as selected from manufacturer's standards.

C. Vinyl-Fabric-Faced Tackboards: Mildew-resistant, washable vinyl fabric complying with FS CCC-W-408, Type II, weighing not less than 13 oz./sq. yd. (440 g/sq. m), laminated to 1/4-inch- (6.4-mm-) thick cork sheet. Provide fabric with a flame-spread rating of 25 or less when tested according to ASTM E 84. Provide color and texture as scheduled or as selected from manufacturer's standards.

1. Backing: Factory laminate cork face sheet under pressure to 1/4-inch- (6.4-mm-) thick hardboard backing.

2.3 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch- (1.57-mm-) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where size of visual display boards 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.
2. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.
3. Chalktray: Manufacturer's standard, continuous, box-type, aluminum chalktray with slanted front and cast-aluminum end closures for each chalkboard.

4. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:

   a. Display Rail: Provide continuous cork display rail approximately 1 or 2 inches (25 or 50 mm) wide, as indicated, integral with map rail.
   b. End Stops: Provide one end stop at each end of map rail.
   c. Map Hooks: Provide 2 map hooks for every 48 inches (1220 mm) of map rail or fraction thereof.
   d. Flag Holder: Provide one flag holder for each room.

2.4 FABRICATION

A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

B. Assembly: Provide factory-assembled chalkboard and tackboard units, unless field-assembled units are required.

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. Provide manufacturer's standard vertical joint system between abutting sections of markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards.

2.5 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION 10100

SECTION 10200 - LOUVERS AND VENTS

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. Fixed, extruded-aluminum louvers.
2. Blank-off panels for louvers.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 8 Section "Steel Doors and Frames" for louvers in hollow-metal doors and frames.
3. Division 15 Sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section, unless otherwise defined in this Section or in referenced standards.

B. Standard Free Area: Free area of a louver 48 inches (1220 mm) wide by 48 inches (1220 mm) high, identical to that provided.

C. Maximum Standard Airflow: Airflow at point of beginning water penetration through a louver 48 inches (1220 mm) wide by 48 inches (1220 mm) high, identical to that provided.

D. Drainable-Blade Louver: Louver designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and channels in jambs and mullions.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.

1. Wind Load: Provide louvers, including anchorage, capable of withstanding the effects of the design loads indicated on **Sheet S1.1 of the Structural Drawings.**
2. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects:

    a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Air-Performance, Water-Penetration, and Air-Leakage Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units 48 inches (1220 mm) wide by 48 inches (1220 mm) high. Test units according to AMCA 500.

1. Perform testing on unpainted, cleaned, degreased units.
2. Perform water-penetration testing on louvers without screens.

1.5 SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: For louver units and accessories. Include plans; elevations; sections; and details showing profiles, angles, and spacing of louver blades. Show unit dimensions related to wall openings and construction; free area for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

1. For installed louvers and vents indicated to comply with design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

D. Product Certificates: Signed by manufacturers of louvers certifying that the products furnished comply with requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with AMCA's Certified Ratings Program.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of louvers that are similar to those indicated for this Project in material, design, and extent.

B. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.

C. Welding Standards: As follows:

1. Comply with AWS D1.2, "Structural Welding Code--Aluminum."
2. Comply with AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. SMACNA Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings 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 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airolite Co.
2. Construction Specialties, Inc.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.

E. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304.

F. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

G. Anchors and Inserts: Of type, size, and material required for loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as needed for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

H. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1. Continuous Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates and without interrupting blade-spacing pattern.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials' tolerances, and perimeter sealant joints.

1. Frame Type: Channel type, unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less. At horizontal joints between louver units, provide horizontal mullions, unless continuous vertical assemblies are indicated.

F. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.

G. Join frame members to one another and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

H. Join frame members to one another and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view; unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Louver Construction: Provide fixed-blade louvers with extruded-aluminum frames and blades.

B. Horizontal, Drainable-Blade Louvers: As follows:

1. Louver Depth: 4 inches (100 mm), or 6 inches (150 mm), unless otherwise indicated.
2. Frame Thickness: 0.081 inch (2.06 mm).
3. Blade Thickness: 0.081 inch (2.06 mm).
4. Blade Angle and Spacing: 45 degrees and 4 inches (100 mm) o.c. for 4-inch-(100-mm-) deep louvers.
5. Blade Angle and Spacing: 45 degrees and 6 inches (150 mm) o.c. for 6-inch-(150-mm-) deep louvers.

2.5 LOUVER SCREENS

A. General: Provide each exterior louver with louver screens complying with the following requirements:

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.

   a. Reinforce extruded-aluminum screen frames at corners with clips.

2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.

D. Louver Screening for Aluminum Louvers: As follows:

1. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.6 BLANK-OFF PANELS

A. General: Fabricate blank-off panels from materials and to sizes indicated and comply with the following requirements:

1. Finish: Same as finish applied to louvers, but black color.
2. Attach blank-off panels to back of louver frames with clips.

B. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets, complying with the following requirements:

1. Thickness: 1 inch (25 mm).
2. Metal Facing Sheets: Aluminum sheet, 0.032 inch (0.8 mm) thick.
3. Insulating Core: Extruded-polystyrene insulation board complying with ASTM C 578, Type VII.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames 0.081 inch (2.06 mm) thick, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with 1/8-by-l-inch (3.2-by-25-mm) PVC compression gaskets.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of colors and glosses.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate Setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

A. Locate and place louver units level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.3 ADJUSTING, CLEANING, AND PROTECTING

A. Periodically clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Protect louvers and vents from damage during construction. Use temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at the time of Substantial Completion.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 LOUVER SCHEDULE

A. Louver Type : Exterior Architectural Louvers

1. Products: Available products include the following:

a. A4157 (4"); Construction Specialties, Inc.

2. Louver Type: Fixed louver.

3. Louver Depth: 4".
4. Louver Construction: Extruded-aluminum frames and blades.
5. Blade Type: Drainable blade.
6. Performance Requirements: As follows:

    a. Minimum Free Area: 48.0 %.

7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

END OF SECTION 10200

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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher[and mounting brackets].

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 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. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.

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. Kidde Residential and Commercial Division.
c. Larsens Manufacturing Company.

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 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

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: Horizontal.

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: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 10530 - ALUMINUM WALKWAY COVER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide aluminum walkway cover system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Work: Documents affecting work of this Section include, but are not limited to General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Manufacturer's Data: Data shall be provided indicating that all materials meet or exceed the specified requirements.

B. Samples: Submit complete sets of samples illustrating materials to be expected in the completed work.

C. Shop Drawings: Submit shop drawings signed and sealed by a Professional Engineer registered in the State where the work is to be erected.

a. Drawing submittals shall contain the following:

a. List of Applicable Codes

b. Design Loadings- Wind load criteria shall be as shown on Sheet S1.1; General Note 13

c. Dimensioned Layout Plan

d. Walkway Cover Sections

e. Connection and Splice Details

f. Foundation Details

1.3 QUALITY ASSURANCE

B. Applicable Standards:

a. Specifications for Aluminum Structures, 6th Edition, 1994

b. Aluminum Association, Aluminum in Building and Construction

c. Specifications for Aluminum Sheet Metal Work in Building Construction

d. Requirements for Education Facilities 1994.

C. Installer: Firm with not less than 5 years of successful experience in the installation of products similar to those required for this project.

D. Specified Product Warranty: Submit standard 1 year warranty including materials and labor on walkway cover system with Owner's name listed as warrantee and beginning date of warranty period corresponding to Date of Substantial Completion.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Products shall be shop fabricated to the greatest extent possible.

B. All materials shall be protected from weather and installation damage continuously during both storage and erection.

C. Handling shall be done in a manner to prevent damage. All damaged areas shall be repaired to match original.

PART 2 - PRODUCTS

2.1 GENERAL

A. Walkway cover shall have drainage from deck to structural gutter and shall convey water to grade using post as downspout.

2.2 MATERIALS

A. Aluminum extrusions shall be 6063 alloy, heat-treated to a T-6 temper.

B. All fasteners and hardware shall be aluminum or stainless steel.

C. Roof Deck: Load bearing roof deck shall be 3 inches deep extruded caps and pans and shall be properly supported by the primary framing members. Roof deck shall be "roll-locked" using interlocking joints designed and fabricated to provide structural continuity and self-flashing. Gauge shall be 0.060 inches or greater to meet required design loads.

D. Gutter: Gutter shall consist of extruded aluminum having the cross-section shown on the drawings. Gutter shall have a 0.110 inch minimum wall thickness and a 5 inch minimum throat width in order to facilitate cleaning by hand. Corners shall be shop fabricated with welded miter joints. Internal gutter splices shall be fastened using aluminum rivet pattern as shown in drawings.

E. Posts: Posts shall consist of four inch or larger 0.150 inch thick extruded aluminum as required to meet design loads.

F. Beams: When required, beams shall be extruded aluminum tubes four inches or larger in cross-section with a minimum wall thickness of 0.150 inches as required to meet design loads.

G. Finish: Finish on all roof deck, posts, beams, and gutters shall be 30 minute clear anodized.

2.3 ACCEPTABLE MANUFACTURERS

A. Lawrence Commercial Systems, 418 Audubon Drive, Tallahassee, Florida 32312. Phone Number: (850) 574-8723, fax number (850) 576-8112 or equal products of another manufacturer.

B. Peachtree Walkway Covers, 1477 Rosedale Drive, Hiram, Georgia 30141

PART 3 - EXECUTION

Addendum 3

3.1 EXISTING CONDITIONS

A. Examine substrates and conditions under which products of this section are to be installed and verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.

B. In the event that discrepancies are discovered, notify the Architect at once. Do not proceed with the installation until discrepancies have been fully resolved.

3.2 INSTALLATION

A. Erection shall be scheduled after all adjacent construction has been completed.

B. Post spacing per shop drawings. When applicable, column interiors shall be filled with grout to the lowest edge of the "drain hole", and the grout sloped to drain prior to the installation of the defector plates.

C. Miter and "butt-cut" joints exhibiting evidence of poor workmanship will be removed and replaced at no additional cost to the Owner.

3.3 CLEANING

A. All discarded materials, rubbish and debris resulting from the work of this section shall be removed from the site. Upon completion of the work, all surfaces which become soiled or coated will be cleaned using methods which will not scratch or otherwise damage finished surfaces.

B. Protect work against damage until final acceptance. Replace or repair any such damaged work to the satisfaction of the Architect.

C. Touch up minor scratches and abrasions.

END OF SECTION

SECTION 10801 - TOILET AND BATH 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. This Section includes the following:

1. Toilet and bath accessories.

B. Related Sections include the following:

1. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.
2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, 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.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:

1. Toilet and Bath Accessories:

a. Bobrick Washroom Equipment, Inc.

b. Bradley Corporation.
c. McKinney/Parker Washroom Accessories Corp.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

G. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

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.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Paper Towel Dispenser: Where this designation is indicated, provide stainless-steel paper towel dispenser complying with the following:

1. Surface-Mounted Type: Sized for minimum of 400 C-fold or 525 multifold paper towels without using special adapters; with hinged front equipped with tumbler lockset; and with refill indicators that are pierced slots at sides or front.

B. Toilet Tissue Dispenser: Where this designation is indicated, provide toilet tissue dispenser complying with the following:

1. Type: Roll-in-reserve dispenser with hinged front secured with tumbler lockset and Single-roll dispenser.
2. Mounting: [Surface mounted with concealed anchorage. Recess mounted designed for nominal 4-inch (100-mm) wall depth.
3. Material: Stainless steel and Satin-finish aluminum bracket with plastic spindle.
4. Operation: Eccentric-shaped, molded-plastic spindle revolves one-half revolution per dispensing operation for controlled delivery; core cannot be removed until roll is empty.
5. Capacity: Designed for 6-inch- (127-mm-) diameter-core tissue rolls.

C. Waste Receptacle: Where this designation is indicated, provide stainless-steel waste receptacle complying with the following:

1. Surface-Mounted Type: With seamless exposed walls; continuously welded bottom pan; and minimum 6.4-gal. capacity, reusable, vinyl liner secured at not less than four points with grommets and hooks.

D. Soap Dispenser: Where this designation is indicated, provide soap dispenser complying with the following:

1. Liquid Soap Dispenser, Horizontal-Tank Type: Surface-mounted type, minimum 40-oz. (1182.9-mL) capacity tank with stainless-steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action; and stainless-steel cover with unbreakable window-type refill indicator.

a. Soap Valve: Designed for dispensing soap in liquid form.

E. Grab Bar: Where this designation is indicated, provide stainless-steel grab bar complying with the following:

1. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
2. Mounting: Concealed with manufacturer's standard flanges and anchors.
3. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
4. Outside Diameter: 1-1/2 inches (38 mm) for heavy-duty applications.

F. Mirror Unit: Where this designation is indicated, provide mirror unit complying with the following:

1. Stainless-Steel, Channel-Framed Mirror: Fabricate frame from stainless-steel channels in manufacturer's standard satin or bright finish with square corners mitered to hairline joints and mechanically interlocked.

G. Mop and Broom Holder: Provide mop and broom holder complying with the following at each mop sink:

1. Products: Available products include the following:
   a. Bobrick B224 x 36
2. Mop and Broom Holder with Utility Shelf: 36-inch- (914-mm-) long unit fabricated of minimum nominal 0.05-inch- (1.3-mm-) thick stainless steel with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted on front of shelf; and approximately 1/4-inch- (6-mm-) diameter, stainless-steel rod suspended beneath shelf for drying rags.

H. Underlavatory Piping Covers: Where this designation is indicated, provide underlavatory guard complying with the following:

1. Products: Trubro Lav Guard Undersink Piping Covers:
2. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

END OF SECTION 10801

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 high-pressure decorative laminate.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

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, electrical switches and outlets and other items installed in plastic-laminate countertops.

C. Samples for Initial Selection:

1. Plastic laminates.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Product Certificates: For each type of product.

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

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. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

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.

C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE 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: Premium.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Formica Corporation.
b. Wilsonart LLC.

D. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Veritcal Surfaces: Grade HGS.
3. Edges: Grade HGS.

E. 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:

a. Solid colors, matte finish.
b. Wood grains, matte finish.
c. Patterns, matte finish.

2. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: Same as laminate cladding on horizontal surfaces.

G. Core Material: Exterior-grade plywood.

H. Core Material at Sinks: exterior-grade plywood.

I. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

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. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Basis of Design – Hafele 631.23 Tow piece round grommet.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:

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.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive 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 (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 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 in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123623.13

SECTION 15010 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the General Contractor in preparing his bid and in no way relieves the General Contractor of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

PLANS AND SPECIFICATIONS

Drawings and Specifications are intended to clearly set forth all work, and the detailed description is added to assist in establishing the scope and the location of the several parts of the work. Collectively, they shall govern and control the scope, character, and design of the Work, and any item called for in any one of the documents shall be as though mentioned in all.

Failure to make reference in the Specifications to any items of the work shown on the Drawings, but necessary to the completion of the Work shall not relieve the Contractor of the full responsibility to furnish the materials and perform the work of such items, in a manner comparable to other items of similar nature for which detailed Specifications are included.

PROJECT FAMILIARIZATION

The bidder is expected to visit the site and familiarize himself with conditions at the site before submitting his bid. He shall familiarize himself with the work required throughout the entire project and shall make allowances for contingencies which may occur in the interconnection of the various systems.

ALTERNATES AND ADDENDA

The Contractor shall investigate all Alternates, Addenda and Allowances as they relate to the Work of this Section.

TESTING

The Work shall include complete testing of all equipment and piping at the completion of the Work and making any connection changes or adjustments necessary for the proper functioning of the system and equipment.

WORK INCLUDED

Work covered under this Section consists of furnishing all labor, materials, tools, equipment, transportation, scaffolding, services, supervision, and performing of all operations required to properly complete all mechanical work in accordance with this Division of the Specifications and as indicated on the applicable Drawings, subject to terms and conditions of the Contract.

SUPERVISION OF WORK

The Mechanical Contractor shall have a qualified and experienced superintendent on the job when any related work is in progress.

RELATED WORK SPECIFIED ELSEWHERE

The Contractor is cautioned to note carefully other Sections of the project Specifications with their cross references to other specific standard specifications, standard detail, etc., describing work to be furnished under these Specifications as well as any mechanical work that may be shown on electrical, structural, architectural, or other drawings, in order that he may fully understand the requirements and work to be provided under this Section of the Specifications.

ORDINANCES AND REGULATIONS

All work shall conform with all local and State ordinances or regulations governing the installation of such equipment. If work as laid out, indicated or specified is recognized to be contrary to or conflicting with local ordinances or regulations, the Subcontractor shall report same to the Architect/Engineer before submitting a bid. The Architect/Engineer will then issue instructions as to procedure.

CODES AND STANDARDS

The standards of the following organizations, and individual standards named, shall be followed the same as if they were fully written herein and constitute a part of the Specification requirements except where otherwise specified: For the specific editions that are applicable see the Drawings.

National Fire Protection Associations - Standards
- NFPA 70, National Electric Code
- NFPA 101, Life Safety Code
- NFPA 90-A, Installation of Air Conditioning and Ventilating Systems.
- NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Op
- FL Building Code
- FL Mechanical Code
- FL Plumbing Code
- Florida Fire Prevention Code
- SREF

National Board of Fire Underwriters
SMACNA HVAC Duct Construction Standard
ANSI/ASME B31.1- Power Piping
ANSI/ASME B31.9 - Building Services Piping

The foregoing rules, standards, regulations, specifications, recommendations and requirements shall be followed by the Contractor as minimum requirements. They shall not relieve the Contract from furnishing and installing higher grades of materials and workmanship which are specified herein or indicated on the Drawings.

Any material, equipment or workmanship specified by reference to the number, symbol or title of Specification or detail, or other standard rules, codes, regulations, etc., shall comply with the latest edition amendments and revisions thereto in effect on the date of these Specifications.

The Contractor shall submit proof, if requested by the Engineer or his representative, that the materials, appliances, equipment or devices that he furnishes and installs under this Contract meet the requirements of the Underwriters' Laboratories, Inc., or Factory Mutual, as regards fire and casualty hazards.

PERMITS, INSPECTIONS AND UTILITY FEES

The Contractor shall obtain necessary permits and inspections required for work and pay all charges incidental thereto. Contractor shall coordinate all utility taps and shall pay all associated fees, impact charges, etc. Upon completion of the work the Contractor shall deliver to the Engineer a certificate of inspection and approval from the local inspection department, if required.

MINOR DEVIATIONS

The Contractor shall note that the Mechanical Drawings are intended to indicate only the extent diagrammatically, general character and location of the work included. Work intended, but having minor details obviously omitted or not shown, shall be furnished and installed complete to perform the functions intended.

Arrangements of piping, ductwork, and equipment that differ materially from the obvious intent of the Drawings will not be permitted except where necessary to avoid interferences, and only where specifically approved by the Architect/Engineer. Drawings shall be furnished showing all changes. Any change resulting in a saving in labor and materials shall be made in accordance with a Contract change order.

BASIC MATERIALS AND METHODS

The materials and methods specified in this article are to be used for work specified throughout this Section of the Specifications.

All materials and workmanship shall be of the highest quality.

Any materials on the job rejected by the Architect/Engineer shall be removed from the premises.

The installation shall be made in a workmanlike manner in accordance with acceptable industry standards except where specific procedures are called for in these Specifications, in which case they shall be followed.

All materials shall be new, free of defects and of the manufacturers latest standard design.

Reference to a particular material or specific equipment by name, make or catalog number is to describe equipment which will meet the requirements of the project and is not intended to restrict bidding.

It is the intent that all of the equipment of a similar type shall be the products of the same (one) manufacturer when practicable, providing unit responsibility for each group.

REVIEW OF MATERIALS

Submittals shall be made in compliance with the General Conditions of the Contract for Construction and the following:

Submittals shall be identified by items numbers as listed in the pertinent section of the specifications and shall be accompanied by a letter of transmittal.

Certificates shall be in triplicate and where required in conjunction with other submittals shall accompany such submittals.

Materials and other items subject to approval shall not be purchased or incorporated in the work before receipt of written approval.

Submittals shall be rendered all at one time for the entire project. Partial submittals will not be accepted or acknowledged. Exception: If a few items have long shop drawing preparation time, then these items will be accepted later to avoid delaying the shop drawing procedure.

SHOP DRAWINGS

Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor and which illustrates some portion of the Work.

All shop drawings submitted shall bear the stamps of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to contractor for proper resubmission. If the shop drawings show variances from the other requirements of the contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment. Otherwise, the Contractor will not be relieved of the responsibility for executing the work even though such shop drawings have been approved.

Submit shop drawings as required by the General Conditions to be retained and additional copies as required by the Contractor, all items required under appropriate sections of the Specifications.

All materials are to be submitted in a hard cover, three ring binder. All materials are to be labeled with the pertinent Specification Section and are to be separated with dividers for each section of the Mechanical Specifications.

All materials submitted late or re-submitted shall be 3-ring punched and marked with the appropriate Specification Section Numbers.

PROJECT CLOSEOUT

The Contractor shall remove all temporary work and temporary facilities prior to final pay request.

The Contractor shall clean spaces that were occupied by temporary work and temporary facilities. Remove debris, rubbish and excess materials from the sites. Burning or burying is not permitted on the sites.

Repair damages caused by installation or use of temporary facilities. Restore to original condition.

Restore grass, landscaping, hardscaping to original condition.

GUARANTEES, BONDS AND AFFIDAVITS

Warranties:

The Contractor shall submit to the Owner all manufacturer's warranties on equipment furnished and installed under this Contract.

In addition, to the guarantee of equipment by the manufacturer of each piece specified herein, the Contractor shall also guarantee such equipment and shall be held for a period of one year from final acceptance test to make good any defects of the materials or workmanship occurring during this period, without expense to the Owner.

Warranty Tags:

Install Equipment Warranty Tags: See Specifications Section: Identification

Affidavits:

The Contractor shall provide affidavits as required in the non-technical portion of these Specifications.

OPERATION AND MAINTENANCE DATA

Manuals and Instructions:

The Contractor shall deliver to the Engineer, upon substantial completion of the Work, two copies of descriptive literature related to the equipment installed under this Contract, including parts lists, wiring diagrams, maintenance and operation manuals and warranties customarily supplied by manufacturers for equipment incorporated in this work. The literature shall be neatly bound in a 3-ring binder and delivered to the Engineer prior to final acceptances. Each manual shall include a copy of the Control Diagrams and a complete description of the operation of the control systems.

The Contractor shall give physical demonstration and verbal instructions for proper operation and maintenance of equipment to the Owner or his designated representative. Schedule these demonstrations and instructions at the Owner's convenience.

Provide two (2) hours of tour and demonstration of all equipment installed under this project.

LCS HVAC Unit Information

Complete the HVAC Unit Information form (following this specification) for each new HVAC unit.

AS-BUILT DRAWINGS

As-Built Drawings are required. Maintain a current and legible record set (full size set) on the job. Final record prints will be drafted by the Engineer and signed off by the Contractor. The Contractor is solely responsible for providing accurate asbuilts.

QUALITY ASSURANCE

Products Criteria:

Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least two (2) years prior to bid opening. Provide list of users upon request.

Equipment having less than a two-year use record, which in the opinion of the Engineer, provided significant benefits to the Owner such as improved energy efficiency, will be acceptable if it is a product of a manufacturer who has been regularly engaged in the manufacture of that specific type of product which has been used in similar applications for a period of two years. The Engineer reserves the right to require the Contractor to submit evidence to this effect for his approval.

Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located, in the opinion of the Engineer, reasonably close to the site.

Manufacturer's Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

Welding: Weldors shall be qualified and tested (certified) to weld the size pipe for this project. Certification shall be within 24 months commencement of welding operations for this project. Certification shall be by a qualified welding testing firm. Weldors shall carry proof of cerfication on the jobsite.

The types and extent of non-destructive examinations required for pipe welds are shown in Table 136.4 of the Code for Pressure Piping, ANSI/ASME B 31.1.

The engineer of record reserves the right to require destructive testing of welds. The contractor shall bear all costs of welding tests that fail and replacing failed welds.

Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

FIRESTOPPING

Provide for firestopping of all mechanical systems. UL listed methods conforming to the situations present shall be utilized. Submit shop drawings of intended methods, including installation instructions and proof of UL Listing.

WALL, FLOOR AND CEILING PLATES

Material and Type: Chrome plated brass or chrome plated steel. Use plates that fit tight around pipes, cover openings around pipes, and cover the entire pipe sleeve projection.

Thickness: Not less than 3/32 inch for floor plates. For wall and ceiling plates, not less than 0.025 for up to 3 inch pipe, 0.035 for larger pipe.

Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, except mechanical rooms or chases. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

INSTALLATION

Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

Protection and Cleaning:

Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Engineer. Damaged or defective items, in the opinion of the Engineer, shall be replaced.

Protect all finished parts of equipment, such as shafts and bearings, where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water, chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

Concrete and Grout: Use concrete and shrink-compensating grout, 3000 psi minimum.

Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

PAINTING

Paint all bare steel pipe, supports, hangers, fabricated parts, etc. with two coats of enamel paint. Prepare surfaces in accordance with the manufacturer's recommendations. Coordinate colors with existing like components or per the Owner.

Paint all cut or heat affected galvanized steel components with two coats of cold galvanizing spraypaint, ZRC Cold Galvanizing compound or equal. Prepare surfaces per the manufacturer's recommendations.

PIPE AND EQUIPMENT SUPPORTS

Generally, support in accordance with industry standards and as described in Section 15150.

Use of chain, wire or strap hangers, wood for blocking, stays and bracing, nor hangers suspended from piping above will not be permitted.

Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 1" clearance between pipe or pipe covering and adjacent work.

LUBRICATION

Field check and lubricate equipment requiring lubrication prior to initial operation.

END OF SECTION

HVAC UNIT INFORMATION

USE THIS FORM TO ADD/REMOVE HVAC UNITS OR TO TRANSFER TO ANOTHER SITE
ONE ACTION PER FORM

PLEASE CHECK ACTION: INSTALL NEW UNIT _____ REMOVE UNIT _____ TRANSFER UNIT _____

TRANSFER UNIT FROM _____ TO _____

UNIT INFORMATION

SITE: _____ UNIT ID (BARCODE):_____

LOCATION OF UNIT: _____ FISH#:_____

PLEASE MARK (X) FOR LOCATION:

Wall Hung	Ceiling Hung	Above Ceiling	Mechanical Room
Mezzanine	Floor Mount	Ceiling Surface	Roof Top

BRAND NAME: _____

MODEL #:_____

SERIAL#:_____

PLEASE MARK (X) FOR TYPE OF UNIT:

Air Handler-AH	Condenser-CD	Package-PK	Fresh Air-FA
Window-WU	Heat Pump-HP	Hydronic-HW	

NOTE: Do not complete this section for removal or transfer of unit.

FILTER SIZES:
A) _____X_____X_____
B) _____X_____X_____
C) _____X_____X_____

NUMBER OF FILTERS:
A) _____
B) _____
C) _____

BELT SIZE: _____

MOTOR SIZE: _____

FREON TYPE: _____

FREON AMOUNT: _____

SECTION 15150 – SUPPORTS AND ANCHORS

PART 1 - GENERAL

DESCRIPTION OF WORK

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

This section is a Division 15 Basic Materials and Methods section, and is part of each Division 15 section making reference to or requiring supports, anchors, and seals specified herein.

Extent of supports, anchors and seals required by this section is indicated on drawings and/or specified in other Division 15 sections.

Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors and seals.

MSS Standard Compliance:

Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.

Select and apply pipe hangers and support, complying with MSS SP-69.

Fabricate and install pipe hangers and supports, complying with MSS SP-89.

Terminology used in this section is defined in MSS SP-90.

UL Compliance: Provide products which are Underwriters Laboratories listed.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.

HORIZONTAL PIPING HANGERS AND SUPPORTS

Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and support to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulating piping. Provide copper plated hangers and support for copper piping systems.

Adjustable Steel Clevises: MSS Type 1.

Steel Double Bolt Pipe Clamps: MSS Type 3.

Adjustable Steel Band Hangers: MSS Type 7.

Steel Pipe Clamps: MSS Type 4.

Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast iron floor flange.

Vertical Piping Clamps: Except as otherwise indicated, provide factory fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper plated clamps for copper ping systems.

Two-Bolt Riser Clamps: MSS Type 8.

Four-Bolt Riser Clamps: MSS Type 42.

HANGER-ROD ATTACHMENTS

Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with ANDI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping hangers and building attachments, in accordance with MSS-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provider copper plated hanger-rod attachments for copper piping systems.

Steel Turnbuckles: MSS Type 13.

Malleable Iron Sockets: MSS Type 16.

BUILDING ATTACHMENTS

Except as otherwise indicated, provide factory fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

Center Beam Clamps: MSS Type 21.

C-Clamps: MSS Type 23.

Malleable Beam Clamps: MSS Type 30.

Side Beam Brackets: MSS Type 34.

Concrete Inserts: MSS Type 18.

SADDLES AND SHIELDS

Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation adjoining insulation.

MISCELLANEOUS MATERIALS

Metal Framing: Provide products complying with NEMA STD ML 1.

Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.

Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ATM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

Heavy Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance wit AWS standards.

PART 3 - EXECUTION

PREPARATION

Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selection and procedures to followed in performing the work in compliance with requirements specified.

INSTALLATION OF BUILDING ATTACHMENTS

Install building attachments as required locations within concrete or structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is places; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

In areas of work requiring attachments to existing concrete, use self-drilling rod inserts, Phillips Drill Co., "Red-Head" or equal.

INSTALLATION OF HANGERS AND SUPPORTS

General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do no use wire of perforated metal to support piping, and do not support piping from other piping.

Horizontal steel pipe and copper tube 1-½" diameter and smaller: support on 6-foot centers.

Horizontal steel pipe and copper tube over 1-½" diameter: support on 10-foot centers.

Locate pipe hangers/supports within 1' of elbow when pipe turns up or down, e.g. for suppy/return piping to AHU coils/headers.

Support piping to not bear on coil headers or on flexible piping connections.

Vertical steel pipe and copper: support at each floor.

Plastic pipe: support in accordance with manufacturer's recommendations.

Fire protection piping: support in accordance with NFPA 13.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

Paint all black steel hangers with black enamel. Galvanized steel and copper clad hanger do not require paint.

Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

Provision for Movement:

Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

Insulated Piping: Comply with the following installation requirements.

Shields: Where low compressive strength insulation or vapor barriers are indicated, install non-compressible insert and use a coated protective insulation shield.

Clamps: Attach clamps, including spacers (if any) to piping projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

Support fire protection piping independently of other piping.

INSTALLATION OF ANCHORS:

Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe

runs, at intermediate points in pipe runs between expansion loops and elbows. Make provisions for present of anchors as required to accommodate both expansion and contraction of piping.

Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

EQUIPMENT BASES

Where specified, provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation unless otherwise specified. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top edge or corners ¾" on all sides.

Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe fittings. Provide factory fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION

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SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of contract, including General and Supplementary Conditions and Division-15 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Provide identification of the following:

Mechanical Equipment (air handlers, condensing units, terminals, VFDs, etc.)
Mechanical Controls (panels, equipment, devices, sensors, etc.)
Mechanical Piping (chilled water, hot water, etc.)

Provide Equipment Warantee Tags:
Mechanical Equipment (air handlers, condensing units, terminals, VFDs, etc.)

Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division 15 sections.

Types of identification devices specified in this section include the following:

Laminated Self adhesive Identification Materials.
Self-Adhering Pipe Identification Materials

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Codes and Standards:

ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

SUBMITTALS

Product Data: Submit six (6) copies of manufacturer's technical product data and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURES:

Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following:

Allen Systems, Inc.
Brady (W. H.) Co.; Signmark Div.
Industrial Safety Supply Co., Inc.
Seton Name Plate Corp.

MECHANICAL IDENTIFICATION MATERIALS:

General: Provide manufacturer's standard products of categories and types required for each application. Where more than one type is specified for application, selection is Installer's option, but provide single selection for each product category. Labels and lettering shall be neat and machine made.

EQUIPMENT IDENTIFICATION MATERIALS:

Plastic or phenolic self-adhesive labels with 3/8" high stenciled letters. Lable shall be black color with white stenciling.

PAINTED IDENTIFICATION MATERIALS:

Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendation of ANSI A13.1

Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

Identification Paint: Standard identification enamel to match existing systems elsewhere in the building.

PLASTIC PIPE MARKERS:

Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1 and matching existing.

Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1 and matching existing.

Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location.

Large Pipes: For external diameters 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height.

Lettering: Comply with piping system nomenclature to match existing systems else where in the building.

Arrows: Apply printed pipe markers with arrows indicating direction of flow.

PART 3 - EXECUTION

EQUIPMENT IDENTIFICATION:

General: Coordinate names, abbreviations with the schedules on the plans.

Install equipment labels on all new and affected panels, and equipment. Place labels in conspicuous location. Ensure label does not interfere with access.

EQUIPMENT WARRANTY TAGS:

General: Warranty tags to include: manufacturer, model number, serial number, warranty end date.

Install equipment labels on all new and affected panels, and equipment. Place labels in conspicuous location. Ensure label does not interfere with access.

PIPING SYSTEM IDENTIFICATION:

General: Coordinate names, abbreviations, pipe colors and other designations used in mechanical identification work, with existing corresponding designations with plans and existing equipment. Consult with the engineer regarding conflicts with existing equipment names.

Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

Plastic pipe markers, with application system as indicated under "Materials" in this section.

Stenciled marker, black or white for best contrast.

Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine room, accessible maintenance spaces and exterior non-concealed locations.

Near each valve and control device.

Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

Near locations where pipes pass through walls or floors/ceiling, or enter non-accessible enclosures.

At access doors, manholes and similar access points which permit view of concealed piping.

Near major equipment items and other points of origination and termination.

Spaced intermediately at maximum spacing of 25' along each piping run, except reduce spacing to 15' in congested areas of piping and equipment.

On piping above removable acoustical ceilings, except omit intermediately spaced markers.

END OF SECTION

SECTION 15250 - MECHANICAL INSULATION

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF WORK:

Extent of the mechanical insulation required by this section is indicated on the Drawings and schedules, and by the requirements of this section.

Types of mechanical insulation specified in this section include the following:

Piping System Insulation:
- Cellular glass
- Closed-cell elastomeric
- Preformed fiberglass

Duct Insulation:
- Fiberglass Ductboard
- Fiberglass Ductwrap
- Fiberglass Duct Liner

RELATED WORK

Refer to Division 7 for fire caulking; not work of this section.

Underground chilled water piping is pre-insulated.

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in the manufacture of mechanical insulation products, of types required, whose products have been in satisfactory use in similar service for not less than three (3) years.

Installer's Qualifications: Installer shall be an insulation specialty sub-contractor. A professional insulator with adequate experience and ability shall install all insulation. Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) having flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) methods.

Comply with the manufacturer's recommendations for installation of insulation materials.

SUBMITTALS

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data, performance data, and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Each type of insulation material, mastics, mechanical fasteners, jacketing/bands, protective coverings, and accessories.

An insulation system schedule that includes each component of the installation for each type of duct and/or piping system for this project.

DELIVERY, STORAGE, AND HANDLING:

Deliver insulation, coverings, cements, adhesives and coatings to the site in containers with manufacturer's stamp or label, affixed and showing fire hazard indexes of products.

Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

DUCTWORK INSULATION MATERIALS:

Fiberglass Duct Wrap: Federal Specification HH-1-558B, 1 pcf density, k=0.24, rated to 450 degrees F operating temperature. FSK reinforced foil vapor retarder. Owens / Corning Type 100 or an approved equivalent.

Rigid Fiberglass Board Insulation: Federal Specification HH-1-558B, 3 pcf density, k=0.23, rated to 450 degrees F operating temperature. FSK reinforced foil vapor retarder. Owens / Corning Quiet R, Manville Type 814 or an approved equivalent.

Closed Cell Elastomeric Duct Wrap: ASTM C 534, k=0.27, rated to 200 degrees F operating temperature, maximum permeability = 0.17 perm-in. Armaflex II or an approved equivalent.

Fiberglass Duct Liner Board: ASTM C 518, k=0.23, rated to 250 deg F operating temperature, ASTM C1338 and G21 Fungi Resistance, ASTM G22 Bacteria Resistance, UL 181 Erosion Test for 4000 fpm maximum air velocity.

PIPING INSULATION MATERIALS:

Cellular Glass Piping Insulation (limited to above-grade installations): ASTM C 552, 8 pcf density, k=0.38, rated to 900 degrees F operating temperature. Pittsburgh Corning Foamglass or an approved equivalent.

Cellular glass bedding mastic: Benjamin Foster 30-45

Indoor Insulation Jacket: All service kraft reinforced foil jacket with an elastomeric polymer barrier reinforced with glass fabric. Vapor permenace less than 0.02 grains/hr.sf.in.Hg. Owens/Corning ASJ/SSL-II, Lamtec 30J or equal.

Indoor Insulation Fittings: Finish with glass fabric and vapor barrier mastic. Childers CP-30 or Pittcote 300.

Exterior Insulation Jacket: Aluminum jacketing 0.016" thickness with bands and seal of same product. Childers Products or equal.

Fiberglass Pipe Insulation: ASTM C 547, 3 pcf density, k=0.26, rated to 650 degrees F operating temperature. Owens/Corning, Fiberglass

Fiberglass insulation jacket: All service kraft reinforced foil jacket. Owens/Corning, ASJ/SSL-II or an approved equivalent.

Closed Cell Elastomeric Insulation: ASTM C 534, k=0.27, rated to 200 degrees F operating temperature, maximum permeability = 0.20 perm-in. Armaflex AP or an approved equivalent.

PART 3 - EXECUTION

INSULATION SYSTEMS:

Duct Systems: Insulate new supply, return, outside air, and transfer air ductwork with 1-1/2" thick fiber glass blanket generally and transition to rigid ductboard at wall penetrations extending 6" on each side of wall.

Duct Systems - Lined: Where indicated, insulate new supply, return ducts with 1" thick fiberglass duct liner board. Duct sizes indicated are internal free area.

Interior Refrigerant Piping: Insulate with 3/4" closed-cell elastomeric insulation.

Exterior Refrigerant Piping: Insulate with 3/4" foam glass insulation with ASJ vapor barrier. Cover with aluminum jacketing.

Interior Chilled Water Piping: Insulate with 2" thick foam glass with ASJ cover for pipes 4" and above, and 1-1/2" thick for all others sizes. Elbows shall be finished with mesh tape and mastic. Exposed insulation in mechanical rooms shall be jacketed with aluminum.

Exterior, and Under Roof Chilled Water Piping (above grade): Insulate with 2" thick foam glass finish with vapor-barrier all-service jacket or coating and cover with aluminum jacketing.

Interior Heating Hot Water Piping: Insulate with 1.5" thick fiberglass insulation cover with aluminum jacketing.

Exterior, and Under Roof Heating Hot Water Piping (above grade): Insulate with 2" thick foam glass and cover with aluminum jacketing.

Miscellaneous Cold Drains and Piping for Freeze Protection: Interior: Insulate with 3/4" closed cell elastomeric insulation. Seal all seams joints, etc. Exterior: Same as interior but use aluminum jacketing.

Domestic Water Piping: Insulate with 3/4" fiberglass with all service jacket.

Mechanical Room Jacket: Aluminum jacketing 0.016" thickness with bands and seal of same

product. Childers Products or equal.

Domestic Water Piping Exposed to the Exterior: Insulate with 1" thick cellular glass pipe insulation with mastic and glass fabric finish.

Exterior Jacket: Aluminum jacketing 0.016" thickness with bands and seal of same product. Childers Products or equal.

Exposed Hot Water Piping and Domestic Cold Water Piping within 8 feet of the floor and throughout mechanical rooms shall be finished with an aluminum jacket.

Equipment, tanks, flexible connections, pumps, etc. shall be insulated with 1" thick (heating systems) and 1.5" thick (cooling systems) elastomeric foam.

GENERAL INSTALLATION REQUIREMENTS:

Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

Surfaces shall be clean and dry before attempting to apply insulation. Mechanical systems shall be turned off and the system shall be at room temperature before insulating. A professional insulator with adequate experience and ability shall install insulation.

Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose. Seal all joints, seams, etc. air and water tight.

Rated floors and partitions shall be penetrated only with insulation materials and techniques UL listed to maintain rated assembly. Any questions shall be referred to the Engineer.

Exposed/exterior piping shall be finished with an aluminum jacketing.

Insulate all hot water piping/equipment/tanks/etc. that operate above 105 deg F.

INSTALLATION OF DUCT WRAP

Application: The insulation shall be applied over 4" wide brushed strips of Foster's 85-20 adhesive spaced 12" on center. The insulation shall be overlapped approximately 2' and stapled in place. All ducts 24" or larger in width shall have the insulation additionally secured with mechanical fasteners spaced approximately 18" on center.

Insulation shall be cut and applied to the ductwork with not less than 2" overlap of backing on each edge and on the linear seams. Insulation shall be removed from all overlapping tabs. Exterior insulation shall overlap internal ductliner 12" where ductliner is stopped and exterior insulation is continued.

On rectangular ducts install so insulation is not excessively compressed at corners.

Seams shall be stapled approximately 6" on center with outward clinching staples.

Seal all seams, tears, punctures, penetrations for hanger straps, or any other breaches of duct wrap facing with tape or mastic to provide a vapor tight system.

INSTALLATION OF RIGID FIBERGLASS BOARD INSULATION

Application: The insulation joints shall be lapped, butted, or mitered and taped in place. All ducts 24" or larger in width shall have the insulation additionally secured with mechanical fasteners spaced approximately 18" on center. Tape all joints and staple with outward clinching staples. Final tape over staples.

Seal all seams, joints, tears, punctures, penetrations or any other breaches of insulation facing with tape. to provide a vapor-tight permanent system.

Use mastic over final taped joints for the connections to fan coil units, air handlers, etc.

INSTALLATION OF RIGID FIBERGLASS DUCT LINER BOARD INSULATION

Application: Apply adhesive to at least 90% of the duct surface. Cut/fit duct liner to assure tight, overlapped corner joints. The top pieces shall be supported at the edges by the side pieces. Apply adhesive to all transverse, longitudinal and cut seams/joints. Secure insulation with mechanical fasteners (weld type) spaced approximately 12" on center. Coat minor tears, edges, damaged areas with a coating of adhesive. See manufacturer's recommendations for more information.

INSTALLATION OF FIBERGLASS AND ELASTOMERIC PIPING INSULATION:

Insulation is not to be installed until the piping systems have been checked and found free of all leaks, and piping is dry (achieved room temperature) and free of debris.

Provide hanger type and support shields of 18-gauge galvanized steel over or embedded in the insulation. Shield shall extend halfway up the pipe insulation cover and at least 6" on each side of the hanger. Insulation shield edges shall be hemmed. Use incompressible inserts at each hanger/support to prevent compressing insulation due to weight of pipe.

Provide standoffs and clamps for wall/floor mounted piping to accommodate insulation thickness. Insulate over clamp and seal all joints, gaps, etc. air and water tight. Use incompressible inserts at each hanger/support to prevent compressing insulation due to weight of pipe.

Securely fasten shield with straps at each end. Insulate anchors adequately to prevent moisture condensation problems.

Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use pieces or scraps abutting each other.

Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier jackets, and protect to prevent puncture or other damage. Gaps and openings in chilled water insulation vapor barrier will not be tolerated.

Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation applied to adjoining pipe. Optional: install factory molded, precut or job fabricated units or elastomeric insulation of same thickness.

Use adhesive to secure elastomeric insulation to metal surfaces. Seal seams, joints, etc. air tight. Provide removable plugs of insulation where access to ports or devices are necessary.

Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

Exposed/outdoor piping with elastomeric insulation shall be protected by aluminum jacketing.

INSTALLATION OF CELLULAR GLASS PIPE INSULATION:

Install continuous coat of insulation adhesive/bedding on piping and on insulation butt and longitudinal ends. Install insulation sections and stagger joints. Butt ends tight, wipe excess bedding, and secure insulation with aluminum bands and wrap with vapor barrier jacket along entire length and butted ends. Apply additional vapor-barrier tape where needed. Seal ends air and water tight with approved mastic.

Apply vapor-barrier jacket in accordance with the manufacturer's instructions. Insure integrity of the vapor barrier with properly applied butt strips. Repair all punctures, penetrations, and holes with tape approved by the manufacturer.

INSTALLATION OF ALUMINUM JACKETING:

Install aluminum jacketing only after insulation installation is completed. Install full-length sections and overlap joints per the manufacturer's requirements. Orient longitudinal seams at bottom of piping. Install stainless steel or aluminum bands to secure insulation on 2' centers. Install prefabricated aluminum fittings at elbows/offsets. Seal all seams joints, openings, etc. water tight with clear/gray silicone sealant.

PROTECTION AND REPLACEMENT:

Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

Seal wall penetrations with sheet metal clip angles along duct/wall perimeter and on both sides of wall.

END OF SECTION

SECTION 15400 - PLUMBING

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Hot and cold water supply piping and all valves, fittings, etc.

A system of waste and vent piping.

Plumbing fixtures.

Domestic water heaters

RELATED WORK

Site Utilities will generally be completed under other contracts.

Electrical wiring is specified in the Electrical Sections.

QUALITY ASSURANCE

All materials and installations are to comply with the following. If conflicts occur between plumbing codes and the specifications, the most restrictive requirements shall govern.

National Electric Code

Florida Building Code

Florida Plumbing Code

Florida Energy Efficiency Code For Building Construction

Florida Administrative Code, 10D-10, Sanitary Facilities for Buildings Serving the Public and Places of Employment.

Accessibility Requirements Manual, Florida Board of Building Codes & Standards

State Requirements for Educational Facilities

Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, whether or not standard for the model scheduled or offered as a substitute, shall constitute the minimum requirements for equipment furnished under this section.

SUBMITTALS

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Water heaters

Plumbing fixtures

Piping, fittings, primers and adhesives

Backflow preventers

Valves, cleanouts, and floor drains

Insulation

Proposed fire proofing systems at penetrations of rated walls

CHANGES

The Drawings indicate generally the locations of plumbing fixtures, apparatus, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner and as directed by the Architect/Engineer.

PART 2 - PRODUCTS

MATERIALS WHICH PENETRATE FIRE WALLS

Where insulated piping or plastic materials penetrate fire walls, provide a UL listed systems for maintaining the rating.

Where bare metal piping systems penetrate fire walls, provide a permanent sleeve which is grouted or rocked into wall. Provide a UL listed fire caulk for the annular space.

PLUMBING FIXTURES, TRIM AND FITTINGS

Furnish and install all plumbing fixtures and trim, floor drains and cleanouts as shown on the Drawings. Fixtures shall be as specified or equivalent quality fixtures by American Standard, Kohler, Universal Rundle or Eljer.

Provide all items of brass and chrome plated finish except where otherwise noted.

Brackets, Anchors, and Cleats: Furnish and install where required for support, conceal behind finished wall.

PIPING

Where more than one material is specified for a particular application, the contractor may select.

All materials shall comply with latest ASTM specifications in each instance that ASTM has specifications and standards relating to such materials.

Sanitary Waste and Vent

Cast Iron Soil Pipe, service weight bell and spigot; ASTM A 74, with neoprene single service compression gaskets.

PVC Sewer Pipe, schedule 40, ASTM D2665.

Cast Iron Soil Pipe, service weight no-hub, ASTM A 74, with neoprene gasket and stainless steel band and screw assemblies conforming to CISPI Standard 301. May be used for vent piping. May be used for drain piping only where space prohibits use of bell's spigot piping.

Copper tubing, Type L, conforming to ASTM B88, with brazed or solder-joint copper, brass or bronze fittings conforming to ANSI B16.18 or B16.22.

Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

Domestic Water Pipe:

Domestic water pipe shall be type L copper conforming to ASTM B88. Piping above grade shall be hard drawn. Piping below grade shall be annealed soft copper with bituminous coating. ~~Piping located with in block walls shall be CPVC.~~

Below Grade & Below Slab Piping & Fittings: Ductile iron pipe: AWWA C151, working pressure 150 psig, exterior and interior bituminous coating. Provide flanged and anchored connection to interior piping.

Below Grade Piping Alternative: PVC pipe: ASTM D2241, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring-Tite or approved equal.

Below Grade Piping Alternative 4" and Above: PVC pipe: AWWA C900, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring Tite or approved equal.

Exposed Pipe in Toilet Areas:

Exposed pipe shall be chrome plated brass, American Brass Co., or equivalent. Furnish and install chrome plated brass wall plates.

Lavatory and Similar Waste Arms:

Type M or L copper water tube, Mueller or equivalent.

Urinal Waste Arms:

PVC.

PIPE ACCESSORIES:

Pipe sleeves: metal (pvc may be used where appropriate) sized to allow minimum clearance between pipe and sleeves or insulation and sleeves.

Provide chrome-plated brass escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.

Furnish and install dielectric or isolation fittings at all points where copper pipe connects to steel pipe.

Adjustable wrought clevis type hanger and rods: Grinnel Company or equivalent. Provide copper hangers for copper piping.

Install water hammer arrestors as shown on the Drawings.

VALVES

Ball Valves: 125 lb., bronze ball valve.

TRAPS

For Lavatories and Sinks: Fully Cast Brass, chrome plated.

PIPE INSULATION

Preformed fiberglass insulation with all service jacket and pvc fitting covers. Insulation shall comply with the 25/50 flame spread and smoke development ratings.

PART 3- EXECUTION

INSTALLATION OF WATER HEATERS

Provide ball valves on both the incoming cold water and leaving hot water supply piping. Provide unions to facilitate replacement of the storage tank and/or heater. Provide storage tank drain.

Heat trap shall be installed in the hot water supply piping.

Provide drain pan fitted for heater size.

Install and pipe relief valves to building exterior or other safe waste receptor. Slope piping towards drain.

Insulate hot water piping.

INSTALLATION OF PIPING

On vertical sanitary drain lines, connect all soil and waste inlets through sanitary tees, wyes, or wyes and eighth bends. Short radius fittings may be used for vent piping. On horizontal lines connect all waste and soil connections through wyes or wyes and eighth bends. Double branch fittings may be used on vertical lines and horizontal runs, providing proper grades can be maintained.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Lay horizontal drain pipes to uniform grade; riser pipes, vertical. Make changes in directions of drain pipes with long bends. No screwed joints permitted in drain pipes, except as described herein.

Lay all sewers and branches, where practicable, on undisturbed earth cut at proper grade. Where laid on fill, provide adequate supports to maintain pitch of the line.

Sizes of risers and mains of water system piping shall be as designated on the Drawings. Verify any omitted sizes before installation.

Cover pipe openings at all times that the work is not in progress at that point.

Cut brass and copper pipe by means of hacksaw. Remove all burrs and metal chips, dirt, etc., before joining pipe. Chrome plated pipe shall show no wrench marks after installation; no threads shall show.

Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Make maximum spacing between pipe supports as follows:

Nominal Pipe Size	Maximum Span
3/4" and under	5'
1"	7'
1-1/4"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'

Sanitary and storm drain piping shall be supported by at least one hanger on each full length of pipe close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.

For support spacing of all other horizontal piping refer to MSS-SP-69 and provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.

Vertical Pipe Supports: Up to 6 inch 60 feet long or not over 12 inch pipe up to 30 feet long, Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the building structure. Vertical pipe larger than the foregoing, support on base elbows or tess, or substantial pipe legs extending to the building structure. Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.

Bases of drain stacks: If not buried in earth support on concrete, brick in cement mortar, or metal brackets permanently attached to building structure.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Yard supply main piping: Piping shall be installed in strict accordance with the manufactures recommendations. Provide 6" clean sand fill for pipe bedding. Insure minimum 18" of cover. Provide concrete thrust blocks at all changes of direction. Hand dig thrust block area just behind fittings. Bevel ends of PVC piping. Test piping in accordance with manufactures instruction.

Condensate piping: Pipe full size (UOS) using Type "L" copper tubing with sweat wrot pressure or DWV fittings. Slope condensate ¼" per foot to drain. Provide air gap. Support on 4' centers and secure with metal framing channel. Isolate dissimilar metals.

INSTALLATION OF VALVES

Isolate all major piping assemblies as shown on the Drawings and as required for proper operation and maintenance. All valves shall be accessible. Provide valve boxes and access panels where required for accessibility.

Install service valve for hot and cold water at each plumbing fixture.

INSTALLATION OF TRAPS

Trap each fixture by water sealing trap placed as near the fixture as possible.

Vent all traps and place within 5 feet of the fixture which it serves unless otherwise noted.

INSTALLATION OF PIPE SLEEVES

Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings above or below grade.

Where subject to moisture or weather, seal sleeves with watertight sealant.

INSTALLATION OF FIXTURES, TRIM, AND FITTINGS

Install the fixtures, trim and fittings specified, taking care to properly anchor each fixture.

Installation of carriers shall comply with manufacturers' maximum recommendations. Carriers shall be bolted to floor slab using all bolt holes or slots provided on carrier. Bolt size shall match hole or slot. Provide lock washer on each bolt. Use "Red Head" self drilling anchors as manufactured by Phillips Drill Co. or approved equal product to set bolts.

When the use of a wrench is necessary on chrome plated piping, protect the pipe from marring by use of felt or cloth wrapping beneath wrench jaws.

INSULATION

Insulate all domestic hot water lines.

Hot water pipe insulation shall be rigid pre-formed fiber glass insulation with a nominal density of 3 pounds per cubic foot with a thermal conductivity of not more than 0.23 at 75 deg F mean temperature. Insulation cover shall be an all service jacket with double self-sealing laps, with self-sealing butt strips. Insulation thickness shall be as follows:

One half-inch (1/2") thick for pipe sizes ½" to 1".
One inch (1") thick for pipe sizes 1-1/4" to 4".

Insulate all domestic cold water lines subject to ambient conditions. Use minimum 1/2" thick closed-cell elastomeric thermal insulation, minimum density of 5.5 pounds per cubic foot with a thermal conductivity of not more than 0.27 at 75 deg F mean temperature. The material shall have a flame spread of 25 or less and a smoke-developed rating of 50 or less as tested by ASTM C534, E84 (25/50) UL-723 (25-50) and NFPA 255 (25-50). Seal all joints, seams, etc. air tight. Insulate (for mechanical protection) all domestic cold water lines located within concrete block walls. Use minimum 1/2" thick closed-cell elastomeric insulation. (ASI 03) Pipe insulation is not required in crawl spaces where located more than 10' from a ventilation opening.

Install insulation in accordance with manufacturer's recommendations.

TESTS AND INSPECTIONS

Make all water and air tests of the piping systems in the presence of and to the satisfaction of the Architect/Engineer or his designated representative. Conduct these tests at such places and with timing to permit work to proceed with as little interruption as possible. Make tests before work is concealed.

Test water piping to hydrostatic pressure at 125 psi and hold for 4 hours.

After the installation of sanitary piping and before the pipe is concealed or the fixtures are installed, cap or plug the ends of the system and fill all lines with water to top of vents above roof and allow to stand until a thorough inspection has been made. Should leaks appear, repeat the tests until the system is tight.

Do not use resin, candle wax or any other such substance for stopping leaks in cast iron soil, waste or vent lines or in storm drain lines. Caulking of screw joints to stop leaks will not be permitted.

STERILIZATION

The sterilization process shall comply with all governing regulations and with the sterilization procedures recommended by the American Water Works Association. The chlorination process may be simplified by first flushing the system thoroughly clean, then charging with water containing a minimum of 50 parts per million of chlorine, allowing this to stand for 24 hours, then thoroughly flushing. After sterilization and final flushing, the local health authority is to be notified and their approval obtained in writing.

END OF SECTION

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SECTION 15510 - HYDRONIC PIPING & SPECIALTIES

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Heating hot water system

Chilled water systems

Preinsulated piping system

Valves

Instrumentation

Hydronic specialties

QUALITY ASSURANCE AND CODES/STANDARDS:

Construct and install piping for highest pressures and temperature in respective systems in accordance with the latest revision of the ASME Code for Pressure Piping, ANSI/ASME B31.1 and Building Services Piping, ANSI/ASME B31.9.

Qualifications for Welding Processes and Operators: ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification."

Regulatory Requirements:

ASME Compliance: fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Quality Control Submittals:

Welders' certificates certifying that welders comply meet the quality requirements specified herein.

Certification of compliance with ASTM and ANSI manufacturing requirements for pipe, fittings, and specialties.

Submit reports specified in part 3 of this Section.

SUBMITTALS:

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings and as many additional copies as required for Contractor use.

Valve Product Data: Provide data from manufacturers, for each hydronic specialty and special duty valve specified. Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions. Submit manufacturer's installation instructions.

Pipe Product Data: Submit data from manufacturer regarding material properties, test data, properties data.

Pipe Fitting Data: Submit manufacturer's product data including certifications, material properties, test data, etc.

Pipe Expansion Provisions: Submit manufacturer's product data including dimensional data, certifications, material properties, capacities, test data, etc.

Preinsulated Piping Systems: Submit scaled shop drawings based upon recent topographical survey, utility survey, and final pipe route. Shop drawings to include expansion calculations and provisions, anchor requirements, field installation notes, etc.

Submit copies of the Weldors' qualifications, certificates, and driver's licenses.

MAINTENANCE DATA:

Maintenance Data: for hydronic specialties and special duty valves, for inclusion in operating and maintenance manual specified in Division 1 and Division 23 Section "Basic Mechanical Requirements."

PART 2 - PRODUCTS

PIPE AND TUBING MATERIALS:

General: Refer to Part 3 Article "PIPE APPLICATION" for identification of systems where the below specified pipe and fitting materials are used.

Steel Pipe: ASTM A 53 or A106, Schedule 40, seamless or ERW, black steel pipe, beveled ends for weld pipe.

Underground Piping: Steel pipe, same as above, with preinsulation system – two-inch thick two-part polyurethane foam insulation and 100 mil thick High Density Polyethylene (HDPE) jacket via qualified reputable manufacturer.

CPVC Plastic Pipe: ASTM D 2846.

FITTINGS:

Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.

Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.

Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

Preinsulated Steel Fittings: Same as above except preinsulated and with HDPE jacket.

Cast-Iron Threaded Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.

Steel Flanges and Flanged Fittings: ANSI B16.5.

Gasket Material: thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

CPVC Plastic Fittings: ASTM D 2846 solvent cemented joints.

SPECIAL DUTY VALVES:

Two-Way Control Valves: Pressure-independent, equal percentage, forged brass body, nickel plated; chrome plated brass ball and stem, fiberglass reinforced Teflon PTFE seat, Viton O-rings, stainless steel spring, 200 psi close-off rating, 0 to 212 deg F temperature range, 5 to 50 psid maximum differential pressure across valve, 400 psi minimum pressure rating with 24 volt multi-function operator, 2 to 10 VDC, 4-20 mA operating range, spring return, 45 in-lb torque (minimum), 95 deg max rotation, and 100 second running time.

Three-Way Control Valves: Same as two way but not pressure independent and A-port equal percentage and B-port modified for common port flow.

Calibrated Plug Valves (Circuit Setter): 125 psig water working pressure, 250 deg F maximum operating temperature, bronze body, plug valve with calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valves 2 inch and smaller shall have threaded connections and 2-1/2 inch valves shall have flanged connections.

Pressure Reducing Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.

Safety Relief Valves: Unless specified otherwise, one hundred twenty-five (125) psig working pressure and 250 deg F maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Select valve to suit actual system pressure and Btu capacity.

BUTTERFLY VALVES:

Comply with MSS SP-67, Butterfly Valves. Provide butterfly valves designed for tight shut-off. Provide gear operators on all butterfly valves 6" and larger. Provide lever operators for valves under 6 inches.

Wafer type valves are prohibited.

Types of Butterfly (BF) Valves: Lug Type 3" and Larger (BF1): 200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-712. Nibco LD 2110-3. Nibco WD 2110-5. Crane 44-FXB-TL. Milwaukee ML123B-8416.

Lug Type 3" and Larger (BF2): 150/200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-722 and LG-721. Nibco LD 2110-5. Crane 44-FXB-G. Milwaukee ML 123B-8115.

Lug Type 4" and Larger (BF3): 175 WWP, cast iron body, nickel-plated ductile or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-72U. Nibco LD 3510-8.

Grooved Type 4" and Larger (BF4): 175 WWP, cast iron body, nickel plated ductile iron or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-82U. Nibco GD 1765-2.

BALL VALVES:

General: Select valve size equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blowout proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome plated ball and reinforced Teflon seats. Valves 1" and smaller shall be full port design. Valves 1 ¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.

Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.

MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

Types of Ball Valves:

Threaded Ends 3" and Smaller: Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee BA 125. Apollo 77-100.

Soldered Ends 3" and Smaller: Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee BA350. Apollo 82-200.

Threaded Ends 3" and Smaller: Bronze two-piece full port body, UL listed (UL842) for use with flammable liquids and LP gas. Nibco T-585-70-UL.

Threaded Ends 2" and Smaller: 175 WWP, bronze two-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.

Threaded Ends 2" and Smaller: 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.

Threaded Ends 2 ½ " and Smaller: 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.

Flanged Ends 2 ½" and Larger: Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

HYDRONIC SPECIALTIES:

Diaphragm-Type Compression Tanks: Size and number as indicated; construct of welded carbon steel for 125 psig working pressure, 375 degree F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1.

Enhanced Air Separator: ASME Pressure Vessel Code construction for 125 psig working pressure, flanged inlet and outlet connection, internal micro-bubble capture media. .

Pump Suction Diffusers: Cast-iron body, with threaded connections for 2 inch and smaller, flanged connections for 2-1/2 inch and larger; 175 psig working pressure, 300 deg F maximum operating temperature; and complete with the following features:

Inlet vanes with length 2-1/2 times pump suction diameter or greater.

Cylinder strainer with 3/16 inch diameter openings with total free area equal to or greater than 5 times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head.

Disposable fine mesh strainer to fit over cylinder strainer.

Permanent magnet, located in flow stream, removable for cleaning.

Adjustable foot support, designed to carry weight of suction piping.

Blowdown tapping in bottom; gage tapping in side.

Chemical Feeder: Bypass type chemical feeders of five (5) gallon capacity, welded steel construction; 125 psig working pressure; complete with fill funnel and inlet, outlet, drain valves, and extended leg supports.

Manual Air Vent: Bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew: and having 1/8 inch discharge connection and 1/2 inch inlet connection.

Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240 degree F operating temperature; and having 1/4 inch discharge connection and 1/2 inch inlet connection.

Y-Pattern Strainers: Cast-iron body (ASTM A 126, Class B), flanged ends for 2-1/2 inch and larger, threaded connections for 2 inch and smaller, bolted cover, perforated Type 304 stainless steel basket, bottom drain connection; 125 psig working pressure.

Flexible Pipe Connections: Rubber-bellows type for chilled water service and stainless steel reinforced for heating hot water systems. Working pressure rating shall be 150 psig (minimum) at 200 deg F. Rubber bellows shall include multi-layered Kevlar tire cord fabric and solid steel retention ring for higher ratings. Flexible pipe connectors shall be same size as the connecting pipe and either screwed or ANSI flanged.

Inline Flexible Expansion Loops: Factory manufactured 180 degree loops consisting of schedule 40 carbon steel pipe with 150# ANSI Flanged connections, 180 degree return fitting, with stainless steel hose and braid flexible sections equal to Metraflex "Metraloops" or approved equal. Loops shall be rated for 200 psig minimum.

INSTRUMENTATION:

ASME and ISA Compliance: Comply with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

Pressure Gauges: ASME B40.1, Grade A, phosphor bronze bourdon-tube type, bottom connection. Drawn steel or brass case, glass lens, 4-1/2 inches diameter. White coated aluminium scale with permanently etched markings. Accuracy of 1% of range span. Range of 2 times operating pressure.

Gauge Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.

Gauge Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

Mercury-in-glass Thermometers: Die cast case, aluminum finished in baked epoxy enamel, glass front, spring secured, 9 inches long. Adjustable joint finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device. Tube shall be red reading, mercury filled, magnifying lens. Scale shall be satin-faced, nonreflective aluminum, with permanently etched markings. Stem shall be copper-plated steel, aluminum or brass, for separable socket, length to suit installation. Accuracy shall be plus or minus 1 percent of range span or plus or

minus one scale division to maximum of 1.5 percent of range span. Temperature ranges for services listed as follows:

Chilled Water	0 to 100
Hot Water	30 to 240

Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.

Test/Pete's Plugs: Shall be nickel-plated brass body, with 1/2 inch NPS fitting and 2 self-sealing valve-type core inserts suitable for inserting a 1/8 inch OD probe assembly from a dial-type thermometer or pressure gauge. Core material shall be EPDM or neoprene. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation.

PART 3 - EXECUTION

PIPE APPLICATIONS:

Heating Hot Water: Use steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

Chilled Water: Use steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

Underground Chilled and Hot Water Piping: Use preinsulated steel piping system.

PIPING INSTALLATIONS:

Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

Install piping generally parallel to walls and column center-lines, unless shown otherwise on the Drawings. Space piping, including insulation, to provide one (1) inch minimum clearance between adjacent piping and other surface.

Slope water supply and return piping at a uniform grade of 1 inch in 40 feet upward in the direction of flow.

Install branch connections to mains using Tee fittings in main with take-off out the bottom of the main, except for up-feed risers which shall have take-off out the top of the main line.

Install unions in pipes 2 inches and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment. Support piping so no weight bears on connector. Use retention rods and/or rings when recommended by the manufacturer.

Install inline flexible loops in piping runs to accommodate axial expansion/contraction. Drawings show approximate location of loops; however, field conditions will dictate final location and quantity. Field determine actual piping runs/lengths after supports have been installed and consult with manufacturer to determine axial displacement and quantify/length of flexible loops. Install loops per the manufacturer's recommendations.

Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, inline pump, and elsewhere as indicated. Install nipple and ball valve in blow down connection of strainers 2 inch and larger.

Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position.

Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the Drawings.

Install butterfly valves with the valve open as recommended by the manufacturer to prevent binding of the disc in the seat.

Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take-offs with 3-elbow swing joints where noted on the Drawings.

Thermometer Wells: In pipes 2-1/2 inch and smaller increase the pipe size to provide free area equal to the upstream pipe area.

Threaded Joints: Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Align threads at point of assembly. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified). Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

Underground Piping: Install piping spaced to accommodate expansion, installation of anchors, and access for assembly of field joints. Provide minimum 24" cover at roadways – see manufacturer's requirements for backfill and compaction to achieve highway loading capability. Install piping in strict conformance with the manufacturer's shop drawings and installation requirements. Fittings shall be preinsulated. Pressure test all piping prior to insulating. Field insulate pipe sections/joints with same materials as base pipe. Additional protection using pressure sensitive protected wraps is

permitted to ensure sealed joints. Continue use of preinsulated piping to 12" above finish grade. Install aluminum jacket on above-gound insulated piping to extend to finish grade.

PIPE WELDING:

All welding shall be performed by qualified and certified welders. Welders' qualifications/certification shall be current, i.e. not more than 24 months since issuance, and fully completed by a reputable source. Welders shall submit copies of certificate and driver's license to engineer for review/approval. Maintain copies of certificates/licenses onsite. Welders shall be qualified on the size pipe utilized for this project.

Unless otherwise specified, welding shall be performed using Shielded Metal Arc Welding (SMAW), otherwise referred to as "stick" welding.

Welds require preparation of surfaces, beveling, and multiple passes.

All welds shall be inspected. The engineer reserves the right to utilize any examination procedure listed in Chapter VI of ANSI/ASME B31.1 to verify integrity of any welds in question. If welds are found to be in compliance then testing costs shall be paid by the project. Otherwise the contractor shall bear all related testing costs, weld/pipe replacement costs, additional engineering inspection or reporting costs, etc.

VALVE APPLICATIONS:

General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:

Shut-off duty: use gate, ball, and butterfly valves.

Throttling duty: use globe and ball valves.

Install shut-off duty valves at supply connection to each piece of equipment, and elsewhere as indicated.

Install throttling duty valves as indicated.

Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.

Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

Install check valves on each pump discharge and elsewhere as required to control flow direction.

Install safety relief valves on hot water generators, boilers, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.

Install pressure reducing valves on make up water system, and elsewhere as required to regulate system pressure.

VALVE FEATURES

General: Provide valves with features indicated and where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

Valve features specified or required shall comply with the following:

Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

Threaded: Provide valve ends complying with ANSI B2.1.

Solder-Joint: Provide valve ends complying with ANSI B16.18.

Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.

Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.

Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.

Extended Stem: Increase stem length by 2: minimum, to accommodate insulation applied over valve.

Mechanical Actuator: Provide factory fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve for all valves 4" and larger that are mounted more than 7' 0" above the floor, or are otherwise difficult to operate regardless of height.

HYDRONIC SPECIALTIES INSTALLATION:

Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system air venting. Pipe air vent drains using ¼" soft copper and terminate at nearest safe waste. Support piping on 2' centers.

Install automatic air vents at high points in the system, heat transfer coils, and elsewhere as required for system air venting.

Install pressure/temperature ports across cooling and heating coils, control valves that do not include these fittings, and as needed for proper testing, adjusting, and balancing.

Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

Use dielectric unions or flanges to isolate dissimilar materials.

FIELD QUALITY CONTROL

Preparation for testing: Coordinate tests with the engineer three days in advance and prepare hydronic piping in accordance with ASME B 31.9 and as follows:

Leave joints including welds uninsulated and exposed for examination during the test.

Flush system with clean water. Clean strainers.

Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing.

Examine system to see the equipment and parts that cannot withstand test pressures are properly isolated.

Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure or at least 100 psig. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test.

After the hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks. Document all tests by recording test area, setup, participant's names, test pressure, duration, and final results.

FLUSHING AND CLEANING:

Water treatment will be provided by the owner. Coordinate flushing and cleaning operation with owner's representative.

Flush entire water piping system. Remove, clean, and replace strainer screens.

Circulate cleaning solution for 4 hours.

Final flush entire water piping system. Remove, clean and replace strainer screens.

Close and fill system as soon as possible after final flushing to minimize corrosion.

END OF SECTION

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SECTION 15764 – VARIABLE AIR VOLUME AIR HANDLING UNITS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

In general, the work consists of, but is not limited to, the following:

Provide air handling units including factory start-up and warranties. Contractor shall visit the site and confirm layout and unit overall sizes prior to submitting shop drawings. Contractor to advise the Architect/Engineer in writing if significant changes are proposed.

RELATED WORK

Electrical power wiring is specified in the Electrical Sections.

All utility connections, including power, controls, drains, chilled water, heating hot water; are described elsewhere.

QUALITY ASSURANCE

Air Handling Units: Certify capacity, static pressure, fan speed, horsepower and selection procedures in accordance with ARI 430.

Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410.

Air-handling Unit Assembly: Shall have UL 1995 certification for safety, including use with electric heat. Units requiring electric connection shall be listed and classified by ETL and CSA as suitable for the purpose specified and indicated.

Air-handling Unit Assembly: Shall meet NFPA 90A requirements.

MANUFACTURER'S STANDARD CONSTRUCTION

Exception to these specifications: It is not the intent that any supplier is locked out based on the specifics of that manufacturer's standard construction. Prior to bid, bidders shall submit request for substitution forms and shop drawings per the Division 1 specifications. The shop drawings shall be to scale and include coil locations, coil pull area, service areas, access door swings, etc.

SUBMITTALS

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings and as many additional copies as required for Contractor use.

Performance data indicating nominal capacity, performance curves per ARI, fan power required, motor data, entering & leaving water temperatures, flow rates and pressure drops.

Submit product data, materials of construction and corrosion protection, required clearances, field connections, weight, dimensional data, specialties and accessories.

Submit installation instructions, including field-wiring diagrams, required utility connections and manufacturer's recommendations. Provide a list of components which will be shipped loose for field assembly. Identify any special handling and storage procedure necessary to protect the equipment prior to operation.

Provide O&M manuals: Include manufacturer's descriptive literature, wiring diagrams, start-up instructions, and maintenance procedures. Provide a schedule of recommended periodic inspection and preventive maintenance procedures. Provide a list of any spare parts recommended for start-up or on site storage.

WARRANTY

Provide manufacturer's standard one year parts and labor warranty.

PART 2 - PRODUCTS

GENERAL

Provide a double-walled air handling unit specifically designed for the intended service. The unit shall be factory fabricated, assembled and tested. Units shall ship fully assembled unless directed otherwise in writing by the contractor. The unit shall perform as indicated in the Schedule and shall be configured to include all components/sections indicated on the Drawings.

Unit shall have injected one-inch thick two-part polyurethane foam insulation.

CASING

Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit. Single height coil sections shall have removable frame sections to facilitate vertical coil extraction.

Top or side lugs shall be provided for lifting the unit/sections.

Construct unit casing exterior panels of G60 galvanized steel with factory painted exterior, UOS.

The unit shall have a complete double wall internal liner of G60 galvanized steel.

Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style neoprene gasket to ensure a tight seal.

The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury,

shall be guarded against accidental contact by an enclosure requiring tools for removal.

Accessibility options shall be as follows:

a. Hinged double-wall access door on either side with removable access panel(s) on the other side.
b. Hinged double-wall access doors on access sides.
c. Removable double-wall access panels on opposite side of hinged door.
d. Side access filter door.

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.

All sections shall be double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 6.

Base rails shall be provided, see plans for height, to fully support the unit longitudinally and transversely. Base rails shall be bolted to the cabinet.

Access Doors: Access doors shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 6.

Cooling Coil Drain Pans: Drain pans for cooling coils shall be stainless steel construction. The pan shall be sloped in 4 directions toward the drain fitting. Drain pan shall have recessed bottom drain connections on both sides of the unit. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.

Provide full size, double-wall, factory painted supply air plenums where specified.

Provide perforated internal liner where specified.

FANS

Provide supply fan with DWDI forward-curved blower. Fan assemblies including fan, motor and sheaves shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Manufacturer must ensure maximum fan RPM is below the first critical speed.

Fan and motor assembly shall be mounted on vibration type isolators inside cabinetry.

Units shall be certified in accordance with the central station air handling units certification program, which is based on AHRI Standard 430.

BEARINGS AND DRIVES

Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards, L-50 life at 200,000 hours heavy-duty pillow-block type, self-aligning, grease-lubricated ball bearings.

Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

V-Belt drives shall be fixed cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed.

Provide self-aligning, grease-lubricated bearings with lubrication fittings. Provide extended grease lines to drive/access side of unit casing, for all fan bearings, rigidly attached for easy service access. All bearings shall perform to L-50 200,000 hour average life.

MOTORS AND DRIVES

Units shall have internal motor and drives and shall be provided with a full size removable service door on the drive side of the fan(s).

All three-phase motors shall have a ± 10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with EPACT where applicable.

Fan motors shall be heavy duty, premium efficiency, totally enclosed fan cooled (TEFC) with Class F insulation. Motors shall be rated for VFD inverter duty and labeled accordingly.

V-Belt drive shall be fixed pitch rated at 1.3 times the motor nameplate. Unit shall be outfitted with redundant belts.

COILS

All coil sections shall be provided with drain pans for condensate removal and cleaning operations. The drain pan shall extend under the complete coil and coil-access section. Cooling coil section drain pan shall be stainless steel. Heating coil section drain pan shall be galvanized steel (G90) with anti-microbial coating. Drain fitting shall be flush with the bottom of the pan for side discharge.

Water Coils

Anti-microbial Coil Coating: All coils shall be coated with an anti-microbial: PoluAl XT MB or an approved equal

All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed.

Coil connections shall be MPT and constructed of bronze.

Coils shall be counter flow design, constructed of copper tubes, aluminum plate fins, copper header and nozzles, stainless steel tube sheet and coil casing.

Coils shall be leak tested to 220-psig air pressure under water.

Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410.

FILTERS

Provide factory fabricated filter section of the same construction and finish as unit casing with filter guides and hinged, removable double-wall access doors.

Provide flat filter section to accommodate two-inch thick 30% efficient filters. Filters shall be removable from one side of the filter section.

Provide two sets of 2" thick 30% efficient (ASHRAE 52-76) pleated media equal to FARR 30-30.

Provide standard filter dimensions: 12", 16", 20", 24", 25", 30"

ACCESS SECTIONS

Access shall be supplied as shown on the plans. Access doors shall be provided at least on one side of each section.

PART 3 EXECUTION

AIR HANDLING UNIT DELIVERY AND SETTING

Protect units on site from physical damage and internal access. Handle carefully to avoid damage to components, enclosures, and finish. Protect coils.

Entire installation shall be in accordance with the applicable requirements of the manufacturer.

Provide concrete pads for units, see drawing details.

Connect ductwork, piping, drains, etc. Mechanical contractor is responsible for piping condensate from unit to point of discharge. See Plumbing sheets.

CLEANING AND START-UP

Vacuum and wet wipe interior or unit. Remove all metal shavings and debris.

Install new air filters, lubricate bearings, verify condensate is properly trapped, piping configuration is correct, belts aligned and tensioned, all shipping braces have been removed, and fan has been test run under observation.

Perform startup and report per the manufacturer's recommendations.

END OF SECTION

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SECTION 15820 - AIR TERMINAL UNITS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Variable Air Volume Terminals

Controls (provided by others) are to be factory mounted

RELATED WORK

Electrical wiring is specified in the Electrical Sections.

Controls are provided under Control Sections.

QUALITY ASSURANCE

ARI certified performance.

Acceptable Manufacturers: Titus, Carrier, Enviro-tec or Trane.

SUBMITTALS

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

VAV boxes

MAINTENANCE DATA:

Submit operation and maintenance data. Include manufacturer's descriptive literature, start-up instructions, and maintenance procedures.

DELIVERY, STORAGE AND HANDLING:

Handle equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with manufacturer's rigging and moving instructions for equipment unloading and moving to final location.

PART 2 - PRODUCTS

BACTERIOLOGICAL LINER

All air terminal units shall be provided with a non-porous sealed bacteriological liner with foil facing in contact with the supply air.

The liner and insulation must meet the requirements of UL 181 and NFPA 90A.

The liner must meet bacteriological standards of ASTM C665 and ASTM C 1338. Liners made of Tedlar, Mylar, Silane or Alpha-Temp are not acceptable.

All cut edges must be sealed from the airstream using metal brackets. Use of adhesive backed tape is not acceptable.

Insulation shall be 4 pound density with a 3.5 R value. The lining shall be the Steri-Loc lining system by TITUS or approved equivalent.

VARIABLE AIR VOLUME TERMINALS

Furnish and install single duct, variable volume terminals of the sizes and capacities shown in the plans.

Terminals shall have pressure independent electronic control.

The terminal casing shall be 22 gauge galvanized steel, internally lined with dual density fiberglass insulation which complies with UL 181 and NFPA 90A. All exposed insulation edges shall be coated with NFPA 90A approved sealant to prevent erosion. Surfaces in contact with the supply air shall have foil facing. The casing shall be sealed to minimize leakage.

The damper shall be heavy gauge metal, with its shaft rotating in Delrin self-lubricating bearings. The shaft shall be marked on the end to indicate the damper blade position. The terminal shall be designed for field conversion from normally open to normally closed, or vice versa, without relocating the actuator, changing parts or adding relays.

The damper shall have a built-in stop to prevent overstroking and shall seal against a closed-cell foam gasket, to limit close-off leakage.

PART 3 - EXECUTION

Install units in accordance with manufacturer's installation instructions.

Install units not more than 18" above ceilings to facilitate access via a ladder.

Support units from structure. Use electrical metal framing channel for bridging between structural members and all threaded rod for suspending units.

Install terminal units to ensure a minimum 24" clear access to all electrical and control components.

Provide and install ceiling access panels where necessary to access filters, electrical, control and other components requiring access.

Install inlet ductwork as straight as possible. See and comply with manufacturer's installation details pertaining to size and length of inlet duct to optimize flow sensor accuracy.

Ensure duct connections are tight.

Coordinate control installation with controls contractor.

Prepare for Test & Balance as required by that Section.

END OF SECTION

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SECTION 15860 - FANS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

In-line Exhaust/Supply Fans
Ceiling Exhaust Fans
Supply Fans

RELATED WORK

Electrical wiring is specified in the Electrical Sections.

Control wiring is specified under other sections, provide any control devices as described on the schedule.

QUALITY ASSURANCE

Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA) approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA standards. All fans provided must be licensed to bear the Certified Ratings Seal.

WARRANTY

Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

SUBMITTALS

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Fans

Fan Accessories

MAINTENANCE DATA:

Submit operation and maintenance data. Include manufacturer's descriptive literature, start-up instructions, and maintenance procedures.

DELIVERY, STORAGE AND HANDLING:

Handle equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.
Store equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with manufacturer's rigging and moving instructions for equipment unloading and moving to final location.

PART 2 - PRODUCTS

FAN SCHEDULE

Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage accessories as scheduled on the Drawings or specified hereafter.

Provide fan accessories as scheduled on the Drawings or required in these specifications.

IN-LINE CENTRIFUGAL FANS

Provide in-line centrifugal fans with backward inclined fan wheel and square steel housing with venturi throat inlet. Finish housing in baked enamel. Housing shall have hinged side panel allowing access for cleaning, inspection and service. Line housing with 1" thick duct liner type insulation. Place motor on resilient mounts. Locate motor outside the air stream. Fan must be completely serviceable without disturbing the duct to fan connections. For belt driven fans, provide insulated motor enclosure and belt guard, (motor and drive cover); disconnect switch, inlet guard, outlet guard, backdraft damper and support brackets. Provide direct-drive, electrically-commutated motors (ECM) where scheduled.

CEILING EXHAUST FANS

Provide U.L. listed centrifugal ceiling fans with forward curved fan wheel and steel housing. Finish housing in baked enamel. Line housing with 1/2" thick acoustical insulation. Place motors on resilient mounts. Provide factory finished white aluminum inlet grille and spring loaded backdraft damper. Provide disconnecting means for each fan. The discharge outlet shall be adjustable to horizontal or vertical positions. Provide sheetmetal duct as required to connect fan to duct or cap or vent. Provide square-to-round transitions as needed.

FAN ACCESSORIES

Provide fan accessories as scheduled on the Drawings or required in these specifications.

PART 3 - EXECUTION

Install fans in accordance with manufacturer's installation instructions. Provide requisite inlet/outlet size and straight duct on discharge to minimize system effect.

Locate ceiling exhaust fans in the center of lay in tiles. Support fans from structure such that no weight bears on tile.

Ensure that fans are wired properly, with correct motor rotation, and positive electrical motor grounding.

Verify motor amperage and voltage.

Verify proper backdraft damper operation

END OF SECTION

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SECTION 15891 - METAL AND FLEXIBLE DUCTWORK

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF WORK:

Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section. In general, the work consists of, but is not limited to, the following:

A system of heating and air-conditioning supply and return ductwork.

Smoke/fire dampers, air diffusers and miscellaneous accessories.

Miscellaneous volume/control dampers.

Ventilation air intake ductwork.

RELATED WORK

Insulation is specified under Section 15250.

QUALITY ASSURANCE:

Manufacture's Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's qualifications: Firm with at least three (3) years of successful installation experience on projects with metal ductwork systems similar to that required for project.

Codes and Standards:

SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.

NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilation Systems".

SUBMITTALS:

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Ductwork and materials

Grilles & accessories

Smoke and fire dampers, miscellaneous dampers and installation instructions

DELIVERY, STORAGE AND HANDLING:

Handle ductwork and equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store ductwork and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

PART 2 - PRODUCTS

DUCTWORK MATERIALS:

Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G-90 zinc coating in accordance with ASTM A 525.

Single-Wall Spiral Round Duct: Round duct with mechanical fastening, spiral flat seams, complying with ASTM A527, with G-90 zinc coating in accordance with ASTM A 525.

MISCELLANEOUS MATERIALS:

General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connections of ductwork and equipment.

Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

Flexible Ducts: Insulated spiral-wound spring steel with flame proof vinyl sheathing complying with UL 181, Class I air duct (duct connectors will not be accepted).

Smoke Dampers: Dampers shall meet the requirements listed in NFPA 90A, 92A and 92B and shall be classified as leakage rated dampers for use in smoke control systems in accordance with the UL555S. Provide factory installed electric actuators qualified under UL555S. For each damper provide an access door 4" smaller than sheet metal size in width (up to 18") and 18" in length.

Fire Dampers: Dampers shall meet UL 555 for dynamic systems and shall be provided with angles, hardwares, etc. Dampers shall be air foil blade type or Style "B" out of the airstream type. Damper procurement and installation shall accommodate existing conditions. Provide damper access either via the duct or grille.

Smoke Damper Actuators: Actuators to be normally closed (powered open), spring return (selectable), 120 VAC with end position indication (two built in auxiliary switches), overload protection with disconnect switch. It will meet UL555 and UL555S requirements and be factory mounted to the smoke damper.

Grilles & Registers: Provide as scheduled on the drawings or an approved equivalent.

FABRICATION:

Duct sizes are internal free area unless otherwise noted.

Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

Construct supply duct for 2" static pressure.

Construct return duct for 1" negative static pressure.

Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

PART 3 - EXECUTION

INSTALLATION OF METAL DUCTWORK

Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

Install metal ductwork in accordance with SMACNA HVAC "Duct Construction Standards". Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight and noiseless systems, capable of performing each indicated service. Install each run with minimum number of joints. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

Use single-wall (spiral) round duct where specified and/or as needed to accommodate existing conditions.

Duct sizes shown are internal dimensions. Maintain free area equivalence when making transitions or when transforming between round and/or rectangular duct.

Seal all transverse and longitudinal joints, seams, etc. regardless of pressure class with approved duct mastic.

Routing: Field verify duct route prior to any fabrication. Coordinate layout with existing structure, suspended ceiling and lighting layouts and similar finished work.

Hangers for steel ducts shall be fabricated from sheet metal. Ducts shall be supported from the structure.

Penetrations: Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct insulation with sheet metal flanges/collars two gauges heavier than duct. Minimum width of flanges/collars shall be 1-1/2" or as required to completely seal opeinging. Overlap opening on rectangular openings by at least 1-1/2". Fasten to duct and substrata. Where ducts pass through fire-rated floors, walls, or partitions, provide in accordance with details and accepted industry practice.

Supply Connections: Provide insulated boots sized to fit the supply grille size as indicated. Boot insulation shall be foil faced where exposed to the air stream and sealed with tape.

INSTALLATION OF SMOKE/FIRE DAMPERS:

General: Install dampers in accordance with the manufacturers' installation instructions in order to maintain the UL listing. Fire dampers shall be out of the air stream as specified on the plans.

INSTALLATION OF FLEXIBLE DUCTS:

Maximum Length: For any duct run using flexible ductwork, do not exceed fifteen (15) feet extended length – use round steel duct for longer runs. Install shortest possible length.

Installation: Install in accordance with Section III of SMACNA "HVAC Duct Construction Standards, Metal and Flexible". No bends shall be made with center-line radius of less than one duct diameter.

Flexible duct hangers shall be constructed from hanger wire and 3" wide sheet metal saddles. Wire gauge shall be per SMACNA and saddles shall have hemmed edges and corners. Support as needed to avoid kinks and flow obstructions.

END OF SECTION

SECTION 15902 - DIGITAL HVAC CONTROLS COORDINATION (BY OWNER)

PART 1 - GENERAL

GENERAL CONDITIONS

This work is to be completed by the Controls Vendor in accordance with a separate direct contract agreement with Leon County Schools as assigned to the Construction Manager for coordination & implementation.

Equipment Installation Contractor/Subcontractors shall be responsible for the following tasks:

a. Coordinate activites with the Control Subcontractor.

b. Provide Control Subcontractor with all drawings, submittals, specifications and manufacturer's performance data needed.

c. Maintaining systems in operation during test and balance.

d. Installation of all control devices in piping and ductwork systems.

Equipment Installation Contractor/Subcontractors to install equpment provided by the Control Subcontractor including:

a. Control Valves, etc.

b. Piping pressure and temperature wells & sockets.

c. Duct-mounted pressure sensors, CO2 sensors, etc.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

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SECTION 15910 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials equipment and incidentals required and install variable frequency drives as shown on the Drawings and as specified here.

These specifications are intended to give a general description of what is required but do not cover all details that will vary in accordance with the requirements of the equipment furnished. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing of all materials equipment and appurtenances for the variable frequency drives specified here.

DESCRIPTION OF SYSTEM

The variable frequency drives specified here will become part of a complete mechanical control system as specified in Division 15. The intention of these specifications is that the mechanical system Supplier shall furnish and coordinate the supply of the Variable Speed Drives with the balance of the equipment and controls installation so as to provide unit responsibility.

The variable frequency drives shall operate standard induction motors. Remote or automatic control of the variable frequency drive shall be as specified. The drives furnished herein shall be totally compatible with the motors to be controlled and the controls supplied.

REFERENCES

Comply with the latest applicable standards: UL-508, National Electric Code, NFPA 70, and IEEE.

QUALIFICATIONS

Variable speed drives shall be of sufficient size for the duty to be performed and shall not exceed their full rated capacity when the driven equipment is operating as specified.

All equipment furnished under these Specifications shall be new and unused and shall be the standard catalog product of the manufacturer.

The drives covered by these specifications are intended to be equipment of proven ability as manufactured by reputable manufacturers having 10 years experience in the production of similar units. The equipment furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.

For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

The variable frequency drive manufacturer shall maintain and staff engineering service and repair shops throughout the United States with personnel trained to do start-up service, emergency service

calls, repair work, service contracts and training of customer personnel. In addition, the drive manufacturer shall maintain such a service and repair facility within 200 miles of the project site.

SUBMITTALS

Copies of all materials required to establish compliance with the Specifications shall be submitted in five (5) copies. Submittals shall include at least the following:

1. Shop Drawings showing all important details of construction, dimensions and anchor bolt locations.

2. Descriptive literature, bulletins, and catalog product sheets of the equipment.

3. Data on the characteristics and performance of the variable frequency drives. Data shall include certification that the variable frequency drives are warranted for use with the motors furnished and the equipment specified in Division 15 and is to be compatible with the instrumentation and control devices installed.

4. Complete Drawings shall be furnished for approval and shall consist of power and control connection diagrams, elementary or control schematics, including coordination with other electrical control devices operating in conjunction with the Variable Frequency Drive, and suitable outline drawings with sufficient details for locating conduit locations and field wiring.

OPERATING INSTRUCTIONS

Three copies of the operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

A factory representative who has complete knowledge of proper operation and maintenance shall be provided for one (1) eight-hour day to instruct representatives of the Owner on proper operation and maintenance. This shall be done in conjunction and in cooperation with the O&M instructions to be provided for the pumps, motors, and instrumentation.

TOOLS AND SPARE PARTS

One (1) set of all special tools required for normal operation and maintenance shall be provided.

The manufacturer shall provide two spares per drive of all Owner-replaceable items such as fuses, pilot lamps, etc.

PRODUCT HANDLING

All parts shall be properly protected so that no damage or deterioration will occur from the time of shipment until installation is completed and the units and equipment are ready for operation.

Factory assembled parts and components shall not be dismantled for shipment or installation unless explicitly stated in manufacturer's installation instructions.

START-UP COMMISSIONING

The manufacturer shall provide start-up commissioning of each VFD supplied by a factory certified service technician who is experienced in start-up and repair services.

Start-up services shall include checking for verification of proper operation and installation of the VFD, its options and all interface wiring to the building automation system. All parameters of the VFD shall be checked and adjusted to within manufacturer's recommended operating ranges.

WARRANTY AND SERVICE AGREEMENT

All equipment supplied under this section shall be covered by a warranty and service agreement. This warranty and service agreement shall be for three (3) years from the date of Owner acceptance. The warranty shall be provided by the drive manufacturer (factory warranty), and include parts, labor, and travel.

The manufacturer's warranty shall be unconditional.

A maintenance and repair service agreement shall be included as part of the drive manufacturer's submittal. Drive manufacturers who cannot provide factory trained service and maintenance are not acceptable.

PART 2 - PRODUCTS

GENERAL

The Contractor shall furnish and install complete Variable Frequency Drives as described in this specification and as detailed on the applicable Drawings.

The Contractor shall be responsible for the installation and start up of the equipment covered by this specification.

CONSTRUCTION

Each Variable Frequency Drive shall consist of a 480 volt, three phase rectifier and variable frequency inverter with features, functions and options as specified.

The Variable Frequency Drives shall be rated for the specified horsepower, NEC full load current, and motor speed at 104 deg F. The variable frequency drives shall be designed to provide continuous speed adjustment of three phase motors. The variable frequency output voltage shall provide constant volts-per-Hertz excitation to the motor terminals up to 60 hertz. Two or more selectable V/Hz patterns shall be available and shall be controlled through software or adjustable hardware.

Variable Frequency Drives shall be rated for an ambient temperature of 0 degrees Celsius to 40 degrees Celsius, an altitude of up to 3,000 feet above sea level and humidity of 0 to 95% non-condensing.

Variable Frequency Drive enclosures shall be NEMA Type 1 or Type 12, wall mounted, ventilated if required by equipment manufacturer and as approved by the Engineer. The inverters shall have complete front accessibility with easily removable assemblies.

The following standard basic control features shall be provided on the inverter:

1. Start, Stop, Power On indicating lights and manual speed control. Terminations for remote mounted operator control devices shall be furnished.
2. Unidirectional operation, coast to rest upon stop.
3. Variable linear independent timed acceleration.
4. Variable torque performance from 4 to 60 Hertz.
5. Dual speed stepover, to prevent operation at two discrete speeds, adjustable.
6. The installation shall meet IEEE 519 Standards for five per cent distortion.
7. Frequency stability of 0.5% for 24 hours with voltage regulation of +-2% of maximum rated output voltage.
8. Phase insensitive to input power.
9. Automatic restart upon return of power following a utility outage.
10. A HAND-OFF-AUTO switch (H-O-A) or keypad button shall be provided and interface with the control sequence specified.
11. Each VFD shall have a non-resettable 0 to 99999.9 hour elapsed run time meter.
12. Each VFD shall have an optically isolated 4-20 mA input for remotely setting motor speed.
13. Each VFD shall have an optically isolated 4-20 mA output signal proportional to the motor speed. Accuracy of the signal shall be verified by comparing the signal to actual motor speed as measured in the field and set to match if required.

The following protective features shall be provided on the drive:

1. Input phase loss and phase reversal protection.
2. Electronic overcurrent trip for instantaneous overload protection.
3. Undervoltage protection of output.
4. Over frequency protection.
5. Over temperature protection.
6. Integral transient protection from input AC line transients meeting ANSI/IEEE Standard C62.41.
7. Electrical isolation between the power and logic circuits, as well as between the 115V AC control power and the static digital sequencing.
8. di/dt and dv/dt protection for converter semiconductors.
9. Units shall have an alpha-numeric or light emitting diodes for diagnostic display of overfrequency, instantaneous overcurrent, DC overvoltage, AC undervoltage/loss of phase, emergency stop, overload, and overtemperature; unit mounted.
10. A protective coating shall be applied to both sides of all printed circuit boards.
11. Input disconnect switch

The following standard independent adjustments shall be provided on the inverter:

1. Minimum speed (as required).
2. Maximum speed (as required).
3. Acceleration time 2 to 60 seconds (minimum).
4. Deceleration time 2 to 60 seconds (minimum).
5. Critical frequency avoidance.
6. Volts per Hertz profile.

The following shall be furnished with the controller:

1. Run indicating relay contacts (closes when VFD is supplying power to the motor) to be wired to Distributed Control Unit.
2. Delayed motor failure indicating relay contact (opens on failure) to be wired to Distributed control Unit.
3. Door mounted output load ammeter, voltmeter, and speed output indicating meters, or equivalent metering shown on alpha-numeric keypad display.
4. Built-in self-diagnostics.

PERFORMANCE

Drives shall have an efficiency at full load and speed that exceeds 95%. The efficiency shall exceed 90% at 50% speed and load.

Drives shall maintain the line side displacement power factor at not less than 0.95, regardless of motor speed and load.

Drives shall be capable of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the drive.

Drives shall be capable of starting into a spinning motor without any adverse affect on the motor and without exceeding normal operating parameters of the drive.

Drives shall meet or exceed IEEE 519 for reflected harmonic distortion.

APPROVED MANUFACTURERS

Furnish units by ABB, Siemens, Cutler-Hammer, GrahamDanfoss, Square D, or Allen Bradley.

PART 3 - EXECUTION

INSTALLATION

Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the location shown on the Drawings. Field wiring shall be in accordance with the manufacturer's recommendations.

TESTING

Tests and checks: Variable frequency drives shall be tested with a motor load of full horsepower rating prior to shipment.

All printed circuit boards shall be functionally tested prior to unit installation.

After all operational tests have been performed, each drive shall undergo a burn-in test. The drive shall be burned in at 100% inductive or motor load without an unscheduled shutdown.

A copy of all tests and checks performed in the field, complete with meter readings and recordings, where applicable, shall be submitted to the Owner.

After the drives have been completely installed, and working under the direction of the manufacturer, conduct in the presence of the Engineer, such tests as necessary to indicate that operation conforms to the Specifications.

END OF SECTION

SECTION 15980 – TEST, ADJUST, AND BALANCE (BY OWNER)

PART 1 - GENERAL

GENERAL CONDITIONS

Actual test, adjust, and balance shall be performed by a Test and Balance Firm hired and paid for by the Owner. The Contractor shall be responsible for:

a. Coordinating the activities of the Test, Adjust, and Balance (TAB) Firm.

b. Notifying the Owner when systems are ready for TAB. The Contractor shall bear the cost of any retesting or return visits required of the TAB firm because systems are not ready.

c. Providing the TAB Firm with all drawings, submittals, specifications and manufacturer's performance data needed.

d. Maintaining systems in operation during TAB work.

e. Making such alterations and corrections (within the scope of the plans and specifications) to systems and equipment as necessary for correct test and balance.

f. Making changes to pulleys, belts, dampers, valve adjustments, pump impeller trimming, or adding dampers, as required by the TAB Firm.

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

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SECTION 16010 ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

APPLICATION

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

These provisions apply to all sections of Division 16 of this project except as specified otherwise in each individual section.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the Construction Manager in preparing his bid and in no way relieves the Construction Manager of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

DESCRIPTION OF WORK

Furnish all labor, materials, equipment and incidentals required to complete all electrical work as specified in this Division and as shown on the Contract Drawings. Division 16 work shall include the installation of a complete and properly operating electrical system. This system required consists basically of, and is not limited to, the following:

Extend the distribution system for lighting and power including the necessary feeders, branch circuits, installation of and connection to lighting fixtures, devices, panelboards, transformers, switches, and all other equipment shown or specified, and the connection to motors, and other power loads furnished under separate divisions.

Extend the building ground system and provide special grounds as indicated.

Connect all control devices as indicated, including all line voltage connections to equipment provided under other sections of the Specification or by other trades.

Furnish and install all necessary access panels for work performed under this section.

Furnish and install emergency lighting system and exit signage as indicated.

Furnish and install the fire alarm and detection system components needed for a complete system. Test, put into operation and certify this system.

Install a system of empty raceways, backboards, grounding apparatus and accessories for the local area network cabling system. Cabling, jacks, active equipment and terminations will be by others.

Install raceways for owner furnished networking system, instructional television and technology.

Provide and install arc flash labels on all new equipment. Labels will be provided to contractor by engineer in pdf format following the submittal phase. Contractor shall print labels and apply to equipment.

Perform the demolition work indicated.

Refer to other Divisions of this specification for electrical requirements of factory installed motors, controllers, power supplies, etc. Electrical connections to equipment furnished as specified in other sections of these Specifications or shown on other than the Electrical Drawings shall be governed by this Division of the Specifications.

The bidder shall inspect the present jobsite conditions before preparing his bid. The submission of a bid will be considered evidence that such a visit and inspection was performed by the bidder and that he takes full responsibility for all factors governing his work.

The electrical work shall be complete, fully operational, and suitable in every way for the service required. Drawings are generally diagrammatic in nature and do not show all details, devices and incidental materials necessary to accomplish their intent. Therefore, it shall be understood that such devices and incidental materials required shall be furnished at no cost to the Owner.

RELATED WORK

Drawings and general provisions of Contract, including General Conditions, Supplementary General Conditions, and Special Conditions sections apply to work specified in Division 16.

The Contractor shall be aware that other divisions of these Specifications may apply to related work required to perform Division 16 requirements. All related work shall be performed in accordance with those divisions.

CONFORMANCE

If the Contractor takes no exceptions to these Specifications in the Submitted Bid, the Contractor will be held totally responsible for failure to comply.

Any exception to the Specification shall reference the affected paragraph(s), subject(s), and list benefit to the Owner.

The Owner reserves the right to have the Contractor replace installed material or equipment which does not comply with these Specifications at the Contractor's expense.

SUBMITTALS

Obtain approval before procurement, fabrication, or delivery of items to the job site. Submit manufacturers' data on the equipment listed below and as directed in other Sections of Division 16. Follow the procedures required in Division 1 of this specification. Data shall be in the form of manufacturer's descriptive data sheets and engineering drawings and will be reviewed by the Architect/Engineer before materials and equipment are delivered to the work site. Review of the submittal by the Architect/Engineer is to check for general conformance to the design intent and will

not relieve the Contractor of the responsibility for the correctness of all dimensions, conformance and the proper fitting of all parts of the work.

Panelboards and Circuit Breakers
Disconnect Switches
Plugs and Receptacles
Motor Starters
Transformers
Surface Mounted Raceway and Installation Drawings
Lighting Fixtures
Lamps and Ballasts
Lighting Controls and Installation Drawings*
Fire Alarm System and Devices and Installation Drawings*

* prepared by Manufacturer or System Supplier

Submit manufacturers' names and catalog numbers for the following materials:

Conduit, Fittings, and Couplings
Boxes and Fittings
600 Volt Wire and Cables
Grounding Equipment

The Contractor shall thoroughly check the submittal for accuracy and compliance with the contract requirements. Shop drawings and data sheets shall bear the date checked and shall be accompanied by the Contractor's statement that they have been checked for conformity to the Specifications and Drawings. Submittals not so checked and noted will be returned without review.

Deliver the entire electrical submittal to the Architect/Engineer complete and in one package. An incomplete submittal will be returned to the Contractor without review.

EQUIPMENT SUBSTITUTIONS

Substitutions that do not increase installation value will not be accepted.

Contractor proposed substitutions may result in necessary changes to the construction documents. Coordination effort due to Contractor proposed substitutions shall be the complete responsibility of the Contractor. All potential conflicts are to be addressed. The Contractor shall also be responsible for any work of any other trades made necessary by the substitution. All potential conflicts with other trades are to be addressed.

The Architect's review of the proposed substitutions and coordination documents is for the benefit of the Owner and not the Contractor and does not relieve the Contractor of responsibility for making any corrections necessary to insure the Owner receives full benefit of the original design intent.

Detailed coordination documents shall be provided for any equipment that, in the opinion of the Architect/Engineer, materially differs from the design documents. This difference includes but is not limited to any equipment having:

- access requirements that differ from the design / specification

- operating characteristics that differ from the design / specification
- footprints or elevations that differ from the design / specification
- connection requirements or locations that differ from the design / specification
- venting or combustion air requirements that differ from the design / specification
- electrical characteristics that differ from the design / specification
- control requirements that differ from the design / specification
- hydronic characteristics that differ from the design / specification
- plumbing requirements that differ from the design / specification

Documentation shall include a detailed listing of all differences from the design / specification. Also included will be a detailed explanation as to why these differences should be considered equal or an improvement.

Any physical differences shall be coordinated with drawings. All Coordination Drawings shall be produced by a competent drafts person and shall be equivalent in quality, detail, and scope to the Construction Drawings.

Acceptance of the substitution as an equal will be the sole descretion of the Architect / Engineer. Items of necessary coordination or review omitted from the documentation shall be grounds for rejection of the substitution.

No cost increase to the Owner for any changes due to coordination will be considered. The Architect/Engineer shall be compensated for any and all efforts associated with review and coordination of non-conforming equipment

CODES, INSPECTION AND FEES

Comply with the indicated edition of the following codes and ordinances. Where specific edition is not indicated, comply with the latest published edition.

NFPA 70 - 2011; The National Electrical Code
NFPA 72 – 2010;The National Fire Alarm Code
NFPA 90A – 2012; Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 101 – 2012; The Life Safety Code
UL Standard 467; Electrical Grounding and Bonding Equipment
UL Standard 506; Enclosures
UL Standard 869; Electrical Service Equipment
ANSI C2 – 1994 - The National Electrical Safety Code
ANSI/NEMA MG 1 - Motors and Generators
ANSI/NEMA MG 2 - "Safety and Use of Electrical Motors and Generators"
NEMA ICS 1 and 2, and IEEE 472
FBC 2010; The Florida Building Code with 2012 Supplements
FBC 2012; The Florida Fire Prevention Code
FBC 2010; The Florida Mechanical Code
FBC 2010; The Florida Plumbing Code
Serving Utility Company Policies
State and Municipal Codes and Requirements

Obtain all permits required. Contractor shall pay all fees for permits and inspections.

COMPLIANCE AND REVIEW

Within two weeks of the awarding of the contract, and before any work is commenced, the Contractor shall meet with all legal authorities having jurisdiction, review all materials and details of this project, and agree on any required revisions. A letter shall be forwarded to the Architect/Engineer listing the names, dates and place of such review and the revisions required. A copy of the letter shall also be sent to the reviewing authority.

The Contractor shall also meet with each serving utility and repeat the above procedure. A letter certifying each meeting shall also be written with the information as described above.

TEMPORARY LIGHTING AND POWER

Provide temporary lighting and power during construction. The Contractor shall contract directly with the serving utility company or may utilize existing building distribution power for temporary and construction power. Temporary power shall be 120/240 volt, single phase.

The Contractor shall pay (unless otherwise prearranged with the serving utility company) all service connection fees for temporary power installation and all electrical bills for temporary construction power until the facility is switched over to main building power.

Temporary wiring shall be done in a safe and neat manner. See Article 590 of the NEC.

Provide a minimum of one (1) 100 watt incandescent lamp for every 300 square feet of interior space being constructed.

Provide 30 amp, 120/240 volt single phase power points throughout the construction area such that a power point will be within fifty feet of where any saws, drills, or other electrical tool is being used. Each power point shall have a disconnecting safety switch.

Provide 20 amp receptacles with ground fault interrupting circuitry. Outdoor or otherwise exposed receptacles shall have weatherproof covers. Provide any necessary special outlets required.

Size temporary power conductors so that voltage drop is kept below 5% at maximum designed load at the delivery point.

RECORD DOCUMENTS

Prepare record documents in accordance with Division 1 requirements. Record documents shall be complete and accurate and clearly show deviations to the Contract Drawings. Additionally, indicate major raceway sizes and routings, locations of all control devices, all equipment and locations to scale, and fuse and circuit breaker ratings and arrangements.

Prepare bound sets of equipment Operation and Maintenance Instructions. These instructions shall include the name and location of the system, the name and telephone number of the Contractor, and all subcontractors installing the system or equipment, and the name and telephone number of each local manufacturer's representative for the system or equipment.

Furnish bound copies of all test results required in other sections of this division.

GUARANTEES

Equipment (excluding lamps): one (1) year from final acceptance by the Owner. Materials and labor: one (1) year from final acceptance by the Owner.

All equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

In addition to the guarantee of equipment by the manufacturer the Contractor shall also guarantee such equipment for a period of one (1) year from final acceptance by the Owner. The Contractor's one (1) year guarantee shall be for equipment, materials, and labor.

The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

Additional guarantee requirements specific to certain parts or assemblies or installations may be in the General and Special Conditions, or other Sections of these Specifications.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIALS

Furnish materials or equipment specified by manufacturers named.

Materials furnished shall be new, undamaged and packed in the original manufacturer's packing.

All equipment and apparatus shall bear the seal of approval of the Underwriter's Laboratory where testing and listing performance criteria has been established for like items.

Protect equipment and materials from mechanical and water damage during construction. Suitable storage facilities shall be provided. Equipment shall not be stored out-of-doors except as follows:

> Concrete items, plastic conduit if protected from sunlight, rigid metal conduit if protected from water and debris, padmounted equipment for outdoor installation if maintained in a normal weathertight condition, ground rods, and large spools of cables with ends properly sealed. In no case will materials be stored directly on the ground. Provide suitable timbers or billets on which items will be stored out of direct contact with the earth.

All items to be installed shall be free of rust and dirt. Damaged materials and equipment shall be replaced by the Contractor at no cost to the Owner.

All electrical panels, enclosures, raceways, conduit, and boxes shall be fabricated of metal unless indicated otherwise.

EQUIPMENT AND MATERIALS STANDARDS

Design and fabrication of electrical equipment and materials:

The American National Standards Institute (ANSI)
The American Society of Mechanical Engineers (ASME)
The American Society for Testing and Materials (ASTM)
The Institute of Electrical and Electronic Engineers (IEEE)
The National Electrical Manufacturers Association (NEMA)
The Occupational Safety and Health Administration (OSHA)
The Underwriters Laboratories (UL)
The National Fire Protection Association (NFPA)

Comply with the latest edition and revisions of these codes and standards.

EQUIPMENT RATINGS

Horsepower and wattages of equipment shown on the Drawings are estimated and comply with a certain basis of design. It is the Contractor's responsibility to coordinate with, and furnish proper connections to equipment substituted and accepted as equivalent to the basis of design.

Conduit, wire, disconnects, fuses, and circuit breakers shall be sized to suit the horsepower and wattage of equipment actually furnished. However, conduit, boxes, wire or disconnects shall not be sized smaller than shown on the Drawings.

PART 3 - EXECUTION

QUALITY ASSURANCE

Installer's Qualifications: At least three years of successful installation experience on projects with electrical work similar to that required for this project.

Manufacturer's Qualifications: Manufacturers regularly engaged in the manufacture of electrical components and equipment of the types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Electrical work shall be performed by experienced persons skilled in the trade.

Work shall be supervised by a licensed journeyman or master electrician who shall be on the job site at all times while work is in progress.

Work shall be done neatly and in keeping with good practice and conventions of the trade. The electrical installation shall be of high quality, and of the performance level associated with top level commercial electrical installations as determined by the Architect/Engineer and the National Electrical Code.

IDENTIFICATION

Provide laminated plastic nameplates for each panelboard, safety disconnect, equipment enclosure and all other major pieces of equipment installed or modified as part of this contract.

Furnish all starters, disconnect switches and control panels with engraved name plates identifying the equipment served. Attach nameplates to equipment, aligned with structural features of equipment, with two pressure pins or #4 stainless steel screws, nuts, and lockwashers.

Identification of flush mounted panelboards and other cabinets shall be on the inside of the cabinet only.

Panelboards shall have typewritten directories with all loads thoroughly described for each circuit. Update existing panelboards and their directories to reflect new work.

CLEANING AND PAINTING

Clean all equipment and boxes thoroughly inside and outside at the completion of installation. Do not leave dirt and debris inside panelboard and equipment cabinets, device and junction boxes, etc.

All painting shall be done according to the Finishes Section of these specifications.

Paint all exposed conduit and wiremold installed on painted surfaces to match surrounding surface. Paint exposed threads on conduits and touch up all scratches in galvanized pipe and fittings with a high quality cold galvanizing compound.

Touchup scratched or marred surfaces of lighting fixtures, panelboards, motor control centers, switchboards, etc. with paint furnished by the equipment manufacturer specifically for the purpose.

Plywood backboards shall be of fire retardant plywood, painted with two coats of fire-resistive finish.

EXCAVATION, TRENCHING AND BACKFILLING

Perform all excavation and trenching to install raceways indicated on the drawings.

No tunneling shall be allowed unless written permission is received by the Architect/Engineer.

Excavated material not suitable for backfill shall be removed from the job site.

Insure that the bottom of trenches are uniform, without large rocks or lumps of dirt which could damage the raceway or conductors.

Backfill with material that will compact readily. Compact backfill material from bottom of excavation up, to within 2" of surrounding undisturbed material.

Cover shall not be less than surrounding grade and no greater than 2" above surrounding grade.

All trenching in and around rooted areas shall be by hand. Contractor shall take all steps necessary to protect existing root growth from damage by trenching or digging. Trenching in proximity to

trees and other growth shall be directed radially away from the main trunk so as not to cut across major roots.

All trenching routing shall be coordinated with and approved by the Architect/Engineer before digging. Contractor shall contact the Architect/Engineer twenty four hours before work is scheduled to begin. Conduit routing shall be clearly laid out with paint or staking before inspection takes place. The Architect/Engineer reserves the right to specify final routing before digging begins, or at any point during the operation.

TESTS

Contractor shall test all wiring for shorts and all equipment for proper grounding before energizing. Equipment shall be thoroughly checked and adjusted for proper operation. Check motors for proper rotation before energizing and adjust if necessary.

END OF SECTION

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SECTION 16100 BASIC MATERIALS AND METHODS

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division. Submit in accordance with Division 1.

PART 2 - PRODUCTS

RIGID CONDUIT, TUBING AND FITTINGS

Rigid steel conduit: zinc coated, threaded type conforming to the requirements of UL 6 and ANSI C80.1 standards. Zinc coating shall be applied to both inner and outer surfaces.

Intermediate metal conduit: hot-dipped galvanized, threaded type conforming to the requirements of UL 1242 and ANSI C80.6 standards.

A fitted thread protector shall protect threaded ends from damage during shipment and handling.

Fittings for rigid steel and IMC conduit: zinc coated, threaded type, conforming to Federal Specification W-F-408.

Electrical Metallic Tubing (EMT): UL 797 and ANSI C80.3 standards.

Fittings for electrical metallic tubing: Federal Specification W-F-408. Steel compression or set-screw type, galvanized or cadmium plated, and suitable for location of installation. Conduit bushings shall be metallic with insulated throats. Insulating grounding type bushings shall be provided where required under "Grounding". EMT connectors shall be similar to T&B "Insuline" with completely insulated throats. Field applied insulated throats are not acceptable.

Plastic conduit for direct burial: UL labeled Schedule 40 PVC manufactured to NEMA TC-2 specifications, and UL 651 specifications.

Plastic interduct for installation in PVC conduits: UL labeled and listed for installation of inside/outside communication cable.

Couplings, fittings, pipe straps and spacers used with rigid plastic conduit shall be fabricated of plastic.

Fittings for plastic conduit: manufactured to NEMA TC-3 specifications.

Acceptable Metal Conduit and Tubing Manufacturers:

EMT:	Allied Tube & Conduit Co. Wheatland Tube Co. Triangle PWC, Inc.
Fittings:	Steel City Thomas & Betts (T&B) Raco Inc.

FLEXIBLE METAL CONDUIT, COUPLINGS AND FITTINGS

Flexible metal conduit for dry interior applications: Federal Specification WW-C-566 and UL 1, continuous, spiral wound galvanized steel type.

Fittings (connectors) for flexible metal conduit: UL E 23018. Squeeze Type of malleable iron zinc plated.

Flexible metal conduit for damp or exterior applications: liquid tight, UL listed, spiral wound galvanized steel with PVC outer jacket.

Fittings for liquid tight conduit: Federal Specification W-F-406. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and gasket sealing rings and insulated throats.

Acceptable Metal Conduit and Fittings Manufacturers:

FMC:	Alflex Corp. American Flexible Conduit Co. Anaconda Metal Hose, ANAMET Inc.
FMC Fittings:	Steel City Thomas & Betts (T&B) Raco Inc.
Wall and Floor Seals:	O-Z/Gedney Co. Spring City Electrical Mfg. Co. Chase Technology Corp.

CONDUIT MOUNTING EQUIPMENT

Hangers, rods, backplates, beam clamps etc. shall be hot-dipped galvanized iron or steel. They shall be as manufactured by the Appleton Electric Co., Thomas and Betts Co., Unistrut Corp., or approved equal.

JUNCTION BOXES

Sheet Steel Outlet Boxes: conform to UL 514A, "Metallic Outlet Boxes, Electrical", UL 514B, "Fittings for Conduit and Outlet Boxes, Covers, and Box Supports", and NEMA OS1, "Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports".

Sheet Steel: Flat-rolled, code gauge galvanized steel.

Acceptable Manufacturers: Sheet-steel boxes shall be manufactured by RACO, Steel City or equal.

All junction boxes and pull boxes shall be sized per NEC requirements and be of the proper NEMA classification for the locations where they are installed. Where boxes occur above other than lift-out ceilings, access panels must be provided.

Wet location covers shall meet NEC wet location requirements (shall comply with NEC 2011 Article 406.9 (B)(1)). Covers shall be "in-use" type and shall mount vertically or horizontally and be of gasketed heavy-duty polycarbonate construction with clear cover with lockable hasp for 1/8" shank lock.

OUTLET BOXES

Switch, receptacle and wall or ceiling mounted junction boxes shall be the 4" X 2 1/8" square type. Tile, dry wall, or flat cover plates for one or two devices shall be furnished for each box as required.

LIGHTING FIXTURE BOXES

Lighting fixture boxes shall be the 4" X 1 1/2" octagonal type.

TELEPHONE AND DATA SYSTEM OUTLETS

Wall outlets shall in general consist of four inch (4") square boxes with single gang switch ring. Conduits shall be supplied turned out of wall above ceiling assembly. Conduits shall be ¾" or larger, with insulated bushing installed on all bare ends.

Install finished blank plates on all unused openings.

OUTDOOR BOXES

Cast Aluminum Boxes: exposed, exterior locations; copper free aluminum, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices, and closure plugs.

Boxes shall have a rear opening in addition to necessary top and bottom openings. Boxes shall be provided complete with a minimum of two closure plugs and self-threading ground screw. Boxes

shall have a thermoset, baked enamel silver gray finish. Weatherproof cover plates for one or two devices shall be furnished for each box as required.

Covers shall be of heavy duty die-cast construction. Mounting screws shall be stainless steel. Covers shall have a thermoset, baked enamel silver gray finish and be equipped with a sealing gasket. Covers shall be equipped with a hasp-type locking tab.

Nonmetallic boxes shall be thermoplastic or polyester fiberglass types as manufactured by Carlon or Pass & Seymour.

LOCATION OF OUTLETS

The approximate locations of outlets, etc. are shown on the drawings. The exact locations shall be determined at the building.

It is the responsibility of the Contractor to note the locations and heights of cabinets, counters, shelving units, etc. before the installation of outlets.

WIREWAY

16 gauge galvanized steel with polyester powder coat finish over a phosphate preparation. UL listed as steel enclosed wireway and auxiliary gutter. Conform to NEMA 3R for outdoor locations.

Size: nominal 8" by 8" square cross section.

Fittings and Accessories: Male and female lengths shall be factory constructed. L's, T's, sweeps and other connectors as required. Junction boxes shall be standard and furnished where required or directed.

CONDUIT BODIES

Conduit bodies shall be constructed of galvanized or cadmium plated malleable iron or copper-free aluminum. Galvanized steel or aluminum covers and gaskets shall be supplied.

LB's 3" and greater shall be mogul type with domed covers.

HOUSEKEEPING PADS

Housekeeping pads shall be provided for all floor-mounted equipment such as transformers, etc. Pads shall be made of concrete extending 3 to 4 inches vertically above finished floor and extending 6 inches horizontally around equipment.

METAL SURFACE RACEWAY

The steel surface metal raceway system for branch circuit wiring and data network, voice, and other low-voltage wiring shall be the 4000 Series manufactured by The Wiremold Company.

Systems of other manufacturers may be considered equivalent with the written approval of the Engineer.

Materials: The raceway and all system components must be UL Listed in full compliance with their standard for surface metal raceways and fittings (UL-5).

Raceway: shall be a two-piece design with a base and snap-on cover. The base shall be furnished in 10' or longer lengths and the cover sections shall be furnished in 5' or longer lengths. The overall dimensions of assembled raceway shall be 4.75" wide by 1.75" deep.

The base shall have an extruded divider separating the 4.75" raceway into two equal compartments.

The cover shall fit onto both compartments to allow access to only one compartment at a time.

The two compartment and separate covers must be available to handle both power and communications wiring.

Fittings: The available fittings should include, but not be limited to the following: flat, internal and external elbows, tee and cross fittings, wire clips, couplings for joining sections of raceway, grounding adapters as an NEC approved secondary grounding method, and transition connectors to 3/4", 1", and 1 ¼" trade size conduit.

The fittings shall have a finish to match the raceway.

Device cover plates for mounting the following commercially available devices must be available: duplex devices, single 1.40" and 1.59" dia. receptacles, GFCI, Sentrex® surge receptacles and other rectangular faced devices and modular voice and data jacks.

Power devices shall be supplied on 24" centers unless noted otherwise on plans. Devices shall be factory installed.

All devices shall be mounted to the cover plates, securely held in place by extruded protrusions.

Cover plates shall be removable by use of a standard screwdriver without marring the extrusion finish.

Communication Devices and Accessories: The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP, STP (150 ohm), fiber optic, coaxial and other cabling types with faceplates and bezels to facilitate mounting.

Communication Devices shall be supplied on 48" centers unless noted otherwise on plans. Device outlets and openings shall be factory installed.

A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available.

CONDUCTORS

Compliance: Provide wires, cables and connectors that comply with the following standards as applicable:

UL Standard 83	Thermoplastic Insulated Wires and Cables

UL Standard 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL Standard 854	Service Entrance Cable
NEMA/ICEA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA/ICEA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
IEEE Standard 82	Test procedures for Impulse Voltage Tests on Insulated Conductors

Wire and cable manufactured more than twelve months before delivery to the jobsite shall not be used.

All conductors shall be soft-drawn copper of not less than ninety-eight percent (98%) conductivity, with NEC Type THW, THHN, or THWN for No. 4 and smaller, and Type RHW, THW, or THWN for No. 2 and larger, 600 volt insulation.

Jackets: Factory applied nylon or PVC external jacketed wires and cables for installation in raceways and where indicated.

Color coding of all ungrounded service, feeder, and branch circuits conductors shall be required according to the following convention:

120/208 Volt, 3 phase: black, red, and blue
277/480 Volt, 3 phase: brown, orange, and yellow
120 volt clock cable shall be red, black and yellow.

Ground wires shall be green and neutrals shall be white. Isolated grounding conductors shall be green with yellow stripe or green with applied yellow tape to indicate isolated ground. Green and white shall be used for these purposes only. Where grounded conductors of different systems are installed in the same raceway, box, auxiliary gutter, or other type of enclosure, each grounded conductor shall be individually identified by system. Additional grounded conductors shall be white with a readily distinguishable colored stripe, other than green, running along the insulation.

Conductors No. 12 AWG through No. 10 AWG may be solid or stranded, and No. 8 AWG and larger shall be stranded. No conductors smaller than No. 12 AWG shall be used except as otherwise noted.

Control conductors shall be No. 14 AWG Type TW, stranded unless indicated otherwise.

Multi-conductor control cable shall be stranded copper, 600 volt polyvinyl chloride insulated and jacketed Type PNR.

Conductors for installation in cable tray shall be specifically approved for installation in cable trays per Article 336 of the NEC.

Acceptable manufacturers: Anaconda Wire and Cable Co., General Electric Co., Okonite Co., Southwire Co., or Rome Cable Co.

CABLES AND CABLE ASSEMBLIES

Cables and cable assemblies for variable frequency drive (VFD) application shall conform to the following: 4-conductor, (3) stranded tinned copper ungrounded conductors plus (1) grounding conductor with cross linked polyethylene XLP insulation. Overall metal foil shielding plus tinned copper braided shielding not less than 85 per cent coverage. Tinned copper drain wire, polyvinyl chloride PVC jacket.

Grounding wire shall be not less than #10AWG.

Acceptable manufacturer: Belden Type 2950x, rating as noted on plans.

CABLE AND WIRE SPLICES

General: the materials shall be compatible with the conductors, insulations and protective jackets of the respective cables and wires. Use connectors with ampacity and temperature ratings equal to or greater than those of the wires upon which used.

In manholes and other locations where moisture might be present, the splice shall be watertight and submersible.

Connectors: UL 486A. Aluminum and aluminum alloy fittings will not be accepted. Connectors shall be plated with tin or tin alloy.

Conductor Sizes No. 6 AWG and Larger: Splices in conductors shall be made with indenter, crimp connectors and compression tools or with bolted clamp type connectors to insure a satisfactory mechanical and electrical joint.

WIRE AND CABLE MARKERS

Wire and cable markers shall be "Omni-Grip" as manufactured by Brady Worldwide, Inc., or equal.

Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by Brady Worldwide, Inc., 3M Co., or equal.

RECEPTACLES

Receptacles shall be furnished and installed where shown on the drawings and shall conform to the following requirements:

Grounding type duplex receptacle: rated 20 amperes, 125 volt, 2 wire, 3 pole with grounded shunt (yoke permanently grounded to third clip), NEMA Configuration No. 5-20R, and conforming to Federal Specification W-C-596F (submit proof of compliance).

All receptacles listed on the drawings shall be specification grade receptacles. Isolated ground receptacles shall be listed for the intended service and shall be marked with orange dot or have orange face.

Tamper resistant receptacles shall be in compliance with the intent of the NEC Article 517.18(C). The design of the tamper resistant receptacle shall not incorporate any switching mechanism.

All exterior devices shall be designed for the application and shall be installed in a waterproof enclosure with proper cover.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

SWITCHES

Flush, enclosed type, specification grade, rated at 20 amperes, 120/277 volts, alternating current only, quiet operation, and shall comply with Federal Specification W-S-896F (submit proof of compliance). Switch housing shall be color coded for current rating.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

Motor switches with inherent thermal overload protection shall be Square D, Type F for flush or surface mounting as required by the location of the unit. Units shall be furnished with pilot lights as indicated.

DEVICE PLATES

All plates for switch, receptacles and telephone outlets located on finished walls shall be UL listed stainless steel with the number of gangs required for the application. All plates for outlets located on unfinished walls or on condulet type fittings shall be zinc coated sheet metal with rounded or beveled edges.

Weatherproof plates shall be of stainless steel, gasketed, sized with twin covers for duplex receptacles, and weatherproof switch for switch plates.

Device plates shall be factory engraved where indicated on the drawings. Letters shall be black filled.

RELAYS

Relays shall be electrically held and operated. Relays shall be mounted in a NEMA-1 enclosure. The contactors shall be capable of switching inductive and resistive loads.

PANELBOARDS

Compliance: NFPA 70 National Electrical Code, UL 67, "Electric Panelboards", NEMA Publication PB1, "Panelboards", Federal W-P-115a Type 1, Class 1 specifications and NEMA PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

Provide factory assembled panelboards in sizes and rating as indicated. Panelboards shall be UL listed and labeled.

Acceptable manufacturers: panelboards shown on the drawings shall be manufactured by Square D.

POWER DISTRIBUTION PANELBOARDS

Provide dead front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors. Select unit with feeders connecting at the top of the panel. Equip with copper bus bars with not less than 98 percent conductivity, and with full size neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so overload on any pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

LIGHTING AND APPLIANCE PANELS

Provide dead front safety type lighting and appliance panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors.

Refer to the drawings to determine each panelboards pertinent characteristics such as bus rating, main circuit breaker or lugs only, voltage rating, number of phases, number of positions required, etc.

Select unit with feeders connecting at the top of the panel. Equip with copper bus bars with not less than 98 percent conductivity, and with full size neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections.

Interrupting ratings shall be coordinated with the available short circuit current. Provide molded case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so overload on any pole will trip all poles simultaneously.

All panels shall be provided with an equipment grounding bus similar to, but isolated from the solid-neutral bus. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures.

Panels shall be carefully aligned and rigidly secured in place with the top of the cabinets located 78 inches above the finished floor.

Each panel shall be furnished with an identification plate as specified in the "Equipment Identification" section of this specification.

Distribution panels which are flush mounted must have door on front of panel.

Circuit Breakers:

Qualifications: NEMA AB3 - 1984 "Molded Case Circuit Breakers".

Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with trip ratings as shown on the drawings.

Circuit breakers shall be quick-make and quick-break units with positive trip indicating mechanism and common trip on all multi-pole breakers.

Single pole 15 and 20 amp circuit breakers shall be UL listed as "Switching Breakers" and be marked SWD.

Circuit breakers shall be the bolt-on type.

Bus Assembly:

Bus bar connections to the branch circuit breakers shall be the "phase sequence" type.

Bus bars shall be of copper construction. All current carrying parts of the bus shall be plated.

Buses shall be full length with constant cross sectional area, designed for the bus current indicated.

Cable lugs shall be furnished in the quantity and size required for the size and number of conductors indicated.

Mains ratings: as shown on the drawings.

Short circuit current rating: as shown on the drawings. Panelboards, as a complete unit, shall have a short circuit current rating equal to or greater than that indicated. It shall be understood that the minimum rating for 240 and 480 volt rated panelboards shall be 10,000 and 14,000 RMS symmetrical amperes respectively.

Cabinet construction:

Panel enclosures: UL 50. Enclosures shall be furnished without knockouts. All knockouts shall be field cut.

The panelboard bus assembly shall be enclosed in a dead front safety constructed steel cabinet.

The size of the wiring gutters and gauge of steel shall be in accordance with NEMA and UL standards; except that the thickness of steel shall not be less than 16 gauge.

The box shall be fabricated from galvanized steel. Boxes intended for outdoor duty, or where indicated, shall be rated NEMA 3R.

Select enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

Construction shall be such that circuit breaker mounting hardware is not required when circuit breakers are added in the future.

The panelboard front cover shall be hinged 1-piece with integral door. The integral door shall have completely concealed hinges and door swings, flush lock and key mechanism, and steel door pull.

A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Typed directory cards shall be furnished in each panel.

All panelboards throughout project shall be keyed alike.

Special Provisions:

Where lighting and appliance panelboards are flush mounted, provide spare conduits stubbed up and capped as specified elsewhere in this section. Where surge protection is required, provide as specified in this section - **SURGE PROTECTION DEVICES (SPD)**. Surge protection device system shall be incorporated into the panelboard assembly as described in **SURGE PROTECTION DEVICES (SPD).**

CIRCUIT BREAKERS INSTALLED IN EXISTING PANELS

Circuit breakers installed in existing panels shall have an A.I.C. rating equal to that of the panel in which they are installed.

SAFETY DISCONNECT SWITCHES

Compliance: NFPA 70 National Electrical Code, UL 98, "Enclosed and Dead Front Switches", NEMA Publication KS1, "Enclosed Switches", and NEMA KS 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

Safety switches shall be provided for all motors and equipment indicated or required by the National Electrical Code.

Safety switches shall be Type "HD" (heavy duty) unless noted otherwise, fused or non-fusible as indicated with number of poles as shown or required. Safety switches for equipment may be non-fused only if equipment is UL tested with circuit breaker protection.

Fuses: general use, dual element time-delay, current limiting. Manufactured by Bussman, Littlefuse, Edison, or equivalent.

Safety switches for indoor general purpose application shall be NEMA 1 and for exterior application shall be NEMA 3R.

Acceptable manufacturer: provide safety switches manufactured by Square D.

Construction: Gray baked enamel finish. NEMA 3R enclosures shall be manufactured from galvanized steel. NEMA 4X enclosures shall be manufactured from 304 stainless steel. Corners shall be ground smooth and polished to overall finish quality. NEMA 4X enclosures shall be fitted with a condensate drain at the bottom and a vent at the top that is rated for NEMA 4X service.

Ratings: Fusible disconnects shall be 240 or 600 volt rated depending on the service voltage.

Fusible disconnects shall be furnished with Class R fuses of the indicated ampere rating (up to 600 amps) and be equipped with rejection clips.

Fusible disconnects shall be UL listed for 200,000 RMS symmetrical ampere short circuit current when equipped with Class R or Class L fuses.

Lugs shall be front removable and be UL listed for aluminum or copper conductors at 60 degrees C or 75 degrees C.

Disconnect switches shall be horsepower rated.

COMBINATION MOTOR STARTERS

Combination motor starters shall be manufactured in accordance with the latest published NEMA standards, sizes, and horsepower ratings. Circuit breaker type combination starters shall consist of a circuit breaker and a motor starter. Combination starters and associated equipment (transformers, relays, etc.) shall be mounted in an oversized NEMA 3R general purpose enclosure of sufficient size to contain all equipment. Starters shall be furnished with three melting alloy type thermal overload relays.

Circuit breakers shall be magnetic type only.

Thermal units shall be of one piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed. Melting alloy overload relays shall be sized per requirements of motors furnished and installed.

Combination Motor Starter shall be equipped with 24 volt coil control relay, 120 volt coil motor starter, 480/120 volt control transformer with fused secondary to operate motor starter coil, and a 480/24 volt control transformer with fused secondary with VA capacity to operate Control Relay and Solenoid Valve.

Combination Motor Starter shall be equipped with enclosure mounted Hand-Off-Auto selector switch with nameplate, factory installed and wired.

Combination Motor Starter shall be equipped with enclosure mounted red "STOPPED" illuminated indicator, green "RUNNING" illuminated indicator, and yellow "OVERLOAD" illuminated indicator. Indicators shall be LED type with nameplate, factory installed and wired.

Acceptable Manufacturers: Subject to compliance with these specifications, furnish units manufactured by one of the following: Allen-Bradley Co., Cutler-Hammer, Square D, or Siemens.

DRY-TYPE TRANSFORMERS

Shall meet NEMA TP1 for energy efficiency.

Shall have a 480 volt delta primary and a 208Y/120 volt secondary with a minimum of 4 full rated primary taps, two 2-1/2% below and two 2-1/2% above nominal voltage. Transformers shall be furnished with primary and secondary lugs sized to accommodate the conductors shown on the Drawings.

Transformers shall have an insulation system rated for continuous operation at 220°C, but they shall be rated for continuous operation at full load with a maximum temperature rise of 115°C above a 40°C ambient temperature.

Transformers shall be capable of carrying a 15% overload continuously without exceeding a 150°C rise above a 40°C ambient temperature.

Enclosures shall be a ventilated type with feet for floor mounting.

Core and coil assemblies shall be grounded to the frame and shall be mounted on rubber isolation pads to reduce sound transmission.

The maximum sound level shall be:

0-50 KVA	45 dB
51-150 KVA	50 dB
151-300 KVA	55 dB
301-500 KVA	60 dB

Acceptable Manufacture: The transformer shall be manufactured by Cutler Hammer, General Electric, Hevi-Duty, Siemens, or Square D.

GROUNDING AND BONDING

Conductors: type THW, THHN/THWN, or RHW to match power supply wiring.

Bonding Jumper Braid: copper braided tape, constructed of 30 gage bare copper wires and properly sized for application.

Flexible Jumper Strap: flexible flat conductor, 48,250 circular mils, with copper bolt hole ends sized for 3/8" diameter bolts.

Grounding Electrodes: solid steel core with a heavy uniform covering of electrolytic copper, 5/8" X 10'. Provide sectional rods if required. Threads, on sectional rods, shall be rolled (not cut) into the composite metal after the copper covering has been applied. Sectional rod couplings shall be of a corrosion resistant alloy.

Plate Electrodes: plate electrodes are not permitted. If sufficiently low resistance cannot be obtained with driven rods, the Architect shall be notified and will provide written instruction on grounding methodology.

SURGE PROTECTION DEVICES

General: provide hybrid high-energy filter units utilized for a facility wide protection system. Each unit in the system shall incorporate surge suppression and high frequency electrical line noise filtering. The system shall provide effective high-energy surge voltage suppression, surge current diversion, high frequency attenuation in all environments connected on the load side of the facility's main overcurrent device. Connection shall be parallel, located as shown on the Drawings. System shall feature fast response time and low clamping voltage with high current capability. SPD's shall be manufactured specifically for the intended service by a manufacturer having a least five years continuous experience designing and manufacturing power conditioning equipment of the type specified.

Manufacture units using redundant metal oxide varistors (MOV) installed in a parallel arrangement. Not less than two MOV's are required per mode regardless of suppression rating.

Standards: Surge Protective Devices shall comply with the following:

1. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits
2. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
3. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
4. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
5. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
6. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 - Article 285
7. ANSI/UL Standards 1449-2006 Listed (UL 1449 Third Edition), UL 1283 Listed, CUL Listed & CE compliant "low-voltage directive."
8. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

The system and each SPD module shall be UL listed for the service and conditions indicated on the Drawings and specified here and shall be enclosed in NEMA 1, 12, or 3R enclosure.

Module shall be tested in accordance with ANSI/IEEE C62.11, C62.41 and C62.45 Categories A, B and C3. Current diverter modules shall withstand one thousand Category C3 surges per IEEE C62.45.

The system shall be protected from fault currents up to 100,000 amperes by suitable integral fuse network. All components shall be protected. High current capacitors shall effectively sink harmonic currents generated by line distortion and shall effectively attenuate line noise (RFI/EMI filtering).

The system shall be equipped with built-in monitoring with status indicators, audible alarm and test switch front panel mounted. Form C dry contacts shall be provided for remote annunciation.

Provide SPD unit with built-in surge counter to indicate and totalize all transients in all modes. Counter shall be LCD or LED and shall read in plain Arabic numbers.

Warranty: 5 years.

Service entrance locations: The nominal unit operating voltage shall be coordinated with the service voltage indicated. The maximum continuous operating voltage of all components utilized in the unit shall not be less than 115% of nominal operating voltage. Operating frequency shall be 60±3 hertz. Protection modes shall be line-to-line, line-to-neutral, line-to-ground and neutral-to-ground.

Maximum repetitive surge current capacity, in amps, shall not be less than as follows:

L-L	200,000
L-N	100,000
L-G	100,000
N-G	100,000

Minimum line noise attenuation above 10 MHz - 50 dB

Install protective module adjacent to main switchboard as indicated on the Drawings. Provide molded case circuit breaker as indicated for isolating module.

Distribution panelboard locations: The nominal unit operating voltage shall be coordinated with the service voltage indicated. The maximum continuous operating voltage of all components utilized in the unit shall not be less than 115% of nominal operating voltage. Operating frequency shall be 60±3 hertz. Protection mode shall be line-to-line, line-to-neutral, line-to-ground and neutral-to-ground.

Maximum repetitive surge current capacity, in amps, shall not be less than as follows:

L-L	150,000
L-N	75,000
L-G	75,000
N-G	75,000

Minimum line noise attenuation above 10 MHz - 50 dB

Install module adjacent to each distribution panelboard as indicated on the Drawings. Provide molded case circuit breaker as indicated for isolating module.

Lighting and appliance panelboard locations: The nominal unit operating voltage shall be coordinated with the service voltage indicated. The maximum continuous operating voltage of all components utilized in the unit shall not be less than 115% of nominal operating voltage. Operating frequency shall be 60±3 hertz. Protection mode shall be line-to-line, line-to-neutral, line-to-ground and neutral-to-ground.

Maximum repetitive surge current capacity, in amps, shall not be less than as follows:

L-L	100,000
L-N	50,000
L-G	50,000
N-G	50,000

Minimum line noise attenuation above 10 MHz - 50 dB

Install module adjacent to cach lighting and appliance panelboard as indicated on the Drawings. Provide molded case circuit breaker as indicated for isolating module.

Conductors shall be #8AWG, stranded copper, minimum and shall be not more than 12" in length. All conductors shall cut to precisely the same length before installation. Conductor requirements apply to grounded conductor.

Recessed Panelboard Installations: Where lighting and appliance panelboards are indicated recessed, provide panelboards that include a factory installed and engineered solid state high performance suppression system meeting the requirements of this section for lighting and appliance panelboard locations. Provide panelboards equipped with integral circuit breaker for suppression/filter system. Panelboards shall incorporate all test points, indicating lights, dry contacts and other features

described here. Panelboards equipped with integral SPD system shall be of same manufacturer as other panelboards not so equipped (surface mounted types only).

NAMEPLATES

Nameplates: 0.125 inch thick laminated plastic; white and black finish; rectangular shaped; minimum of 1.0 X 2.5 inches with 0.25 inch high block style engraved lettering.

PART 3 - EXECUTION

RACEWAY INSTALLATION

All interior and above grade exterior wiring shall be installed in a metal conduit and all embedded in concrete or below grade wiring shall be in PVC conduit unless indicated otherwise on the drawings.

Exterior low voltage (less than 50 volts) wiring may be installed in liquid tight, non-metallic flexible conduit ("Sealtite") where installation is above grade and not subject to damage.

No conduit smaller than 3/4 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

No wire shall be pulled until the conduit system is complete in all details.

The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

Conduit support shall be spaced at intervals of 8 ft. or less, as required to obtain rigid construction.

Single conduits shall be supported by means of two-hole pipe clamps. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. The channel shall be not less than 1 1/2" nominal size.

Conduit hangers shall be attached to structural steel by means of beam or channel clamps.

All conduits on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run straight and true.

Conduit terminating in sheet steel boxes shall have double locknuts and insulated bushings.

Flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present. Flexible conduit length shall not exceed 1'-6" in length for this application.

Provide expansion coupling every 100 feet for long runs of conduit and at concrete expansion joints. Provide ground bonding jumpers around expansion couplings, used on metallic conduit, sized according to Table 250-122 of the NEC.

Transitions from below grade to above grade shall be with rigid galvanized steel long sweep nineties with a bituminous coating where in contact with earth or concrete. Area of transition shall not be subject to standing puddles of water.

Seal all wall penetrations to watertight condition. Finish as applicable to location.

Approval by the Architect shall be required to install conduit in structural members.

In general, the conduit installation shall follow the layout shown on the plans. This layout is, however, diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without additional cost to the Owner. It is recognized that branch circuit routing shown on the drawings may not always be the most economical or the most feasible method. Routing may be changed by the Contractor subject to the following provisions:

Conduits shown routed overhead may not be installed in or below slabs or in walls.

Not more than three circuits may be installed in any one conduit. Care must be taken to provide the appropriate number of neutrals where two or three circuits are on the same phase.

All conduit shall be concealed unless otherwise noted on the drawings.

Exposed conduit will be permitted only as shown on the drawings. Exposed conduit shall be run parallel with or at right angles to the building walls.

All empty conduits shall be provided with a plastic pull wire rated for a minimum of 200 lbs.

Conduit stub-ups at panels shall be secured in place by use of Unistrut and clamps.

Conduit and tubing shall be kept at least twelve (12) inches from parallel runs of flues, steam pipes or hot water lines.

Telephone and data raceways shall be 3/4" minimum. This includes conduits stubbed up into ceiling cavity.

Where exposed connections to motors and equipment from overhead conduits are made without benefit of a wall for conduit mounting, the connection shall consist of vertical conduit (minimum size 1") from Type "LL", "LR" or "TT" Unilet to floor flange. Connection to equipment shall be with flexible liquid-tight from Type FDT boxes located in the vertical conduit.

Flexible conduit in all areas subject to moisture shall be liquid-tight flexible conduit.

All electrical connections to vibration isolated equipment shall be made with flexible conduit.

Connections to indoor dry type transformers shall be made with weatherproof flexible conduit.

All conduit entering the building shall be suitably sealed to prevent the entrance of moisture.

All conduit passing through a structural expansion joint shall be provided with a UL approved expansion joint fitting and bonded as required by the National Electrical Code.

Any wiring in a finished area which cannot be concealed in conduit shall be installed in a surface metal raceway system as manufactured by Wiremold or equal. Utilization of surface metal raceway, if not indicated as such on the plans, will be accomplished only with the written approval of the Architect.

Conduit run in areas with hung ceilings shall be installed in the space above the hung ceiling as close to the structure as possible. Conduits shall be supported from the structure.

Where flex conduit is used from junction box to light fixture it shall be supported such that it does not touch ceiling tiles or interfere with their placement.

Flexible metal conduit connections to light fixtures shall be at least 4 feet but not more than 6 feet in length per NEC 410-117(c).

Where raceways are indicated installed under slabs, they shall be placed not less than 2" below surface of prepared fill. Under no circumstances shall raceways be laid directly on vapor barrier or in or on reinforcing.

Raceways concealed in ground outside building shall be a minimum of 2 feet below grade and topped with a two inch concrete cap before backfilling. Install plastic warning tape 12 inches above raceway, buried in backfill.

RACEWAY INSTALLATION - CONDITIONS

Conduit raceways shall be installed as indicated herein. Where more than one type of raceway is listed under one condition, the Contractor may exercise his option of the raceway used. Conditions of raceway installation are as follows:

Exposed Raceway Below 8'-0" from Finish Floor and in Areas Subject to Moisture: Rigid galvanized steel conduit.

Raceway Concealed Overhead, or in Walls: Rigid galvanized steel conduit, intermediate metallic conduit or electrical metallic tubing (EMT).

Raceway Concealed in Ground Outside Building: Schedule 40 PVC or rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall have a factory-applied PVC coating, two coats of a coal-tar system, or shall be field-wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50-percent overlay.

Final Raceway Connection to Recessed Fixtures in Accessible Locations: Flexible steel conduit maximum of 6'-0" long.

Final Raceway Connection to Pumps, Motors, Transformers, Etc.: Liquid-tight flexible steel conduit maximum of 1'-6" long.

Raceway That Extend Through the Slab or Above Finish Grade: 90° elbows, nipples and couplings of rigid galvanized steel or IMC shall be used where any raceway extends through the slab or above finished grade. In general PVC conduit shall not be allowed above finished slab inside the building or within 1 1/2' of finished grade outside the building.

METAL SURFACE RACEWAY

Prior to and during installation, refer to system layout drawing containing all elements of the system. Installer shall comply with detailed manufacturer's installation instruction sheets, which accompany system components, as well as, system instruction sheets, whichever is applicable.

All raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, cabinets, in accordance with manufacturer's installation sheets.

All metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.

Work shall include fastening all raceway and appropriate fittings and device plates to install a complete aluminum surface raceway system as indicated on the electrical, communication and/or laboratory equipment drawings and in the applicable specifications.

All raceway systems shall be installed complete, including wire clips and grommets where required by manufacturer's installation sheets.

WIRING

All conductors shall be carefully handled to avoid kinks or damage to insulation.

All wires, cables and each conductor of multi-conductor cables shall be uniquely identified at each end by color or with wire and cable markers. Lighting and receptacle wiring shall be distinctly differentiated and junction boxes marked.

Lubrications shall be used, if required, to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

Neutral wires shall be pigtailed to receptacles so that a receptacle can be removed for replacement without the neutral connection to other receptacles on the circuit being disconnected.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

When stranded wire is used for receptacle and lighting circuit, connections to the devices shall be made using vinyl insulated "Sta-Kon" connector terminals.

All 600 Volt wire insulation shall be tested with a "megger" after installation. Tests shall be made at not less than 500 Volts.

OUTLET BOXES

Outlet boxes for flush mounted lighting fixtures shall be accessible. If lighting fixture is in a non-accessible ceiling the box shall be accessible when the fixture is removed.

Set boxes plumb and such that their device mounting plane is within 1/8" of the finished wall.

Surface mounted boxes and wiremold boxes, both new and existing, shall be painted to match surrounding surfaces.

Above ceiling sub-system boxes shall be labeled and color coded. Junction box covers shall be color coded. The following conventions shall be used:

Fire alarm	RED
Intercom	BLUE
ITV	YELLOW
Telephone	GREEN

The location of boxes on the electrical plans is approximate. Review architectural drawings for specific location or if not shown center and align within architectural detail. The Architect shall reserve the right to move boxes during rough in.

DEVICES

Unless indicated otherwise on the drawings all light switches shall be mounted with the centerline of the device 48" above the finished floor.

Unless indicated otherwise on the drawings or in the specifications all receptacles shall be mounted with the centerline of the device 18" above the finished floor.

Receptacles shall be installed with the grounding contact at the top. Where receptacles are required to be mounted horizontally they shall be installed with the neutral contact at the top.

Receptacles above counters shall have major axis horizontal to counter surface and device centerline 6" above counter surface or backsplash (if present).

Mount all devices so that the cover plate edges are in contact with the wall and are parallel to building features.

PANELBOARDS

Mount panelboards such that top most circuit breaker handles shall not be more than 6'-6" above finished floor.

Power circuits to fire alarm system control panel, auxiliary power supplies, command center console and any other fire alarm system component requiring line voltage power shall be dedicated branch circuits. Circuit disconnecting means shall be identified as follows: branch circuit breakers shall have an engraved phenolic nameplate permanently attached adjacent to the circuit breaker, reading "FIRE ALARM CONTROL PANEL", "FIRE ALARM AUXILIARY POWER SUPPLY", or other suitable wording. Provide circuit breakers with lockable ON-OFF clips.

Where panelboards are to be installed on masonry unit walls, including poured reinforced concrete or brick veneer type, install two vertical sections of galvanized steel channel between enclosure and mounting surface. Channel shall be lagged to wall in three places (each length) and the enclosure bolted to the secured channel using stainless steel or galvanized steel hardware. Galvanized channel

shall run the entire length of the enclosure, but shall not be exposed at either the top or bottom of the enclosure.

Only one conductor shall be allowed under each terminal of circuit breakers. No splices are permitted in panelboards. Tighten connectors and terminals in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

Complete and install a typewritten directory for each panelboard that accurately indicates all loads being served by each breaker.

For flush mounted panelboards, provide one 3/4" conduit stubbed-up into the ceiling cavity for every three (3) spare circuit breakers and for every three (3) panelboard spaces, plus one additional.

DISCONNECTS

Motor circuit disconnects shall be mounted within fifty feet and in sight of the load being served.

Disconnects shall be labeled in accordance with Section 16010.

Starters on air handler units shall be interlocked to fire alarm panel to shut down air handler as shown on drawings.

GROUNDING

Ground all non-current carrying metal parts of the electrical system to provide a low impedance path for ground fault current. Route ground connections and conductors to ground and protective devices in shortest and straightest paths as possible.

Insulated grounding bushings shall be required for all raceways, service entrance panels, distribution panels, all raceways one inch and larger and any raceway entering a concentric knock-out.

In general a ground wire shall be installed in every conduit. The conduit installation itself shall serve as an additional grounding means.

Where there are parallel feeders installed in more than one raceway, each raceway shall have a ground conductor.

Where conduits terminate without mechanical connection (i.e., locknuts and bushings) to panelboards, and for all terminations of conduit sizes one inch and larger; and for all sizes of metallic conduit (rigid or flexible) terminating in concentric knockouts, the following procedure shall be followed: Each conduit shall be provided with an insulated grounding bushing and each bushing connected with a bare copper conductor to the ground bus in the electrical equipment. The ground conductor shall be in accordance with Article 250 of the NEC.

Install ground rods as necessary to provide an earth ground having a test resistance of no more than 25 ohms.

Test ground rods for ground resistance value before any wire is connected. A portable ground testing megger shall be used to test each ground rod or group of rods. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of

the electrode tested. Where tests show resistance to ground is over 25 ohms, reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest.

Grounding connections shall be made by exothermal weld or by using a compatible mechanical connector and brazing completely over. Exothermal welds shall be made strictly in accordance with the weld manufacturer's written recommendations. Welds that have puffed up or which show convex surfaces, indicating improper cleaning, are not acceptable. No mechanical connector is required at exothermal welds.

Connect together service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing system.

Ground the neutral of all dry type transformers to effectively grounded building steel, or other listed building electrode, and metal cold water piping system as near as practicable using Table 250-66 of the NEC to size conductor. Provide connections to flanged piping at street side of flange.

Grounding conductors shall be attached to equipment with a bolt-on lug or approved tapered screw used for no other purpose. Use crimp-on spade lugs for stranded conductors.

IDENTIFICATION

Equipment

Equipment identification shall be made using engraved laminated plastic plates (indented tape labels will not be permitted). Characters shall be white on a black background and 1/4" high minimum. Plates shall be secured to the panels by means of screws or metal pressure pins. Cement, by itself, will not be acceptable. All nameplates shall be mounted on the outside surface of the piece of equipment.

Individually enclosed safety switches, circuit breakers, and motor starters, pull boxes, control cabinets and other such items shall be identified indicating load, electrical characteristics, and source. For example, a disconnect switch for a 7-1/2 horsepower, 208 volt, 3 phase air handling unit, Number 8 feed from Panel "MDP", Circuit Number 2 shall be labeled as follows:

AHU-8
7-1/2 HP, 208V, 3Ø
Cir: MDP-2

Service entrance panel, distribution panels, panelboards, and transformers shall be identified indicating panel designation from the drawings, electrical characteristics and source. For example, a 277/480 volt 3 phase panel "LPA" feed from "MDP" Circuit No. 3 shall be labeled as follows:

LP-A
277/480V, 3Ø
(Feeder: MDP-3)

All enclosures containing energized components shall be marked with mylar labels identifying hazards. Such warning messages as "WARNING-HAZARDOUS VOLTAGE", "480 VOLTS", "240 VOLTS", etc. are acceptable. Labels shall be EZ-Code by Thomas & Betts or similar product.

Junction Box Identification: Each junction box cover shall be labeled with a permanent "magic" marker or other means to identify the circuits within. For example, a junction box containing lighting circuits 21, 23, 25 from Panel L2A would be labeled "L2A-21,23,25". Telephone junction boxes shall be labeled "T". Fire alarm system junction boxes shall be labeled "FA". Intercom and other system junction boxes shall be labeled accordingly.

Conductor Identification: All cables and wires shall be color coded as to phase per convention. See color coding above.

Raceway Identification: All raceways leaving the service entrance panel and distribution panels shall be clearly marked as to their circuit number. For example, a conduit containing conductors for Panel MDP, Circuit No. 5 would be marked MDP-5. Empty conduits shall be marked "empty".

Device Identification: When it is not clear what a wall switch or what a receptacle is dedicated for then the device plate shall be engraved appropriately. Blank plates for future devices shall be engraved "FUTURE". All plates shall be factory-engraved.

Warranty Signage Identification: Provide equipment tags to identify equipment and warranty information on all electrical equipment including panelboards, motor control centers, transformers, starters, etc. See sample format below. Labels shall be at least 2" x 4", laminated in plastic, and affixed to equipment in conspicuous location.

Equipment Information Tag
Unit ID: PANEL 'N1A'
Manufacturer: Siemens
Model No. : CDP-7
Serial No. : 56742 OG1
Warranty Period Ends: December 12, 2013
Warranty Contact: Short Circuit, Inc. 123.456.7890

FIREPROOFING

All conduit and boxes passing through or installed within fire walls and smoke walls shall be installed so as to maintain the integrity and rating of the wall through which it passes. Boxes shall be installed within 1/8" of wall surface. Conduits penetrating rated floors shall be installed to maintain the fire rating of the floor using UL approved sealing materials.

END OF SECTION

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SECTION 16115 ELECTRICAL – SELECTIVE DEMOLITION

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes all labor, material, equipment and services necessary and incidental to complete all the demolition and removal of electrical work as shown on the Drawings or as required.

The demolition drawings do not necessarily indicate all the conditions, details, or work required. The Contractor shall examine the building to determine the actual conditions and extent of the work. Any details not clear to this Contractor shall be referred to the Engineer for clarification prior to bidding.

The Contractor shall be responsible for demolition and removal of all existing electrical systems where shown for demolition. No portion of electrical systems shown for demolition may be abandoned in place.

SUBMITTALS

Shop Drawings: Indicate demolition and removal sequence and location of salvageable items.

Schedules: Submit schedule showing time and detailed sequence of demolition, removal of materials and arranged coordination of anticipated electrical interruptions.

1. Schedule demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

Project Record Documents: Submit in accordance with Section 16010.

1. Accurately record actual locations of abandoned or dead ended utilities.

QUALITY ASSURANCE

Contractor shall verify the extent of the demolition work. Any questions as to which systems are to be removed versus which systems are to remain shall be referred to the Engineer for clarification prior to commencing demolition work.

The demolition work shall be a phased operation and shall comply with the construction sequence schedule.

Do not close or obstruct egress width of fire exits or access.

Do not disable or disrupt building fire or life safety systems without written permission from the Owner. In all cases, permission shall have been granted not less than ten (10) working days prior to the intended interruption.

PROJECT CONDITIONS

Owner will vacate demolition area prior to start of demolition work.

Owner will continuously occupy areas of building immediately adjacent to selective demolition areas.

Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations.

Provide minimum of ten (10) working days advanced notice to Owner of demolition activities which will severely impact Owner's normal operations.

Maintain free and safe passage to and from Owner occupied areas.

Condition of Structures: Owner assumes no responsibility for actual condition of areas to be demolished.

Traffic and Passageways: Maintain accessibility for fire fighting apparatus.

1. Conduct demolition operations and debris removal to avoid interference with adjacent occupied facilities.

2. Obtain written permission from authorities having jurisdiction prior to closing or obstructing adjacent occupied facilities.

3. Provide alternate routes when closing or obstructing traffic ways when required by governing authorities.

4. Ensure safe passage of persons around area of demolition. Provide and maintain temporary covered passageways; comply with requirements of governing authorities.

Protection: Perform work in manner to eliminate hazards to persons or property and avoid interference with adjacent areas.

1. Maintain existing utilities that are to remain in service and protect from damage during demolition operations.

2. Do not interrupt existing utilities serving occupied facilities, except when authorized by Owner in writing. Provide temporary services during interruptions.

3. Coordinate in advance with Owner electrical interruptions.

4. Protect existing floors with suitable coverings when necessary.

COORDINATION

The Contractor shall be responsible for coordinating demolition of all affected electrical systems to prevent disruption to the Owner and minimize downtime.

The Contractor shall be responsible for coordinating demolition by other Divisions of the Specifications to prevent disruption to the Owner and minimize downtime.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

EXAMINATION

Beginning alterations to existing building systems means the installer accepts existing conditions.

PREPARATION

Provide, erect, and maintain temporary barriers, warning notifications (signs) and other security devices as may be required for personnel safety.

Inventory each panelboard where circuits are indicated to be reused. Sequentially consolidate existing circuits within each panelboard with regard to area served. Maximize capacity for service to the project area by including existing spares with the group of circuits breakers to be disconnected as a result of this selective demolition. Prepare a current directory, post demolition, for each panelboard as the base upon which the final directories will be compiled.

Temporarily tag every circuit breaker serving systems outside the demolition area. The tag shall be an OSHA compliant, commercially preprinted, 3¼ inch by 5-5/8 inch, accident prevention card with write on matte finish plastic surface, ¼ inch reinforced grommet and attachment string loop. The message on the card front shall read: "DANGER, DO NOT OPEN" and the message on the reverse side shall read: "DANGER, DO NOT REMOVE THIS TAG. NECESSARY DISCIPLINARY ACTION WILL BE TAKEN IF THESE ORDERS ARE DISREGARDED. SEE OTHER SIDE." The tags shall remain in place until the demolition and renovation are complete.

TEMPORARY CONDITIONS

The Contractor shall include all temporary connections necessary to permit the Owner to occupy areas of the building during the various construction phases.

SALVAGEABLE MATERIAL AND EQUIPMENT

Carefully remove, store and protect the salvage materials and equipment shown on the Drawings for Owner's use. Deliver to location directed by Owner.

Carefully salvage, remove and store, and protect for re-installation the materials and equipment shown on the Drawings.

Materials Retained by Contractor:

1. Items of salvageable value not indicated as Owner salvaged or scheduled for reinstallation may be removed as work progresses.

2. Salvaged items must be removed from site as they are removed. Storage or sale of salvaged items on site will not be permitted.

REMOVAL OF DEMOLITION MATERIAL

Contractor shall remove existing systems, shown or specified, necessary or reasonably inferred, for completion of his/her work. Owner will have the option of retaining any item of material removed under this contract. Item or materials not retained by Owner will become the property of the Contractor, removed from the premises and legally disposed off-site.

Contractor shall dispose of fluorescent lamps, ballasts, and other hazardous materials in accordance with all Local, State and Federal regulations.

Contractor shall remove all wiring determined to be disconnected and abandoned, and remove all conduit and junction boxes determined to be empty and not intended to be used during the reconstruction phase.

Remove abandoned wiring to source of supply.

Remove all exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Remove all junction boxes and conduit supports associated with conduit being removed.

Repair adjacent construction and finishes damaged during demolition and extension work.

Maintain continuity of circuits, which remain in service.

Remove all existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings floors, and other surfaces scheduled for demolition unless specifically shown as retain or relocate on drawings.

Remove auxiliary and signal systems (IE: fire alarm, security, telephone, data, sound/paging and the like) not scheduled for reuse or relocation. Remove associated devices, appliances and cabling complete.

Remove electrical systems associated with equipment (IE: motorized doors/shades/gates/ dampers, mechanical HVAC and plumbing equipment, landscape, civil, kitchen and other equipment served by the electrical systems) not scheduled for reuse or relocation on the drawings. Remove electrical junctions boxes, pull boxes, conduit, raceway systems (IE: bus gutter, cable tray, plugmold), wiring, safety switches, control panels, relays and contactors associated with equipment scheduled for removal.

PERFORMANCE

Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect/Engineer.

CLEANING

Broom clean demolition areas of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

Remove temporary work and protection when no longer needed.

Unless noted otherwise, existing fixtures that are to remain shall be cleaned and lamps and ballasts replaced with new lamps and ballasts.

END OF SECTION

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SECTION 16500 LIGHTING

PART 1 - GENERAL

SCOPE OF WORK

Lighting fixtures shall be furnished and installed as shown on the plans and as specified here.

SUBMITTALS

Submit product data for each type of lighting fixture and emergency lighting unit specified. Assemble and bind with separate sheet for each fixture type with all specifications of the proposed fixture, including all accessories clearly indicated on each sheet. As a minimum include the following data and requirements for approval:

1. Complete photometric data.

2. A description of construction details of the proposed fixture.

3. A comparison picture (for evaluating appearance) of the proposed fixture.

Submit product data for each type of lighting fixture even if furnished exactly as specified.

The Architect/Engineer will not consider any substitute fixtures unless the submittal is complete in every detail as stated above.

In addition to the above stated requirements the Architect/Engineer may require the delivery of a production fixture sample to the Architect's/Engineer's office for inspection.

Substitute fixtures shall be equal to or superior to specified fixtures in every detail in order to be approved.

PART 2 - PRODUCTS

LIGHTING FIXTURES

Compliance: NFPA 70, NFPA 101, NEMA LE1 and LE2, and UL 486A. Comply with applicable local codes and regulations for emergency lighting and exit signage.

Lighting fixture types shall be as shown on the Drawings. The catalog numbers listed are given as a guide to the design and quality of fixture desired. Equivalent designs and equal quality fixtures of other manufacturers shall be considered by the Engineer for approval (see **SUBMITTALS** section above).

LAMPS

Fluorescent lamps: medium bi-pin, energy saving cool white type unless indicated otherwise on the Drawings.

Color temperature - 5000 degree K.
Color rendering index (CRI) - 85 or greater.

All lamps of a given type shall be by one manufacturer.

Acceptable manufacturer: Osram Sylvania Inc., General Electric Company, North American Phillips, Inc. or Westinghouse.

LENSES

Prismatic lenses for lay-in fluorescent fixtures shall be clear 100 per cent virgin acrylic. Prisms shall be 3/16" square based male cones aligned parallel and perpendicular to the length and width of the panel. Minimum prism height shall be .080".

Acrylic used in panels shall meet Grade 8 requirements as set forth in ASTM D-788-69a and shall meet IES, NEMA, and SPI standards for acrylic material.

BALLASTS

Fluorescent ballasts: totally discrete electronic, high frequency, energy saving Class P, sound rated A, rapid or programmed start, high power factor type, and listed by Underwriters Laboratories, Inc., for operation on 120/277 volts or as indicated on the Drawings. Electronic ballasts shall be physically interchangeable with standard core and coil electromagnetic ballasts.

Regulatory Requirements: applicable ANSI and IEEE standards including ANSI C82.11 and ANSI/IEEE C62.41 Category A; UL listed Class P and CSA Certified; ballast shall comply with all applicable state and federal efficiency standards. Provide fluorescent lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

Performance Requirements:	frequency	20kHz or greater
	THD	10% or less
	power factor	0.98 or greater
	crest factor	1.5 or less
	noise rating	Class "A"
	temp. rise	25 degrees C (over 40 degree C ambient)

Ballasts for sensitive areas shall have THD less than 10% and crest factor less than 1.7

Ballasts shall be compatible with occupancy sensors.

PCB's: the ballasts used on the project shall not contain polychlorinated bi-phenyls (PCB's).

Warranty: five (5) years.

Acceptable manufacturers: Advance, Sylvania Electric Products, Inc., Motorola, Universal, or General Electric Company.

EXIT SIGN

AC illuminated exit sign, universal mounting.

Lamps: circuit board mounted light emitting diode (LED) type in replaceable circuit board.

Housing: die cast aluminum with brushed stencil face and painted edging, painted matte white.

Faceplate: brushed stencil face with universal punch-out arrows. Lens shall mount behind faceplate.

LIGHTING CONTROLS

Motion Detectors, Ceiling Mount Switches: shall consist of a dual element pyroelectric sensor, low profile design and shall offer 360 degree coverage, maximum 1200 square feet in circular pattern, 500 square feet for typical desktop activity. Provide units with time delay adjustment from 30 seconds to 20 minutes and feature adjustable unit sensitivity. LED display to indicate motion detection. Unit shall operate at 24 volts DC or 120 volts AC as shown on drawings. Provide power pack for switching of lighting loads with fully self-contained transformer and relay. Power pack shall be rated 20 amps (ballast), 120V/277VAC and up to 1 HP inductive loads. Supply units of the proper voltage for the application. Units shall be compatible with all electronic ballasts systems. There shall be no voltage to load in the OFF mode.

Warranty: five years.

Acceptance: Provide complete product data and wiring diagrams in accordance with Section 16010 and Division 1. Provide manufacturer's prepared CAD shop drawings clearly showing devices to be used, location and near-field/far-field coverage.

Acceptable Manufacturer: Sensorswitch, Inc. Equivalent products by Leviton or WattStopper.

PART 3 - EXECUTION

INSTALLATION

Each fixture shall be a completely finished unit with all components, mounting and hanging devices necessary, for the proper installation of the particular fixture in its designated location and shall be completely wired ready for connection to the branch circuit wires at the outlet.

When fixtures are noted to be installed flush, they shall be complete with the proper accessories for installing in the particular ceiling involved. All flush mounted fixtures shall be supported from the structure and shall not be dependent on the hung ceilings or ceiling grids for their support.

Support recessed troffer fixtures from each corner using steel suspension wires to the structure.

Install flush mounted fixtures to eliminate light leakage between fixture frame and finished surface.

Install exit signage plumb and level with ceilings and walls and in accordance with NFPA 101 Life Safety Code. Install unit to be readily visible along the intended egress path. Locate signage so as not to conflict with door swings, equipment operation, etc.

INSTALLATION QUALITY ASSURANCE

Lamps used during the building construction, prior to two (2) weeks from completion of the work, shall be removed and replaced with new lamps.

All fixtures shall be left in a clean condition, free of dirt and defects, before acceptance by the Architect.

All fixtures shall operate properly, with no noticeable noise, flicker or other difficulty, and all lamps shall operate properly and with no color shift before acceptance by the Architect. Fluorescent lamps which exhibit any darkening shall be replaced.

Demonstrate proper operation of emergency lighting units by interrupting electrical energy to each lighting circuit in the area of operation. Demonstration by disconnection of the main service is not acceptable.

END OF SECTION

SECTION 16721 FIRE ALARM SYSTEM

PART 1 - GENERAL

DESCRIPTION

This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, auxiliary control devices, auxiliary booster panels, and wiring as shown on the drawings and specified here.

The fire alarm system installation shall comply with requirements of NFPA Standard No. 72 and local code requirements for protected premises signaling systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of EN29001, BS5750: Part 1: ANSI/ASQC Q91-1987.

The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).

The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.

Acceptable manufacturers are:

1. Edwards/EST

BASIC PERFORMANCE

Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Class B signaling line circuit.

Initiation Device Circuits (IDC) shall be wired Class B.

Notification Appliance Circuits (NAC) shall be wired Class B.

Digitized electronic signals shall employ check digits or multiple polling.

Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The System Alarm LED shall flash.

2. A local audible signal in the control panel shall sound.

3. A backlit LCD display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises.

4. History storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

5. All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm notification appliances and/or relays) shall be activated.

6. A supervised signal to notify an approved central station is to be activated. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on-site configurable to provide either a "reverse polarity", "local energy", "shunt" or dry contact connection. This circuit shall be configured as required to properly interface with digital dialer to be provided.

7. The mechanical controls shall activate the air handling systems per life safety specification, NFPA-101. Activation of the engineered smoke control system shall commence in accordance with sequence of operation. The Control Panel shall initiate and control all smoke control system functions when in automatic mode.

SUBMITTALS

General:

Submit manufacturer's data to the Engineer for review in accordance with Division 1 requirements.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

Shop Drawings:

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, and performance in the form of standard data sheets.

Provide equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts drawn to scaled floor plan depiction.

Provide power requirements and battery sizing calculations for review.

Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

Software Modifications:

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

The Contractor's base bid shall include all programming and software modifications necessary to provide a fully functioning and properly operating system. Any modifications necessary for component additions or deletions to the system prior to system acceptance, and any modifications during the warranty period shall be included unconditionally in the base bid.

Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

GUARANTY

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

APPLICABLE STANDARDS AND SPECIFICATIONS

The specifications and standards listed below form a part of this specification. The system shall fully comply with all relevant standards currently adopted by the Florida Fire Prevention Code 2012 Edition.

National Fire Protection Association (NFPA) - USA:

No. 72	National Fire Alarm Code.
No. 101	Life Safety Code.

Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems.
No. 864	Control Units for Fire Protective Signaling Systems.
No. 268A	Smoke Detectors for Duct Applications.
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances.
No. 38	Manually Actuated Signaling Boxes.
No. 1971	Visual Notification Appliances.

Local and State Building Codes

All requirements of the Authority Having Jurisdiction (AHJ).

APPROVALS

The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL	Underwriters Laboratories Inc.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIAL, GENERAL

All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

CONDUIT AND WIRE

Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

All wiring shall be installed in a metal conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

Power limited circuits must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760.

All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

Conduit shall be 3/4 inch minimum.

Wire:

All fire alarm system wiring shall be new.

Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer.

All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. Initiating device circuits and notification appliance circuits shall not be laid along the same pathways or installed in the same conduit with each other, or with the communication loop (if applicable). This requirement does not apply specifically to junction boxes, device boxes or terminal cabinets where terminations or taps are made.

All field wiring shall be completely supervised.

Terminal Boxes, Junction Boxes and Cabinets:

All boxes and cabinets shall be UL listed for their use and purpose.

Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

MAIN FIRE ALARM CONTROL PANEL

The Fire Alarm System Control Panel is an EST 3 panel, is existing to remain, and is located in the administration office of Building 1.

SYSTEM COMPONENTS

Programmable Electronic Sounders:

Electronic sounders shall operate on 24 VDC nominal.

Electronic Sounders shall be field programmable without the use of special tools, to provide interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.

These devices shall be capable of either ceiling or wall mounting.

Shall be flush mounted where shown on plans.

Strobe Lights:

Shall operate on 24 VDC nominal.

Shall meet the requirements of the ADA as defined in section 702.1 of FBC Accessibility Chapter 7 and shall meet the following criteria:

The strobe intensity shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The flash rate shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The appliance shall be placed 80 inches above the highest floor level within the space, or 6 inches below the ceiling, which ever is the lower.

Visual alarm devices shall be installed where audible devices are installed.

Audible/Visual Combination Devices:

Shall meet the applicable requirements above for audibility.

Shall meet the requirements above for visibility.

Units shall provide a common enclosure for the fire alarm audible and the visual alarm devices. The unit shall be clearly marked with "Fire" lettering visible from a 180 degree field of view.

Addressable Devices - General

Addressable Devices shall provide an address-setting means.

Detectors shall be Intelligent and Addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.

Addressable smoke and thermal detectors shall provide an LED. LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and LED shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.

Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

Addressable Pull Box (manual station)

Addressable Pull Boxes shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual Stations shall be constructed with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

Stations shall be suitable for or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

Intelligent Photoelectric Smoke Detector

The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

Intelligent Thermal Detectors

Thermal Detectors shall be intelligent addressable devices adjustable for activation temperature by software. Initial programming for all units shall be 135 degrees F and have a rate-of-rise element

rated at 15 degrees F per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.

The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.

Intelligent Duct Smoke Detector

In-Duct Smoke Detector Housing shall accommodate either an intelligent ionization sensor or an intelligent photoelectric sensor, of that provides continuous analog monitoring and alarm verification from the panel.

When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to shut down air handling systems.

Provide remote alarm/power LED indicator where shown on the Drawings.

Addressable Dry Contact Monitor Module

Addressable Monitor Modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.

The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box.

The IDC zone may be wired for Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

Two Wire Detector Monitor Module

Addressable Monitor modules shall be provided to connect one supervised IDC zone of conventional 2-Wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

The Two-Wire Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box or with an optional surface backbox.

The IDC zone may be wired for Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

Addressable Control Module

Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox.

The control module NAC circuit may be wired Class B with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.

The control module shall provide address-setting means and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.

A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.

The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

Isolator Module

Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.

If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section.

The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.

The Isolator Module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

TERMINAL CABINETS

Provide manufacturer's standard surface mounted terminal cabinets for termination of circuits as required. Terminate all conductors on designated terminal blocks or strips with identification of each conductor in the cabinet.

Use of standard NEMA 1 control enclosure is acceptable. Construction shall be 16 gauge steel with hinged front cover with flush latch operated with coin or screwdriver. Provide units with separate backpanel for mounting terminal blocks. Do not mount terminal block directly to back of enclosure

BATTERIES

Shall be 12 volt, gel cell type (at least two required).

Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes (15 minutes for a voice evacuation system) of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. Liquid electrolytes are not acceptable. To prevent spills and leakage, fluid level checks or refilling shall not be required.

PART 3 - EXECUTION

INSTALLATION

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. The manufacturer's authorized representative shall provide onsite supervision of installation.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices and auxiliary panels shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

TEST

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short Notification Appliance Circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

Verify all signals transmit properly to monitoring center.

FINAL INSPECTION

At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate to the Architect that the systems function properly in every respect.

INSTRUCTION

Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the owner.

END OF SECTION

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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.
2. Bait-station system.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. 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.

C. Bait-Station System Installation Report: After installation of bait-station system is completed, submit report for Owner's records and include the following:

1. Location of areas and sites conducive to termite feeding and activity.
2. Plan drawing showing number and locations of bait stations.
3. Dated report for each monitoring and inspection occurrence, indicating level of termite activity, procedure, and treatment applied before time of Substantial Completion.
4. Termiticide brand name and manufacturer.
5. Quantities of termiticide and nontoxic termite bait used.
6. Schedule of inspections for one year from date of Substantial Completion.

D. Sample Warranties: For 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 employs workers trained and approved by manufacturer to install manufacturer's products and who is accredited by manufacturer.

1.6 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide

treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Corporation, Pest Control Solutions; Phantom or Termidor.
   b. Bayer Environmental Science; Premise 75 or Premise Pro.
   c. Syngenta; Demon Max.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

2.2 BAIT-STATION SYSTEM

A. Description: EPA-Registered system acceptable to authorities having jurisdiction. Provide bait stations based on the dimensions of building perimeter indicated on Drawings, according to product's EPA-Registered Label and manufacturer's written instructions.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Corporation, Pest Control Solutions; Advance Termite Bait System.
   b. Dow Chemical Company (The), Dow AgroSciences LLC; Sentricon Termite Colony Elimination System.
   c. Ensystex; Exterra System.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
3. Crawlspaces: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.

4. Masonry: Treat voids.
5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 INSTALLING BAIT-STATION SYSTEM

A. Bait-Station System: Install during construction to determine areas of termite activity and after construction, including landscaping, is completed.

B. Place bait stations according to product's EPA-Registered Label and manufacturer's written instructions, in the following locations:

1. Conducive sites and locations indicated on Drawings.
2. In and around infested trees and stumps.
3. In mulch beds.
4. Where wood directly contacts soil.
5. Areas of high soil moisture.
6. Near irrigation sprinkler heads.
7. Each area where roof drainage system, including downspouts and scuppers, drains to soil.
8. Along driplines of roof overhangs without gutters.
9. Where condensate lines from mechanical equipment drip or drain to soil.
10. At plumbing penetrations through ground-supported slabs.
11. Other sites and locations as determined by licensed Installer.

C. Spacing: Place bait stations according to manufacturer's written instructions and at a frequency no less than the following:

1. One bait station per 20 linear feet (6.1 linear meters).
2. One cluster of bait stations per 20 linear feet (6.1 linear meters), with no fewer than three bait stations per cluster.

3.5 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.6 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

END OF SECTION 313116

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Chain-Link Fences: Industrial.
2. Gates: Swing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet (3.66 m) high, and post spacing not to exceed 10 feet (3 m).

B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans,

gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: Manufacturer's color charts or 6-inch (150-mm) lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

D. Qualification Data: For Installer.

E. Maintenance Data: For the following to include in maintenance manuals:

1. Polymer finishes.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

B. Interruption of Existing Utility Service: Do not interrupt utility services to 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 no fewer than two days in advance of proposed interruption of utility services.
2. Do not proceed with interruption of utility services without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Chain-Link Fences and Gates: 'Master Halco' or equal.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic and Polymer-coated wire with a diameter of 0.192 inch (4.88 mm).

    a. Mesh Size: 2-1/8 inches (54 mm).
    b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. (366 g/sq. m) with zinc coating applied after weaving.
    c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

2. Selvage: Twisted top and knuckled bottom.

2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40.
2. Fence Height: as indicated.
3. Strength Requirement: Heavy industrial according to ASTM F 1043.
4. Post Diameter and Thickness: According to ASTM F 1043.
5. Post Size and Thickness: According to ASTM F 1043.

    a. Top Rail: 1.66 inches (42 mm).
    b. Line Post: 2.375 inches (60 mm).
    c. End, Corner and Pull Post: 2.875 inches (73 mm).
    d. Swing Gate Post: According to ASTM F 900 2.375-inch (60-mm) diameter, 3.11-lb/ft. (4.63-kg/m) weight.

        1) Openings up to 12 Feet (3.7 m): Steel post, 2.875-inch (73-mm) diameter, and 4.64-lb/ft. (6.91-kg/m) weight.

2) Openings Wider Than 12 Feet (3.7 m): Steel post, 4-inch (102-mm) diameter, and 8.65-lb/ft. (12.88-kg/m) weight.
3) Guide posts for Class 1 horizontal-slide gates equal the gate post height, 1 size smaller, but weight is not less than 3.11 lb/ft. (4.63 kg/m); installed adjacent to gate post to permit gate to slide in space between.

6. Coating for Steel Framing:

a. Metallic Coating:

1) 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/A 653M.

2.4 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single and double swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: 2 inches (50 mm) less than adjacent fence height.
2. Leaf Width: As indicated.
3. Frame Members:

a. Tubular Steel: 1.90 inches (48 mm) round.

C. Frame Corner Construction:

1. Welded or assembled with corner fittings and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.

D. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet (1.52 m) wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

1. Owner to provide pad locks.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

a. Hot-Dip Galvanized Steel: 0.106-inch- (2.69-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.

2.6 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M. Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94/C 94M.

1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.7 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.8 FENCE GROUNDING

A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.

1. Material above Finished Grade: Copper.
2. Material on or below Finished Grade: Copper.
3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Connectors and Grounding Rods: Comply with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel.

    a. Size: 5/8 by 96 inches (16 by 2440 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements as specified by manufacturer.

1. Install fencing on established boundary lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

    a. Concealed Concrete: Top 2 inches (50 mm) below grade to allow covering with surface material.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 10 feet (3 m) o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 6 feet (1.83 m) or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

G. Bottom Rails: Install, spanning between posts.

H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:

1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).

a. Gates and Other Fence Openings: Ground fence on each side of opening.

1) Bond metal gates to gate posts.

2) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (460 mm) below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2, unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. ~~Connect conductor to each fence component at the grounding location, including the following:~~ Addendum 1

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.7 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.8 DEMONSTRATION

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

END OF SECTION 323113