HILLSBOROUGH COUNTY

FLORIDA

REQUEST FOR PROPOSALS
FOR

EAST LAKE FIRE STATION NO. 32 REPLACEMENT
(CIP NO. C91179000*)*

CONSTRUCTION MANAGER (CM) AT-RISK

Volume 2 of 3
Technical Specifications (Part 1 of 2)

RFP NO. : RFP-C-0198-0-2016/ST

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SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Special Conditions, other Division-1 Specification Sections, and the CM-AT Risk GMP RFP Package "RFP" apply to this Section.

1.2 SUMMARY OF CONSTRUCTION MANAGER'S (CM'S) SCOPE OF WORK

The Summary of **CM'S** Scope of Work is generally described herein: In general, the name of the Project is the "**East Lake Fire Station No. 32 Replacement"**. The Work includes but is not limited to the furnishing of all labor, materials, equipment, permitting services, field engineering, construction management, and project administration/supervision activities to construct fully finished and functional fire station. The facility must be of high quality and low maintenance; must meet or exceed the requirements of the GMP Construction Documents Package and must meet the needs of the user and maintenance agencies. The construction of this facility shall meet the requirements of all governing local, state and federal regulations, codes and ordinances, including the Florida Accessibility Code for Building Construction and the Americans with Disabilities Act (ADA).

1. 2.1 <u>Project Location:</u>

1. 2.2 Generally, the construction work includes but is not limited to: Construction of a single story approximately 15,665 sq. ft. 7-bay fire station building, together with all associated on-site and off-site improvements such as access drives, parking lot, dumpster enclosure, sign, flagpole, landscaping, irrigation, storm drainage system, sidewalks, median improvements, fences, refueling facility , emergency generator and all necessary utilities, including a fire sprinkler system (NFPA 13 system). The project also includes the construction of an emergency traffic signal at Hillsborough Avenue as an Additive Alternate, which alternate may or may not be accepted by the County.

A. The Construction Documents also include certain Alternates and Options which may or may not be included as part of the Work at the **COUNTY'S** option. These alternates and options are listed in Section 01030 Alternates and Options of Division One Specifications.

1.3. CONSTRUCTION MANAGER'S WORK

The **CM'S** construction Work shall include, but shall not be limited to the furnishing of all labor, materials, equipment, and project administration/supervision activities, including scheduling, to construct **<u>one</u>** fully finished facility which meets or exceeds the program and standards set forth in the RFP as follows:

A. Obtaining all permits and approvals from regulatory and utility agencies.

B. All required on-site and off-site work associated with the project including but not limited to access drives, sidewalks, parking, signage, flagpole, refueling facility, landscaping and irrigation, water and wastewater connections and extensions, electrical utility services, fire protection, storm water retention system, etc.

C. Construction of one complete, functional fire station facility as described in the GMP documents.

D. The work includes all associated equipment and building systems as described in the GMP drawings and specifications including mechanical systems, water and sanitary systems, fire protection, electrical systems, conduit and wiring for data/telecommunications, emergency generator, 911 "Tear & Go" System, etc.

E. Provision of all close-out documents, including but not limited to as-built surveys and drawings, maintenance manuals, warranties and guarantees as described in Division 1 of the Specifications, Section 01700 "Project Close-out." This is to include, but not be limited to the following:

1. Training for **COUNTY'S** Facilities Management and other personnel on the maintenance and operation of all systems, including video taping of all training classes.

2. Post-construction warranty and guarantee services including standard and extended warranties.

1.4 CONSTRUCTION MILESTONES

A. The **CM** shall achieve the Milestone Dates described in Attachment "B" of this "RFP".

B. The **CM** must provide a Guaranteed Schedule to meet the above stated completion milestone dates. Earlier completion than those dates stated above are not required and will not necessarily be accepted by the **COUNTY**.

C. No later than one month prior to Substantial Completion date, the **CM** coordinate all testing, and inspections of systems and facilities with the Vendors and Testing Engineers.

1.5 WORK BY OTHERS

A. The **CM'S** attention is directed to the fact that Work may be conducted at the site by other contractors during the performance of the Work under this Contract. The **CM** shall conduct the operations so as to cause a minimum of interference with the Work of such other contractors and shall cooperate fully with such contractors and the project representative to provide continued safe access to their respective portions of the site, as required too perform their respective contracts.

1.6 NOISE CONTROL

CM shall eliminate noise within the project area to the extent possible. All local ordinances and regulations covering noise control shall be observed.

1.7 STORAGE

Storage conditions shall be acceptable to **COUNTY** for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such storage arrangements and conditions shall be presented in writing for **COUNTY'S** review and approval and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to Project Manager. The stored materials shall be insured for full value. Certificates of liability insurance coverage must be submitted to the Project Manager with the request for payment by the **CM.** All arrangements and costs for storage facilities shall be paid by the **CONSTRUCTION MANAGER**.

1.8 NOTICES TO OWNERS AND AUTHORITIES

A. **CONSTRUCTION MANGER** shall notify all property owners and owners of utilities when prosecution of the Work may affect them.

B. **CM** shall review with the various utility companies the construction methods and work to be done in the vicinity of utilities.

1.9 REFERENCE STANDARDS

Reference to the standards of any technical society, organization, or association or to codes of local or state authorities shall mean the latest effective standard, code, specification, or standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.

1.10 DUST/DIRT CONTROL

The **CM** shall be careful not to create dust, dirt or contamination of adjoining active storm drain and channel waters during demolition or other activities. The **CM** is responsible for any and all damage as a result of the Work.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION
01010

SECTION 01030 – ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

B. This Section includes a Schedule of Alternates and includes administrative and procedural requirements governing Alternates.

1.2 DEFINITIONS

A. Definition: An alternate is an amount proposed by **CONSTRUCTION MANAGER (CM)** and stated on the GMP Proposal for certain work defined in the Agreement that may be added to or deducted from the GMP amount if the **COUNTY** decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the **CM'S** Construction Price to incorporate the Alternate into the Work. No other adjustments are made to the GMP.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to fully integrate that Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Schedule: A "Schedule of alternates" is included in this Section. Specifications Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION - SCHEDULE OF ALTERNATES AND OPTIONS

3.1 SCHEDULE OF ALTERNATES

Alternate No. 1. Emergency Generator:
GMP: Emergency generator set, automatic transfer switch and remote annunciator are not included in base GMP.

Note: Emergency generator installation with its associated concrete pad and electrical work shall be provided as part of base proposal.

Additive Alternate: Provide the cost to furnish the emergency generator set with its associated Automatic transfer, remote annunciator as indicated in construction documents.

Add to GMCP

2. **Alternate No. 2. Emergency Traffic Signal:**
GMP: The construction of emergency traffic signal is not included in the base GMP.

Additive Alternate: Provide a cost to add all work associated with construction of emergency traffic signalization as per drawings Sheets T-1 through T-10 prepared by CPWG, Inc.

Add to GMCP

END OF SECTION 01030

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for the Projects coordination including, but not necessarily limited to:

1. Coordination
2. General installation provisions
3. Cleaning and protection
4. Administrative and supervisory personnel
5. Security procedures

B. Progress meetings, coordination meetings and pre-installation conferences are included in SECTION 01200 - MEETINGS AND CONFERENCES.

C. Requirements for the **CONSTRUCTION MANAGER'S** Construction Schedule are included in SECTION 01300 - CONSTRUCTION MANAGER SUBMITTALS.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work for both sites. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Coordinate work and delivery of materials for both sites.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules
2. Installation and removal of temporary facilities
3. Delivery and processing of submittals.
4. Maintenance of record drawings.

5. Progress meetings.
6. Projects Closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as **COUNTY'S** property.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare and submit Coordination Drawings where close and careful coordination is required for installation of products and materials fabricated offsite by separate entities and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in SECTION 01300 – CONSTRUCTION MANAGER SUBMITTALS.
4. Refer to Division 15 and Division 16 for specific Coordination Drawing requirements for mechanical and electrical installations.

PART 2 - PRODUCTS (NOT APPLICABLE).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Project Manager for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible

results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, refer mounting height decisions to the Project Manager for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessively high humidity.
3. Water.
4. Heavy traffic.
5. Soiling, staining and corrosion.
6. Combustion.
7. Unusual wear or other misuse.
8. Contact between incompatible materials.
9. Excessive weathering.
10. Theft.
11. Vandalism.

END OF SECTION 01040

SECTION 01045 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. General provisions of Contract, including General and Supplementary Conditions.

B. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for cutting and patching.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

B. Approval by the **PROJECT MANAGER** and **PROFESSIONAL** to proceed with cutting and patching does not waive the **PROJECT MANAGER** and **PROFESSIONAL'S** right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the **PROJECT MANAGER** and **PROFESSIONAL'S** opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect.

B. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding.

B. Review areas of potential interference and conflict with trades involved. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Provide temporary support of Work to be cut.

B. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

B. Cut existing construction using methods least likely to damage elements to be retained or adjoining construction.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance.
4. Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access.

B. Remove completely paint, mortar, oils, putty and items of similar nature.

C. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. All required submittals shall be made in accordance with provisions set herein and in other sections of this Division 1.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for Field-Engineering services before, during, and after completion of construction, including, but not limited to, the following:

1. Land Survey Work,
2. Civil-Engineering Services,
3. Material Testing Services,
4. System Testing Services.

1.3 SUBMITTALS

A. Certificated Survey: Submit a survey signed by a Florida Registered Land Surveyor/Professional Engineer showing the location, dimensions, and elevations of all building structures. This to include the location, dimension, and elevation of all site improvements, such as, roads, pavements, and above and under ground utilities. The names of Land Surveyor, Professional, and Testing Services Professional shall be submitted to the **PROJECT MANAGER** for approval.

B. Certified Stormwater Management Survey: Submit a survey signed by a Florida Registered Civil Professional Engineer showing the location, dimensions, and elevations of all site storm drainage related site improvements. This to include, but not limited to the following: site elevations, above swale elevations, underground storm drainage piping invert elevations, sizes of storm ponds, pond elevations, and size of storm control structures, as required by the Regulatory Agencies for final acceptance and approval of the storm management system. The names of Professional shall be submitted to the **PROJECT MANAGER** for approval.

C. Certification Letter: Submit a letter signed by a Florida Registered Civil Engineer and the **CONSTRUCTION MANAGER** certifying that all site improvements were constructed in accordance with the approved Construction Document Drawings, Specifications, and all Regulatory Agencies requirements. Also, that all site related drainage and utilities permits have been applied for and final approvals have been obtained for the Project. Copies of all permit and final Regulatory Agencies approval shall be attached with the certificate.

D. Record Documents and Test and Balance Report: Submit a Record Documents, record survey data, and Test & Balance Reports in accordance with other Sections of this Division 1.

1.4 QUALITY ASSURANCE

Surveyor/Engineer Qualifications: Engage a Surveyor and Engineers of the discipline required, licensed in the State of Florida to perform required Engineering Services for that specific discipline. The Surveyor and Engineers shall be approved by the **PROJECT MANAGER** prior to commencement of the Work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on the Drawings before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval of **COUNTY'S** representative. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

B. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

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

C. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

D. Verify all information with approved permit drawings to assure that the Work is in compliance with all Regulatory Agencies approval.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each building. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.

2. As construction proceeds, check every major element for line, level, and plumb.

B. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations,

column grids and locations, floor levels, and control lines and levels required for mechanical and electrical Work.

C. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

D. Storm Management System: Locate and lay out all storm water management structures, swales, and ponds. Set and label markers with required grade elevations and underground storm piping.

END OF SECTION 01050

SECTION 01070 - ABBREVIATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

Wherever in these Specifications references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear in these specifications shall have the meanings indicated herein.

1.3 ABBREVIATIONS AND ACRONYMS

AAMA	Architectural Aluminum Manufacturers Association
AAR	Association of American Railroads
AASHTO	American Association of the State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
AGA	American Gas Association
AGC	Associated General Contractors
AGMA	American Gear Manufacturers Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ASA	Acoustical Society of America
ASAE	American Society of Agriculture Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association

BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturers Association
CBM	Certified Ballast Manufacturers
CEMA	Conveyors Equipment Manufacturers Association
CGA	Compressed Gas Association
CLPCA	California Lathing and Plastering Contractors Association
CLFMI	Chain Link Fence Manufacturers Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturers Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
IOS	International Organization for Standardization
ITE	Institute of Traffic Engineers
FDOT	Florida Department of Transportation
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission of Association
MTI	Marine Testing Institute
NAAM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturers Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SSA	Swedish Standards Association
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPR	Simplified Practice Recommendation
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SWFWMD	Southwest Florida Water Management District
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute

UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01070

SECTION 01095 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

A. Applicable Publications: Whenever in these specifications references are made to published specifications codes, standards, or other requirements, it shall be understood wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date of receipt of proposals shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the drawings shall be waived because of any provision of or omission from said standards or requirements.

B. Assignment of Specialists: In certain instances, specification text requires (or implies) that specific Work is engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the **CONSTRUCTION MANAGER** has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction process or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the **CONSTRUCTION MANAGER**.

1.3 DEFINITIONS

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

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

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

D. Approved: Means "approved by **PROJECT MANAGER** and/or **PROFESSIONAL**."

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

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

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

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

I. Installer: An "Installer" is the Subcontractor or an entity engaged by the **CONSTRUCTION MANAGER** either as an employee, subcontractor, or contractor of lower tier for performance of a

particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

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

    b. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the **CONSTRUCTION MANAGER** has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the **CONSTRUCTION MANAGER**.

        1) This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

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

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

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

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

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

1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied but not stated shall be interpreted as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.
2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the **CONSTRUCTION MANAGER**. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the **CONSTRUCTION MANAGER** or by others when so noted.

    a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.5 INDUSTRY STANDARDS

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

B. Publication Dates: Comply with the permit requirements in effect as of the date of the issuance of the Building Permit, issued by the Hillsborough County Construction Services Division.

C. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the **CONSTRUCTION MANAGER** shall obtain copies directly from the publication source.

D. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.6 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the specifications, all Work specified herein shall conform to or exceed the requirements of all applicable codes, and the applicable requirements of such documents are not in conflict with the requirements of these specifications nor applicable codes.

B. References herein to "Building Code," "Code" or "FBC" shall mean the Florida Building Code. The latest edition of the code, as approved and used by the local agency, as of the date of award, and as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the **PROJECT MANAGER** and **PROFESSIONAL** for clarification and directions prior to ordering or providing any materials or labor. The **CONSTRUCTION MANAGER** shall bid the most stringent requirements.

D. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations,** including all changes and amendments thereto.

E. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations,** including all changes and amendments thereto.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01095

SECTION 01200 – MEETINGS AND CONFERENCES

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

A. In accordance with the Agreement, prior to the commencement of any construction Work, a preconstruction conference will be held at a mutually agreed time and place. The conference may be attended by:

1. Responsible officer of **CONSTRUCTION MANAGER** and superintendent assigned to the project
2. Principal subcontractors
3. Representatives of principal suppliers and manufacturers as appropriate
4. **PROFESSIONAL**
5. **PROJECT MANAGER**
6. Representatives of the **COUNTY**
7. Governmental representatives as appropriate
8. Others as requested by **CONSTRUCTION MANAGER**, **COUNTY**, **PROFESSIONAL**, or **PROJECT MANAGER**.

B. Unless previously submitted to **PROJECT MANAGER**, **CONSTRUCTION MANAGER** shall bring to the conference a tentative schedule for each of the following:

1. Progress and order of the Work
2. Procurement Schedule
3. Values for progress payment purposes
4. Schedule of shop drawings and other submittals
5. Updated bar chart schedule

C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include as a minimum:

1. **CONSTRUCTION MANAGER'S** schedules
2. Transmittal, review, and distribution of **CONSTRUCTION MANAGER'S** submittals
3. Processing applications for payment
4. Maintaining record documents
5. Critical work sequencing
6. Field decisions and changes
7. Use of premises, office and storage areas, security, housekeeping, and **COUNTY'S** needs
8. Major equipment deliveries and priorities
9. **CONSTRUCTION MANAGER'S** assignments for safety and first aid

D. **PROFESSIONAL** and not the **CONSTRUCTION MANAGER** will preside at the conference and will arrange for keeping the minutes and distributing them to all persons in attendance. The **CONSTRUCTION MANAGER** shall provide the **PROFESSIONAL** specific information requested by the **PROFESSIONAL** for preparation of the Minutes.

1.2 PROGRESS MEETINGS

A. **CONSTRUCTION MANAGER** shall schedule and conduct regular progress meetings as required

by progress of the Work. **CONSTRUCTION MANAGER**, **PROJECT MANAGER**, **PROFESSIONAL**, and all subcontractors active on the site shall be represented at each meeting. **CONSTRUCTION MANAGER** may request attendance by representatives of its suppliers, manufacturers, and other subcontractors.

B. The **PROFESSIONAL** shall preside at the meetings and provide for keeping minutes and distribution of the minutes to the **COUNTY**, **CONSTRUCTION MANAGER** and others. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve problems which may develop.

1.3 COORDINATION/PRE-INSTALLATION MEETINGS

In addition to progress meetings, **CONSTRUCTION MANAGER** is to hold coordination meetings and pre-installation conferences with personnel and subcontractors to assure coordination of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01300 - CONSTRUCTION MANAGER SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REQUIRED SUBMITTALS

The **CONSTRUCTION MANAGER** shall submit all required Submittals as described herein, the Agreement, other parts of the Specifications and Construction documents.

1. Preliminary Submittals
2. Shop Drawings
3. **CONSTRUCTION MANAGER'S** Schedule
4. Samples
5. Technical Manuals
6. Submittal of Proposed Equivalent Products
7. Progress Reports
8. Schedule of Values

1.3 PRELIMINARY SUBMITTALS

. Prior to preconstruction meeting, the **CONSTRUCTION MANAGER** shall submit four (4) copies of the following items to the **PROJECT MANAGER** and **PROFESSIONAL** for review:

1. An updated Bar Chart Schedule
2. An Updated Schedule of Values
3. A Schedule of Shop Drawing submittals
4. A list of all permits and licenses the **CONSTRUCTION MANAGER** has obtained and copies of all permits obtained
5. A list of **CONSTRUCTION MANAGER'S** principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1.4 SHOP DRAWINGS

A. The **PROFESSIONAL** shall concurrently review all **CONSTRUCTION MANAGER** submittals.

B. Three (3) hard copies and one (1) PDF copy of each submittal shall be given to the **PROFESSIONAL.** When the **PROFESSIONAL** reviews the submittals and returns the PDF copy to the **CONSTRUCTION MANAGER** marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required. Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

C. When the submittal is returned to the **CONSTRUCTION MANAGER** marked "REJECTED - RESUBMIT," the **CONSTRUCTION MANAGER** shall revise said submittal and shall resubmit to the **PROFESSIONAL,** using the same number of copies as for the initial submission**.**

D. Fabrication of an item shall not commence before the **PROFESSIONAL** has reviewed the pertinent submittals and returned copies to the **CONSTRUCTION MANAGER** marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

E. The **PROFESSIONAL'S** review of **CONSTRUCTION MANAGER** submittals shall not relieve the **CONSTRUCTION MANAGER** of the entire responsibility for the correctness of details and dimensions. The **CONSTRUCTION MANAGER** shall assume all responsibility and risk for any misfits due to any errors in **CONSTRUCTION MANAGER** submittals. Any fabrication or other work performed in advance of the receipt of approved submittals shall be entirely at the **CONSTRUCTION MANAGER'S** risk and expense. The **CONSTRUCTION MANAGER** shall be responsible for the dimensions and the design of adequate connections and details.

1.5 CONSTRUCTION MANAGER'S SCHEDULE

A. **CONSTRUCTION MANAGER'S** schedule shall be prepared and updated with each Request for Payment and submit two (2) copies as requested by the **PROJECT MANAGER.**

B. The schedule shall be comprehensive, covering both activities at the site of the Work and offsite activities such as design, procurement, and fabrication. The schedule shall be orderly and realistic and shall be revised as necessary to meet this requirement. The **CONSTRUCTION MANAGER** shall promptly advise the **PROJECT MANAGER** and **PROFESSIONAL** of any occurrence that may impact the schedule. No revision to the schedule can be made without review and acceptance by the **PROJECT MANAGER.** The schedule shall be incorporated with the Bar Chart Schedule.

C. The **CONSTRUCTION MANAGER** shall assist the **PROJECT MANAGER** in reviewing and evaluating each schedule furnished. Schedules which are not accepted and which are returned to the **CONSTRUCTION MANAGER** shall be revised to correct the defects noted and shall be resubmitted to the **PROJECT MANAGER** within fifteen (15) calendar days after receipt, as requested by the **PROJECT MANAGER**.

D. When required to perform and complete the Work in accordance with the revised schedule, the **CONSTRUCTION MANAGER** shall provide additional labor, materials, equipment, or other factors of production in excess of those in use before the changed revised schedule was ordered.

1.6 SAMPLES

A. **CONSTRUCTION MANAGER'S** samples shall be prepared, submitted, reviewed, monitored and approved in accordance with the Agreement.

B. Unless otherwise specified, whenever in the Specifications samples are required, the **CONSTRUCTION MANAGER** shall submit not less than three (3) samples of each such item or material to the **PROJECT MANAGER** or designee for approval at no additional cost to the **COUNTY**.

C. Samples, as required herein, shall be submitted for approval prior to ordering such material for delivery to the job site and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the Work.

D. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and manufacturer's names for identification.

E. Unless otherwise specified, all colors and textures of specified items will be selected by the **COUNTY** or the **COUNTY'S** designee from the manufacturer's standard colors and standard product lines.

1.7 TECHNICAL MANUALS

A. The **CONSTRUCTION MANAGER** shall furnish to the Professional/Project Manager four (4) identical sets of technical manuals and one electronic computer file set Each set shall consist of one or more volumes, each of which shall be bound in a standard size, three-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the technical manuals.

B. The technical manuals shall include for each item of mechanical and electrical equipment:

1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.

2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and frequency of required lubrication.

3. Preventive maintenance procedures and schedules.

4. Parts lists by generic title and identification number complete with exploded views of each assembly.

5. Disassembly and re-assembly instructions.

6. Name and location of nearest supplier and spare parts warehouse.

7. Recommended troubleshooting and start-up procedures.

8. Reproducible prints and electronic files of the record drawings, including diagrams and schematics, as required by Section 01720 of these specifications.

C. The **CONSTRUCTION MANAGER** shall submit the required technical manuals complete and in the number and fashion specified prior to requesting payment in excess of seventy-five percent (75%) of the base contract value. Failure to do so shall be cause for the **COUNTY** to withhold any further payments to the **CONSTRUCTION MANAGER** until the requirements of this paragraph are met.

1.8 SUBMITTAL OF PROPOSED EQUIVALENT PRODUCTS

A. The review of all materials, processes or equipment offered as equivalent to that indicated or specified in the Contract Documents shall be in accordance with the Agreement and Shop Drawings Submittal requirements.

B. All materials, processes, or equipment which are to be offered by the **CONSTRUCTION MANAGER** as equivalent to those indicated or specified in the Contract Documents shall be submitted to the **PROJECT MANAGER** and **PROFESSIONAL** as scheduled or within thirty (30) calendar days after date of Notice to Proceed. No equivalents will be accepted after this date and it is agreed that all other items will be as specifically named in the specifications or on the drawings.

C. In addition to the provisions set forth in the General Conditions, the **CONSTRUCTION MANAGER** shall meet the following criteria for review of the submittal of Substitutions and Equivalent Products by the **COUNTY** and **PROFESSIONAL**:

1. Proposed submittal changes are in keeping with general intent of the approved design and contract documents approved by the **COUNTY**.
2. The request is timely, fully documented and properly submitted.
3. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

4. The specified product or method of construction cannot receive necessary approval by a governing authority and the requested substitution can be approved.
5. A substantial advantage is offered to the **COUNTY**, in terms of cost, time, energy conservation or other considerations of merit. The **CONSTRUCTION MANAGER** is responsible for any additional compensation to the **PROFESSIONAL** for evaluation services.
6. The specified product or method of construction cannot be provided in a manner that is compatible with the other materials, and where the **CONSTRUCTION MANAGER** certifies that the substitution will overcome the incompatibility.
7. The specified product or method of construction cannot be coordinated with other materials, and the **CONSTRUCTION MANAGER** certifies that the substitution can be coordinated.
8. The specified product or method of construction cannot be warranted as required by the Agreement and Contract Documents and where the **CONSTRUCTION MANAGER** certifies that the substitution will provide the required warranty.
9. Where a proposed substitution involves more than one subcontractor, each subcontractor shall coordinate with the other subcontractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

C. The **CONSTRUCTION MANAGER'S** submittal and the **COUNTY'S** acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Agreement or Contract Documents does not constitute an acceptance or valid request for substitution, nor does it constitute an approval.

1.9 PROGRESS REPORTS

A. One (1) progress report shall be furnished to **PROJECT MANAGER** and **PROFESSIONAL** with each Application for Payment. If the Work falls behind schedule, **CONSTRUCTION MANAGER** shall submit additional progress reports at such intervals as **PROJECT MANAGER** may request.

B. Each progress report shall include sufficient narrative to describe any current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to **PROJECT MANAGER** and **PROFESSIONAL**, must be substantiated with satisfactory evidence.

C. Each progress report shall include a list of the activities completed with their actual start and completion dates, a list of the activities currently in progress, and the number of working days required to complete each.

1.10 SCHEDULE OF VALUES

A. **CONSTRUCTION MANAGER'S** Schedule of Values shall be prepared, submitted, reviewed, monitored and approved in accordance with the Agreement.

B. At least ten (10) days prior to submitting the first Application for Payment the **CONSTRUCTION MANAGER** shall prepare and submit to **PROJECT MANAGER** and **PROFESSIONAL** two (2) copies of the schedule of values covering each lump sum item. The schedule of values showing the value of each kind of work shall be acceptable to **PROJECT MANAGER** and **PROFESSIONAL** before any partial payment estimates are prepared. Such items as Bond premium, temporary construction facilities, and plant may be listed separately in the schedule of values, provided the amounts can be substantiated.

C. The sum of the items listed in the schedule of values shall equal the contract lump sum price.

D. An unbalanced schedule of values providing for overpayment of **CONSTRUCTION MANAGER** on items of Work which would be performed first will not be accepted. The schedule of values shall be revised and resubmitted until acceptable to **PROJECT MANAGER** and **PROFESSIONAL**.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01300

SECTION 01310 - BAR CHART SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 THE REQUIREMENT

A. A bar chart schedule shall be employed by the **CONSTRUCTION MANAGER** for the planning and scheduling of all work required under the Contract Documents.

B. If requested by the **PROJECT MANAGER**, the bar chart schedule shall also reflect **CONSTRUCTION MANAGER'S** estimated cash flow projections for the entire Project.

1.3 SUBMITTAL PROCEDURES

A. Submittal Requirements

1. The CONTRACTOR shall submit four (4) copies of the Bar Chart Schedule and one (1) electronic copy.

2. Schedule will be submitted on a standard drawing sheet, size 24 inches x 36 inches.

3. The time scale (horizontal) shall be in weeks. The activities shall be listed on the left-hand side (vertical).

4. Activities shall be broken down into sufficient detail to show most work activities. The listing from top to bottom shall be in a logical manner of which the work will be accomplished. Space shall be provided between activities or within bars to allow for marking of actual progress.

5. A written narrative of the planning logic along with a description of work and quantities included in each activity shall be submitted with the bar chart schedule.

B. Time of Submittals

1. Within fifteen (15) days after Notice to Proceed with Work but no later than Pre Construction Meeting, Contractor shall submit a bar chart schedule with for review by the **PROJECT MANAGER** and **PROFESSIONAL**. The schedule submitted shall indicate a project completion date the same as the contract completion date indicated in the Agreement.

2. A copy of the schedule, clearly showing progress made shall be submitted on a two or four week basis depending on the duration of the project and reporting time agreed to in the preconstruction meeting.

C. Acceptance

1. The bar chart schedule, when accepted by the **PROJECT MANAGER** and **PROFESSIONAL**, shall constitute the project work schedule unless a revised schedule is required due to one or more of the following:

   a. Substantial changes in the work scope.
   b. A change in contract time.
   c. Delinquency by Contractor that requires a recovery schedule.

2. Such acceptance will neither impose on **PROJECT MANAGER** or County, responsibility for the progress or scheduling of the Work, nor relieve **CONSTRUCTION MANAGER** from full responsibility therefor.

D. Schedule Revisions

1. Upon request of the **PROJECT MANAGER**, **CONSTRUCTION MANAGER** shall provide a revised bar chart schedule if, at any time, **PROJECT MANAGER** considers the completion date to be in jeopardy because of activities behind schedule. The revised bar chart schedule must show how **CONSTRUCTION MANAGER** intends to accomplish the Work to meet the contractual completion dates. The form and method employed by **CONSTRUCTION MANAGER** shall be the same as for the original bar chart schedule.

2. Upon approval of a change order modifying the work scope, the approved change shall be reflected in the next scheduled submittal by **CONSTRUCTION MANAGER**.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01310

SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittal of Shop Drawings, Product Data, Samples, and other miscellaneous quality control submittals.

B. Shop Drawings include, but are not limited to, the following:

1. Fabrication drawings.
2. Installation drawings.
3. Setting diagrams.
4. Shopwork manufacturing instructions.
5. Templates and patterns.
6. Schedules.

C. Product Data include, but are not limited to, the following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.

D. Samples include, but are not limited to, the following:

1. Partial Sections of manufactured or fabricated components.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Components used for independent inspection and testing.
7. Field samples.

E. Quality control submittals include, but are not limited to, the following:

1. Design data.
2. Certifications.
3. Manufacturer's instructions.
4. Manufacturer's field reports.
5. Test Reports

1.3 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with other submittals and related activities that require sequential activity including:

    a. Testing.
    b. Purchasing.
    c. Fabrication.
    d. Delivery.

2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work to avoid delay in processing because of the **PROFESSIONAL'S** need to review submittals concurrently.
3. Scheduling: Includes the Submittal Schedule listing submittals and indicating time requirements for coordination of submittal activity with related construction operations.
4. Processing: Allow sufficient time for submittal review, including time for resubmittals.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.

1. Indicate name of the firm or entity that prepared each submittal on the label or title block.
2. Provide a space approximately 4 by 5 inches (100 by 125-mm) on the label or beside the title block to record the review and approval markings and the action taken by the **PROFESSIONAL**.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the **CONSTRUCTION MANAGER** to the **PROFESSIONAL** and **PROJECT MANAGER** and to other destinations by use of a transmittal form.

1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.
2. Include the certification stating that information submitted complies with requirements of the Contract Documents.

1.5 SHOP DRAWINGS

A. Submit newly prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings. Submit in

accordance with Section 1300 of the Specifications.

1. Submit Coordination Drawings where required for integration of different construction elements, (i.e. mechanical ductwork, electrical conduit, plumbing piping, owner furnished equipment, millwork, etc.). Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.
2. Highlight, encircle, or otherwise indicate deviations from the Contract Documents and final construction documents on the Shop Drawings.
3. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
4. Submittal: Submit four (4) prints for the **PROFESSIONAL'S** review. The **PROFESSIONAL** will retain 2 prints. The remainder will be returned.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.

1. Where Product Data includes information on several similar products, some of which are not required for use on the Project, mark copies clearly to indicate which products are applicable.
2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.

B. Submittals: Submit two (2) copies of each required Product Data submittal. Submit two (2) additional copies where copies are required for maintenance manuals. The **PROFESSIONAL** will retain one copy and will return the other marked with the action taken and corrections or modifications required.

C. Distribution: Furnish copies of final Product Data submittal to the manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.

1.7 SAMPLES

A. Submit full-size, fully fabricated Samples, cured and finished in the manner specified, and physically identical with the material or product proposed for use.

1. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

B. Preliminary Submittals: Where Samples are specified or as requested by the **PROJECT MANAGER** or **PROFESSIONAL** for selection of color, pattern, texture, or similar characteristics from a manufacturer's range of standard choices, submit a single, full set of available choices for the material or product.

C. Submittals: Except for Samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation, and other characteristics. One set will be returned marked with the action taken.

D. Distribution of Samples: Distribute additional sets of Samples to the subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of the Work. Show distribution on transmittal forms.

E. Field samples specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.8 QUALITY ASSURANCE SUBMITTALS

A. Submit quality control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section 01400 QUALITY CONTROL.

1.9 ACTION BY CONSTRUCTION MANAGER

A. The **CONSTRUCTION MANAGER** will review each submittal, mark to indicate the action taken, and return.

B. Action Stamp: The **CONSTRUCTION MANAGER** will stamp each submittal with a uniform, action stamp.

C. Two Copies of submittals approved by the **CONSTRUCTION MANAGER** shall be submitted to the **PROJECT MANAGER** and **PROFESSIONAL**.

1.10 ACTION BY PROJECT MANAGER AND PROFESSIONAL

A. The **PROFESSIONAL** will review each submittal for conformance with the Contract Documents.

B. The **COUNTY** reserves its right to reject shop drawings and other submittals found not to be in conformance with the Contract Documents including the Final Construction Documents. **CONSTRUCTION MANAGER** shall perform whatever remedial work necessary in order to comply with the requirements of the Contract Documents and the Final Construction Documents.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01340

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality control services.

B. Quality control services include inspections, tests, and related actions, including reports performed by **CONSTRUCTION MANAGER**, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by **PROJECT MANAGER** or **PROFESSIONAL**.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve **CONSTRUCTION MANAGER** of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

    a. Inspections, test and related actions specified are not intended to limit the **CONSTRUCTION MANAGER'S** quality control procedures that facilitate compliance with Contract Document requirements.
    b. Requirements for the **CONSTRUCTION MANAGER** to provide quality control services required by the **COUNTY**, **PROFESSIONAL** or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. **CONSTRUCTION MANAGER** Responsibilities: **CONSTRUCTION MANAGER** shall provide inspections, tests, and other quality control services specified elsewhere in the Contract Documents or required by authorities having jurisdiction. Costs for these services are included in the GMCP.

1. Where individual Sections specifically indicate that certain portions, tests, and other quality control services are required, the **CONSTRUCTION MANAGER** shall employ and pay for a qualified independent testing agency to perform quality control services. Cost for these services must be included in the Guaranteed Maximum Construction Price.

B. Retesting: The **CONSTRUCTION MANAGER** is responsible for retesting where results of inspections, tests, or other quality control services prove unsatisfactory and indicate noncompliance with Contract Document requirements.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
5. Security and protection of samples and test equipment at the Project site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specifications Sections shall cooperate with the **COUNTY**, the **CONSTRUCTION MANAGER** and the **PROFESSIONAL** in performance of its duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the **PROJECT MANAGER**, **PROFESSIONAL** and **CONSTRUCTION MANAGER** promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
3. The agency shall notify the **PROJECT MANAGER**, **PROFESSIONAL** and **CONSTRUCTION MANAGER** promptly of irregularities or deficiencies observed in the Work during performance of its services.

E. Coordination: The **CONSTRUCTION MANAGER** and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the **CONSTRUCTION MANAGER** and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The **CONSTRUCTION MANAGER** is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. All certified written reports of each inspection, test or similar service performed by the independent testing agency shall be submitted to the **COUNTY** and **PROFESSIONAL** in duplicate.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

B. Report Data: Provide written reports of each inspection, test, or similar service.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test or similar service shall include, but not

be limited to:

a. Date of issue.
b. Project title and number.
c. Name, address and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or **PROFESSIONAL** opinion as to whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

3. The **COUNTY** reserves the right to engage and pay for the services of an independent agency to perform additional testing at any time, beyond that required of the **CONSTRUCTION MANAGER**.

1.5 QUALITY ASSURANCE

. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is **CONSTRUCTION MANAGER'S** responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01400

SECTION 01410 - MATERIALS TESTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROCEDURE

A. The **CM** shall **retain and pay** for a qualified independent testing company for performing all required testing, including but not limited to; soil compaction testing for earthwork, asphalt concrete testing, concrete materials testing, masonry mortar and grout testing, all other testing required to establish compliance with the contract documents. The independent testing company shall be approved by the Professional and the **COUNTY** prior to start of the required services**.** The **CM** shall be responsible to coordinate all required testing with the testing services and the Professional and **COUNTY** as necessary.

The **COUNTY** reserves the right to obtain additional testing if it deems necessary. Retesting due to non-compliance shall be paid for by **CM**.

1.3 QUALIFICATIONS OF TESTING AGENCY

A. The Testing Agency selected shall meet the basic requirements of ASTM E329 "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

B. The Testing Agency selected shall meet "Recommended Requirements for Independent Laboratory Qualification," latest edition, as published by the American Council of Independent Laboratories.

C. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.

D. Tests and inspection shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.

E. The **CONSTRUCTION MANAGER** shall submit one (1) copy of all testing to the **PROJECT MANAGER** and **PROFESSIONAL** for review.

1.4 AUTHORITIES AND DUTIES OF THE TESTING AGENCY

A. Reviewing Drawings and Specifications: The Testing Agency shall obtain and review the project plans and specifications. The Agency shall attend site meetings to coordinate materials inspection and testing requirements with the planned construction schedule.

B. Notification of Deficiencies in the Work: The agency shall notify the Project Manager and Professional and **CONSTRUCTION MANAGER** first by telephone and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.

C. Reports: The agency shall send copies of test and inspection reports to the following parties:

1. 1 copy to the Project Manager or his representative
2. 3 copies to Professional
3. 1 copy to the Supplier of the material tested

D. Limitation of Authority: The Testing Agency is not authorized to revoke, alter, relax, enlarge upon,

or release any requirements of the Specifications or to approve or accept any portion of the Work or to perform any construction work.

1.5 PAYMENT OF TESTING AGENCY

A. The **CONSTRUCTION MANAGER** shall pay for the Testing Agency services for testing of materials for compliance with the requirements of the Contract Documents.

B. The **CONSTRUCTION MANAGER** shall also pay for testing and re-testing of materials that do not comply with the requirements of the Contract Documents and all other items as specified in these Specifications.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCOPE OF WORK

Testing will be conducted where and how indicated in the technical specifications.

END OF SECTION 01410

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

. Drawings and general provisions of the **CONTRACT**, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.
4. Storm and sanitary sewer.

C. Temporary construction and support facilities required include but are not limited to:

1. Field office.
2. Sanitary facilities, including drinking water.
3. Dewatering facilities and drains.
4. Temporary enclosures.
5. Hoists and temporary elevator use.
6. Temporary Project identification signs and bulletin boards.
7. Waste disposal services.
8. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities required include but are not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition.

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the **COUNTY**, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the **COUNTY**, the **CONSTRUCTION MANAGER** may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

C. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the **COUNTY**, the **CONSTRUCTION MANAGER** may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Temporary Offices: **CONSTRUCTION MANAGER** shall provide a well-lighted site field office for use by his superintendent and for construction meetings for the duration of the WORK. A construction trailer or other temporary facility shall be air-conditioned and adequately furnished for drawing layout and construction meetings. At a minimum, the furnishings shall include standard desk, 8-10 person conference table, plan table plan rack, file cabinet and chairs.

C. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

H. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the WORK. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to apply for service, obtain meter and install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

B. Water Service: Provide water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.

D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

E. Temporary Telephones: Provide temporary telephone service throughout the construction period for personnel engaged in construction activities. **CONSTRUCTION MANAGER'S** key personnel must be available for communication for duration of Work by telephone, digital pagers, cellular phone, and facsimile machine.

F. Toilets: Install self-contained toilet units.

3.3 SUPPORT FACILITIES INSTALLATION

A. Locate storage sheds, field offices, and other temporary construction and support facilities for easy access and removal.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the **COUNTY**.

B. Dewatering and Drains: Maintain the site, excavations, and construction free of water.

C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

D. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Do not permit installation of unauthorized signs.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the **COUNTY**.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations.

E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by high winds, rain and similar elements.

C. Termination and Removal: Remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

D. At Substantial Completion, clean, and renovate permanent facilities used during the construction period including, but not limited to, the following:

1. Replace air filters and clean inside of ductwork and housings.
2. Replace significantly worn parts and parts subject to unusual operating conditions.
3. Replace lamps burned out or noticeably dimmed by hours of use.
4. Clean HVAC coils, etc.

END OF SECTION 01500

SECTION 01505 - MOBILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Mobilization shall include the obtaining of necessary permits, insurance, and bonds; moving onto the site of all plant and equipment; temporary buildings, temporary utilities and other construction facilities; all as required for the proper performance and completion of the Work. Mobilization shall include, but not be limited to, the following principal items:

1. Install temporary construction power, wiring, and lighting facilities.
2. Establish fire protection plan and safety program.
3. Secure construction water supply.
4. Provide on-site sanitary facilities and potable water facilities as required.
5. Arrange for **CONSTRUCTION MANAGER'S** field office.
6. Submit all required insurance certificates and bonds.
7. Obtain all required permits.
8. Post all OSHA, EPA, Department of Labor, and all other required notices.
9. Have **CONSTRUCTION MANAGER'S** superintendent at the job site full time.
10. Submit a detailed construction schedule acceptable to the **COUNTY** as specified.
11. Erect project construction signs as specified.
12. Submit a finalized schedule of values of the WORK in the **COUNTY'S** approved format.
13. Submit a finalized schedule of submittals.

1.2 PROJECT SIGNS

COUNTY shall provide to the **CONSTRUCTION MANAGER** a project sign approximately 4' X 8' in size. **CONSTRUCTION MANAGER** shall provide all erection materials. Sign shall be erected in a location as directed by the **PROJECT MANAGER**. Sign shall be braced to keep it in a plumb position for the construction duration. The **CONSTRUCTION MANAGER** shall remove and dispose of the sign when directed by the **PROJECT MANAGER**.

1.3 PAYMENT FOR MOBILIZATION

The **CONSTRUCTION MANAGER'S** attention is directed to the condition that no payment for mobilization, or any part thereof, will be approved for payment under the Contract until all mobilization items have been completed as specified.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01505

SECTION 01530 – BARRICADES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Scope:

1. Erect and maintain all barricades required by the drawings, specification and by regulatory authorities and agencies.

2. Types of barricades shall include but not be limited to:

   a. Street barricades
   b. Safety barricades
   c. Protective barricades.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. Comply with duly constituted regulatory authorities and agencies in matters pertaining to

   a. Permitting
   b. Safety precautions
   c. Barricades
   d. Lighting of barricades
   e. Protection of environmental matters

2. Maintain safety among persons employed in accordance with the standards set by the OCCUPATIONAL SAFETY AND HEALTH ACT (latest adoption). The **COUNTY** and **PROFESSIONAL** shall be held harmless for any accident, injury or any other incident resulting from non-compliance with these standards.

PART 2 – PRODUCTS

1.1 MATERIALS

A. Lumber for barricades: Sound, thoroughly seasoned, dressed 4 sides, free from excessive warp, kiln dried with maximum moisture content of 15%, of nominal sized, and complying with PS-20.

1. Lumber for barricades used in the closing of streets and for use in streets or where vehicular traffic regularly occurs: No. 2 Southern Pine or equivalent (to be painted).
2. Lumber used for safety barricades: Same as for closing of streets.
3. Lumber for protective barricades: No. 2 common Southern Pine pressure treated with water borne preservative complying with the American Wood Preservers Bureau (not to be painted).

B. Paint for barricades scheduled to be painted: Alkyd chlorinated paraffin-plasticizing oil finishing system type:

1. Primer: Exterior wood primer, 1 coat, and 4.0 wet mil thickness.
2. Finish: Exterior house and trim paint, 2 coats, 3.2 wet mil thickness.
3. Colors: To comply with regulatory agency requirements; otherwise such shall be 6" side alternating diagonal stripes equivalent to the following Sherwin-Williams colors:

Yellow-orange	BK-221
White	BW-64

4. The following manufacturers are approved, subject to compliance with these specifications:

Sherwin-Williams	P.P.G. Porter
Benjamin-Moore	Glidden
Devoe	Rust-O-Leum

5. Comply with manufacturer's recommendations for application.

PART 3 – EXECUTION

3.1 CONSTRUCTION

A. Construct barricades in sound, well-braced manner in accordance with best practice.

B. Suspend a sandbag from beneath each free standing barricade device adding weight to prevent blow over.

3.2 BARRICADE SCHEDULE/TYPES

A. Safety Barricades

1. Safety barricades as herein defined shall be those used to warn or to guard vehicles and human beings against injury or damage against dangerous conditions such as excavations, overhead items subject to falling, ongoing construction work or other dangerous situations. The **CONSTRUCTION MANAGER** shall maintain and service such safety barricades in good repair until such condition or situation no longer exists.
2. Provide and maintain daily, yellow blinker lights on safety barricades from dusk to dawn each night until the barricade is removed.

B. Protective Barricades

1. Protective barricades as herein defined shall be those used to protect from damage by vehicle or other device, all trees, shrubs, bushes, manholes, drainage structures or other items which are scheduled or intended to remain permanently in place and which are subject to damage. Such protective barricades shall perimeter or otherwise guard such items to be protected by 6 feet of clearance on all sides. Vertical posts of such protective barricades shall be embedded in the earth to a depth of 3 feet minimum and shall extend to a height 4 feet above existing grade. Such protective barricades shall remain in place and Contractor shall maintain and service such in good repair until all work is complete or until directed by the Architect to remove such, whichever is earlier.
2. Protective barricades need not be provided with reflectors or blinking lights nor need such protective barricades be painted.
3. Protective barricades shall be constructed of 2 x 6 nominal pressure treated lumber.

END OF SECTION 01530

SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

Part 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the **CONTRACT**, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 EXPLOSIVES AND BLASTING

The use of explosives on the Work will not be permitted unless approved by the **PROJECT MANAGER**.

1.3 DUST ABATEMENT

CONSTRUCTION MANAGER shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary and as directed by **PROJECT MANAGER** to prevent **CONSTRUCTION MANAGER'S** operation from producing dust in amounts damaging to property or landscape, or causing a nuisance to persons living in or occupying buildings in the vicinity or as directed by **PROJECT MANAGER**. **CONSTRUCTION MANAGER** shall be responsible for any damage resulting from any dust originating from **CONSTRUCTION MANAGER'S** operations. The dust abatement measures shall be continued until **CONSTRUCTION MANAGER** is relieved of further responsibility by the **PROJECT MANAGER**. No separate payment will be allowed for dust abatement measures and all costs therefor shall be included in the **CONSTRUCTION MANAGER'S** GMP.

1.4 RUBBISH CONTROL

During the progress of the Work, **CONSTRUCTION MANAGER** shall keep the site of the Work and other areas used by **CONSTRUCTION MANAGER** in a neat and clean condition and free from any accumulation of rubbish. **CONSTRUCTION MANAGER** shall dispose of all rubbish and waste materials of any nature occurring at the Work site and establish regular intervals of collection and disposal of such materials and waste. **CONSTRUCTION MANAGER** shall also keep haul roads free from dirt, rubbish, and unnecessary obstructions resulting from **CONSTRUCTION MANAGER'S** operations. Equipment and material storage shall be confined to areas approved by the **PROJECT MANAGER**. Disposal of all rubbish and surplus materials shall be off the site of construction at the **CONSTRUCTION MANAGER'S** expense, all in accordance with local codes and ordinances governing locations and methods of disposal, in conformance with all applicable safety laws, and to the particular requirements of Subpart H, Section 1926.252 of the OSHA Standards for Construction.

1.5 CHEMICALS

All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilizer, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

1.6 TEMPORARY DRAINAGE PROVISIONS

CONSTRUCTION MANAGER shall provide for the drainage of stormwater and such water as may be applied or discharged on the site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the site, and adjacent property.

1.7 EROSION CONTROL

CONSTRUCTION MANAGER shall prevent erosion of soil on the site and adjacent property resulting from its construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operations that will tend to promote soil erosion.

1.8 POLLUTION CONTROL

CONSTRUCTION MANAGER shall prevent the pollution or clogging of drains by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sediment, debris, or other substances will be permitted to enter sanitary or storm sewers.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01560

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the **CONSTRUCTION MANAGER** selection of products for use in the Project.

B. Standards: Refer to Section "Reference Standards and Definitions" for applicability of industry standards to products specified.

C. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Sections "Substitutions" and "Substitute Materials and Equipment."

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

    a. **"Named Products"** are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
    b. **"Foreign Products,"** as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 SUBMITTALS

A. Product List Schedule: Prepare a schedule showing products specified in a tabular form acceptable to the Project Manager and Professional. Include generic names of products required and where specified, the manufacturer's name and proprietary product names for each item listed.

1. Coordinate the product list schedule with the **CONSTRUCTION MANAGER'S** Bar Chart Schedule and the Schedule of Submittals.
2. Form: Prepare the product-listing schedule with information on each item tabulated under the following column headings:

    a. Related Specification Section number.
    b. Generic name used in Contract Documents.
    c. Proprietary name, model number and similar designations.
    d. Manufacturer's and name and address.
    e. Supplier's name and address.

f. Installer's name and address.
g. Projected delivery date, or time span of delivery period.

3. Initial Submittal: Within 15 days after date of Notice to Proceed With Work, but no later than pre construction conference, submit 6 copies of an initial product list schedule.

a. At the **CONSTRUCTION MANAGER'S** option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

4. Completed Schedule: Prior to issuance of any Notice to Proceed With Construction, submit 6 copies of the completed product list schedule.
5. Professional's Action: The Professional's response will include the following:

a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.
b. A list of acceptable product selections.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the **CONSTRUCTION MANAGER** is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. The **CONSTRUCTION MANAGER** is responsible for providing products and construction methods that are compatible with products and construction methods of other Work.
2. If a dispute arises over concurrently selectable, but incompatible products, the Professional will determine which products shall be retained and which are incompatible and must be replaced.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with Contract Document are only available at prices or terms that are substantially higher than foreign products that also comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface, which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
2. Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.

    a. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions to obtain approval for use of an unnamed product.

3. Non-proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the **CONSTRUCTION MANAGER** to use of these products only, the **CONSTRUCTION MANAGER** may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

    a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Project Manager's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Project Manager/Professional will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

    1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01610 – FLORIDA PRODUCT APPROVAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Florida Building Code Product Approval requirements.

B. Related Sections include the following:

1. Division 1 Section "Materials and Equipment" for overall product requirements.

C. Product approval numbers for required building components used as the basis for design are shown on the drawings.

1.3 QUALITY ASSURANCE

A. Comply with Product Approval F.A.C. Rule 9B-72.080. For each product installed in the building envelope, either:

1. Provide to the Building Department the applicable Product Approval Numbers, or

2. Provide certification acceptable to the Building Department that products installed conform to the Florida Building Code Fifth Edition 2014.

B. The list of building components for the required products and manufacturers is as follows:

1. Exterior doors.
2. Windows
3. Panel Walls
4. Roofing Products
5. Shutters, if specified.
6. Skylights, if specified
7. Structural Components
8. Other products as applicable, comprising a building's envelope introduced as a result of new technology.

C. The list shown above is not comprehensive. No effort was made to list each and every possible aperture in the building envelope. The **CONSTRUCTION MANAGER** shall check to see what aperture(s) apply and furnish the applicable Product Approval Number as issued by the State of Florida Department of Community Affairs (DCA), or required certification.

D. Wind Speed Zone: This Project is located in the 120 mph wind speed zone with a use factor of 1.15, yielding a Design Wind Velocity of 140 mph for the building as a whole and a Design Wind Velocity of 156 mph for the safe room. This Project is not located in the Wind-Born Debris Zone.

1.4 SUBMITTALS

A. Submit the applicable Product Approval Number for above paragraph 1.3C for each product varying from those listed on the drawings as the basis of design and for any other required component of the building envelope.

B. For any component not having a Product Approval Number supply the following:
   1. Engineering Analysis and Calculations:

   (a) 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.
   (b) **Design wind load shall be 140 mph, importance factor 1.15**.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01610

SECTION 01631 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the **CONSTRUCTION MANAGER** after award of the Contract are considered to be requests for substitutions. Substitutions will be considered by the **COUNTY** as special requests. The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the **COUNTY**.
3. The **CONSTRUCTION MANAGER'S** determination of and compliance with governing regulations and orders issued by governing authorities.

C. If the Specifications provides for options of products and allows "or equal" products, **CONSTRUCTION MANAGER** must follow the substitution process stated herein and in the **AGREEMENT** for obtaining approval of such "equal" products.

1. **CONSTRUCTION MANAGER** must submit all requests to consider "or equal" products within 30 days of Notice to Proceed With Work. Otherwise, one of the specified options must be used.
2. The **COUNTY** shall make the decision if a product is equal or not. The **COUNTY'S** decision is final.

1.4 SUBMITTALS

A. Substitution Request Submittal: The **COUNTY** will consider requests for substitution if received within 30 days of Notice to Proceed with Work date. Requests received more than 30 days after Notice to Proceed with Work date shall not be considered.

1. Submit copies of each request for substitution for consideration to Professional and Project Manager.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide associated cost increase or decrease, including any design cost.

3. Provide complete documentation showing compliance with the requirements for substitutions.

If necessary, the **COUNTY** will request additional information or documentation for evaluation.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The **COUNTY** will receive and consider the **CONSTRUCTION MANAGER'S** request for substitution when one or more of the following conditions are satisfied. If the following conditions are not satisfied, the **COUNTY** will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The **COUNTY** will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
6. The requested substitution offers the **COUNTY** a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the **COUNTY** must assume. The **CONSTRUCTION MANAGER** will assume responsibilities for redesign and evaluation services, increased cost of other construction, and any other cost associated with the substitution.
7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the **CONSTRUCTION MANAGER** certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials and where the **CONSTRUCTION MANAGER** certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the **CONSTRUCTION MANAGER** certifies that the proposed substitution provides the required warranty.
11. Where a proposed substitution involves more than one prime Contractor and/or Subcontractor, each shall cooperate with the other Contractor and/or Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.

B. The **CONSTRUCTION MANAGER'S** submittal and the **COUNTY'S** acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01631

SECTION 01700 - PROJECT CLOSE-OUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 COMPLETION PROCEDURES

A. Substantial Completion is as defined in the General Conditions. When the **CONSTRUCTION MANAGER** believes Substantial Completion has been achieved, **CONSTRUCTION MANAGER** shall request, in writing to the **PROJECT MANAGER**, that Substantial Completion be recognized as having been achieved and request that the **COUNTY** issue a Certificate of Substantial Completion. Prior to making such a request, the **CONSTRUCTION MANAGER** must have:

1. Complete all WORK necessary for the safe, proper and complete use or operation of the Project as intended, including obtaining occupancy permits, operating testing and certificates and similar releases.
2. Provide training to **COUNTY'S** maintenance agency.
3. Prepare a **CONSTRUCTION MANAGER**-generated punch list, i.e., a list of all items required to render the Project complete satisfactory and acceptable, for submission with the request for inspection and issuance of a certificate of Substantial Completion.
4. Submit to the **PROFESSIONAL** and **PROJECT MANAGER** for acceptance and approval the following close-out documentation:

    a. One year Warranty letter from sub-contractors and **CONSTRUCTION MANAGER.**
    b. All extended warranties in accordance with the specifications. (All Warranties shall commence on the date of Substantial Completion.)
    c. As-built drawings, a complete set of reproducible drawings as well as electronic files (AutoCAD) indicating changes to the project noted with clouds.
    d. All required test reports, including a commissioning report relating specifically to the HVAC system and supplied by the HVAC equipment vendor.
    e. Three sets of approved shop drawings and one set of electronic files.
    f. Three bound 3-ring binders with one set each of manufacturer's information on equipment and materials, maintenance information and warranties. **CONSTRUCTION MANAGER** to provide technical support for one year after final completion in addition to the one (1) year General **CONSTRUCTION MANAGER's** warranty.

B. Upon receipt of the request from the **CONSTRUCTION MANAGER**, the **PROJECT MANAGER**, assisted by the **PROFESSIONAL**, and other **COUNTY** personnel, as appropriate, shall review the request, the Work and the **CONSTRUCTION MANAGER -** generated Punch List to determine whether the Work is ready for Substantial Completion inspection. If this review fails to support Substantial Completion inspection, the Project Manager shall so notify the **CONSTRUCTION MANAGER** citing the reasons for rejection. If the **PROJECT MANAGER** and **PROFESSIONAL** determine the Work is ready for Substantial Completion inspection, the following procedures will be followed:

1. The **PROJECT MANAGER** will within a reasonable time schedule and conduct inspection(s) of the Work with the **PROFESSIONAL**, other **COUNTY** personnel as required, and the **CONSTRUCTION MANAGER** for the purpose of formally reviewing the status of completion of the Work, the readiness of the Project for use and the **CONSTRUCTION MANAGER**-generated punch list. A copy of the **CONSTRUCTION MANAGER**-generated punch list will be provided to all participants and any additional items noted during the inspection will be added to the list. The **PROJECT MANAGER**, the **PROFESSIONAL**, their representatives and other **COUNTY** representatives will review the Work and the **CONSTRUCTION MANAGER**-generated punch list to assure all deficiencies are noted on a final document (the "Punch List"). The Punch List must include all items required to render the Project complete, satisfactory and acceptable. If **PROJECT MANAGER** and **CONSTRUCTION MANAGER** disagree on whether an item belongs on the Punch List, the **PROJECT MANAGER** has the final say on whether the item is included or not.
2 If, upon completion of the inspection(s) the **COUNTY** does not consider the Project Substantially Complete, the **PROJECT MANAGER** will notify the **CONSTRUCTION MANAGER** in writing giving reasons why the Project is not Substantially Complete.
3. If, upon completion of the inspection(s), the **COUNTY** considers the Project Substantially Complete, the **PROJECT MANAGER** shall prepare a Certificate of Substantial Completion to establish the date for Substantial Completion as the date of the completed inspection(s). The Certificate of Substantial Completion shall be approved by the **COUNTY** upon the signature of both the Project Manager and the Professional and shall be issued to the **CONSTRUCTION MANAGER**. This Certificate shall fix the date of Substantial Completion.

C. Final Completion will be deemed to have occurred when all Work is completed including the following:

1. All final Construction Review (punch list) items have been corrected, signed off by the **CONSTRUCTION MANAGER,** the Project Manager and the Professional, and demonstrated to the **COUNTY** during a final inspection.
2. All record drawings, operations and maintenance manuals, warrantees and guarantees have been reviewed and accepted.
3. The **PROFESSIONAL** and **PROJECT MANAGER** have reviewed and accepted the following documentation:
   a. Consent of Surety to Final Payment.
   b. **CONSTRUCTION MANAGER's** Affidavit of Payment of Debts and Claims.
   c. Sub-contractor Waiver of Liens.
   d. One year Warranty letter from sub-contractor and **CONSTRUCTION MANAGER.**
   e. All extended warranties in accordance with the specifications. (All Warranties shall commence on the date of Substantial Completion.)

f. As-built drawings, a complete set of reproducible drawings as well as electronic files (AutoCAD) indicating changes to the project noted with clouds and annotations indicating equipment changes.
g. All required test reports.
h. One set of approved shop drawings.
i. Three bound 3-ring binders with one set each of manufacturer's information on equipment and materials, maintenance information and warranties. Additionally provide one set of electronic files with this same information. **CONSTRUCTION MANAGER** to provide technical support for one year after final completion in addition to the one (1) year General **CONSTRUCTION MANAGER's** warranty.

4. Demobilization and site clean up are complete.
5. The **PROJECT MANAGER** and **PROFESSIONAL** have issued a Certificate of Final Completion.
6. The requirements specified under the Contract have been met.
7. All facilities and/or equipment have been properly demonstrated to be functioning as required and all training has been completed.

D. Beneficial Occupancy will normally not occur before Substantial Completion but can occur for a discrete element of a project when desired by the **COUNTY**. When Beneficial Occupancy is requested, the same procedure specified in 1.02(B) above will be used except that no notice or request will be forwarded to the Board of County Commissioners. Upon completion of the procedure, the **COUNTY** will accept occupancy of that element of work.

1.4 START-UP PROCEDURES

A. **CONSTRUCTION MANAGER** is responsible for the complete test, check out, start-up and commissioning of all elements of the project. The **CONSTRUCTION MANAGER** shall verify these activities through daily inspection reports, test record, on-site vendor certifications and by other appropriate means. The test and start-up requirements below are complementary to those specified elsewhere in the Contract Documents.

1. Component test and check out is the verification that each component of the Work is in compliance with the Contract Documents, and is ready to perform its intended function.
2. Sub-system test and start-up is the verification that a discreet group of related components is functioning as intended within itself and is ready to perform its intended function in the overall system.
3. System test and start-up is the operation and verification that all related components and sub-systems are functioning as intended and are ready for final commissioning and operation.
4. Commissioning is placing a complete system or project into service.

B. **CONSTRUCTION MANAGER** shall conduct all test, check out and start-up requirements specified in the Contract Documents and provide documentation of same to the **COUNTY** prior to commissioning. Where vendor on-site inspections are required prior to or during start-up, the **CONSTRUCTION MANAGER** shall require vendor to provide a written statement that the installation and check out is complete and proper and that the item(s) are ready for start-up and/or commissioning.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and lock in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line prints of Contract Documents and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Documents. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Documents or Shop Drawings.
3. Note related RFI (request for information), PCR (proposed change request), or AAR (authorized allowance release) numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as RFIs, AARs and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation. Note related authorized allowance releases and mark-ups of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data to the **PROJECT MANAGER** for the **COUNTY'S** records.

E. Record Sample Submittal: Immediately prior to the date or dates of Substantial Completion, the **CONSTRUCTION MANAGER** will meet at the site with the **PROFESSIONAL** and the **COUNTY'S** personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the **COUNTY** for record purposes. Comply with delivery to the **COUNTY'S** Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the **PROJECT MANAGER** for the **COUNTY'S** records.

G. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.

3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the **COUNTY'S** personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
f. Provide new, clean air filters for all equipment and systems controlling air within the facility.

C. Pest Control: If required by the **PROJECT MANAGER**, engage an experienced exterminator to make a final inspection and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. **Do not** burn waste materials. **Do not** bury debris or excess materials on the **COUNTY'S** property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the **COUNTY'S** property, arrange for disposition of these materials as directed.

3.3 FINAL ISSUES

A. **PROJECT MANAGER** and **CONSTRUCTION MANAGER** shall meet and resolve all outstanding issues including, but not limited to:

1. Claims and adjustments for time or costs
2. Outstanding, unused allowances
3. Procedures for handling warranty issues

B. A Final Change Order shall be processed if required. Final payment and closeout procedures shall comply with Articles 7, 8, 9 and 10 of the Construction Manager Agreement and all other requirements of the Contract Documents.

END OF SECTION 01700

SECTION 01710 - FINAL CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Divisions 2 through 16.

B. General Project closeout requirements are included in Section "Project Closeout."

C. General cleanup and waste removal requirements are included in Section "Temporary Facilities."

D. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of WORK to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or any portion of the Project.

1. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign

substances. Sweep paved areas broom clean. Remove petrol-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

2. Remove tools, construction equipment, machinery and surplus material from the site.
3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
5. Broom clean concrete floors in unoccupied spaces.
6. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo if required.
7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
8. Remove labels that are not permanent labels.
9. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
10. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
11. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
12. Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.
13. Clean food service equipment to a sanitary condition, ready and acceptable for its intended use.
14. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
15. Leave the Project clean and ready for occupancy.
16. Provide new, clean air filters for all equipment and systems controlling air within the facility.

C. Pest Control: Engage an experienced licensed exterminator to make a final inspection, and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

E. Compliance: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remain after completion of associated construction has become the Owner's property, dispose of these materials as directed.

END OF SECTION 01710

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Project Record Documents as follows:

1. Record Drawings and specifications
2. Operating and Maintenance documents
3. Miscellaneous Records
4. Instruction of the **COUNTY** operating personnel in operation and maintenance of building systems and equipment.

B. Specific record copy requirements that expand requirements of this Section are included in the individual Sections of Divisions-2 through -16.

C. General project close-out requirements are included in Section 01700 "Project Close-Out."

D. General requirements for submittal of Project Record Documents are included in Section 01300 "Contractor Submittals."

E. Maintenance of Documents and Samples: Store record documents and Samples in the field office apart from **CONSTRUCTION MANAGER's** Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and Samples available at all times for inspection by the Project Manager and Professional.

1.3 RECORD DOCUMENTS

A. General: Do not use record documents for construction purposes; protect from deterioration and lock in a secure, fire-resistant location; provide access to record documents for the Project Manager's review during normal working hours.

1. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on Record Drawings.
2. Accurately record information in an understandable drawing technique.
3. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line whiteprints of Construction Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Construction Drawings. Give

particular attention to concealed elements that would be difficult to measure and record at a later date.

C. Record Specifications: Maintain one complete copy of the Construction Specifications, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work, which cannot otherwise be readily discerned later by direct observation. Indicate related Change Orders and mark-up of record drawings and Specifications.

1. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the **CONSTRUCTION MANAGER** will meet at the site with **User Agency** personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to **User Agency** for record purposes. Comply with delivery to **User's** Sample storage area.

E. Miscellaneous Record Submittals: Refer to Section 01300 "Contractor Submittals" for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Professional/Project Manager for the **COUNTY'S** records.

F. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size as described in Section 01730 "Operating and Maintenance Data".

G. Electronic files: The **COUNTY** will furnish a compact disc containing the Project's electronic files to the **CONSTRUCTION MANAGER**. The **CONSTRUCTION MANAGER** shall transfer all information on the marked record drawings set to electronic files utilizing a program and format acceptable to the **COUNTY** (AutoCAD). The transfer of information must be provided by a professional drafter. The **PROFESSIONAL** shall review and approve the resulting electronic record. A printed copy will then be furnished with the approved electronic record (on compact disc) by the **CONSTRUCTION MANAGER** to the **COUNTY**.

H. Mark-up Procedure for documents: During the construction period, maintain a set of blue- or black-line white-prints of Final Construction Drawings, and one copy of the Final Construction Specifications, including addenda and modifications issued for Project Record Document purposes. Mark the Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements, which would be difficult to identify or measure and record later. Mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure

and record later. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

1. All deviations must be highlighted on the record drawings using a "Cloud". If any revisions to the original plans required a Change Order, the "Cloud" shall include the Change Order number.

I. Minimum Record Drawings Standards: All as-built conditions must be noted as follows:

1. Mark new information that is important to the **COUNTY**, but was not shown on Contract Drawings or Shop Drawings.
2. Note related Change Order numbers where applicable.
3. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
4. Locate valves, fittings, plugs, caps and taps for pipelines.
5. Provide invert elevation of all drainage and sewage services.
6. Note limits, dimensions, and depth of concrete encasement, casing pipe, and sheeting.
7. Note horizontal and vertical locations of other public and private utilities when they are encountered during construction.
8. Indicate size, type, depth, location, and limits of any abandoned pipe that is part of design. Include type of abandonment (i.e. end plug, mortar filled, etc.).
9. Roadway: Provide elevations of all roadway vertical control points and terminations of curb returns.
10. Building: All dimensional changes larger than 1/4". Material and substitution changes from specified materials. Changes to design and room layouts. Structural modifications. Electrical panelboard and equipment changes including corrected circuit numbers as they appear on panelboard directories. Corrected motor horsepower or full load amperages. Mechanical equipment, changes in duct work, layout, and equipment.
11. Mark actual manufacturer, trade name, catalog, and supplier of each product changes made by change order or field order.

1.4 SITE RECORD DOCUMENTS

A. The **CONSTRUCTION MANAGER** shall also submit Final Site "As-Built" plans, for project site, as electronic files and in paper copy signed by a Florida Registered Land Surveyor, according to the following requirements:

1. All site horizontal and vertical controls, grade, elevations for roadways and walks, all drainage related systems and ponds, mitigation areas, building locations and finish floor elevations, site amenities locations, elevations and associated landscaping as previously requested.

B. **CONSTRUCTION MANAGER** shall require the Registered Land Surveyor to make periodic inspections of the work during construction to verify that the work remains in conformance with the Plans and Specifications.

1.5 OTHER SUBMITTALS REQUIREMENTS

A. Reproducibles: Immediately after the inspection for Certification of Substantial Completion, review completed marked-up record Drawings with the **PROJECT MANAGER** and **PROFESSIONAL**. When authorized, prepare a full set of corrected reproducibles and electronic files of **CONTRACTOR**'S Marked up Drawings.

1. Incorporate changes and additional information previously marked on record print sets as described above. Erase, redraw, and add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
2. Incorporate changes in CADD files of Final Construction Documents.
3. The **CONSTRUCTION MANAGER** is responsible for printing and distributing reproducibles.
4. Review of Reproducibles: Before copying and distributing, submit corrected reproducibles and the original marked-up prints to the **PROFESSIONAL** for review. When acceptable, the **CONSTRUCTION MANAGER** will initial and date each reproducible, indicating acceptance of general scope of changes and additional information recorded, and of the quality of drafting. The reporducibles and the original marked-up prints will be reviewed by the **PROFESSIONAL** and then returned to the **CONSTRUCTION MANAGER** for organizing into sets, printing, binding and final submittal.

B. Distribution: Copies and Distribution: After completing the preparation of reproducible record drawings, print 3 black-line white prints of each Drawing, whether or not changes and additional information were recorded. Organize the copies into manageable sets. Bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets.

1. Organize and bind original marked-up set of prints and specifications that were maintained during the construction period in the same manner.
2. Organize record reproducibles into sets matching the print sets. Place these sets in durable tube-type Drawing containers with end caps. Mark the end cap of each container with suitable identification.
3. Submit the marked-up record set, specifications, reproducibles, 3 copy sets, and CD to the **PROJECT MANAGER** for **COUNTY'S** records. The **CONSTRUCTION MANAGER** will retain one copy set.

1.6 OPERATING RECORDS AND MAINTENANCE MANUAL SUBMITTAL

Submit, three (3) copies of required records and maintenance, operating, warranty manuals after issuance of the Certificate of Substantial Completion, but prior to the Final Completion. Manuals shall be submitted and prepared in compliance with Section 01300 "Contractor Submittals" and Sections 01730 "Operating and Maintenance Data".

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record- keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Professional for the **COUNTY'S** records, if applicable, the following:

1. Categories of requirements resulting in miscellaneous records include, but are not limited to the following, if applicable:

    a. Field records on excavations and foundations.
    b. Field records on underground construction and similar Work.
    c. Authorized measurements utilizing unit prices or allowances.

d. Certifications received in lieu of labels on bulk products.
e. Batch mixing and bulk delivery records.
f. Testing and qualification of tradesmen.
g. Documented qualification of installation firms.
h. Load and performance testing.
i. Inspections and certifications by governing authorities.
j. Leakage and water-penetration tests.
k. Fire resistance and flame spread test results.

2. Final inspection and correction procedures.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 RECORDING

Post changes and modifications to the Documents as they occur. Do not wait until the end of the **PROJECT**. The **PROJECT MANAGER** and **PROFESSIONAL** will periodically review record documents to assure compliance with this requirement.

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Special Conditions and other Division 1 Specifications Sections apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for operating and maintenance manuals including the following:

1. Preparation and submittal of operating and maintenance manuals for building operating systems or equipment.
2. Preparation and submittal of instruction manuals covering the care, preservation and maintenance of architectural products and finishes.
3. Instruction of the **COUNTY'S** operating personnel in operation and maintenance of building systems and equipment.

B. Special operating and maintenance data requirements for specific pieces of equipment or building operating systems are included in the appropriate Sections of Divisions 2 through 16.

C. Preparation of Shop Drawings and Product Data are included in Section "Submittals."

D. General closeout requirements are included in Section "Project Closeout."

E. General requirements for submittal of Project Record Documents are included in Section "Project Closeout."

F. In addition to the manual submittal, provide an electronic copy of these documents.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.
2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.

B. Instructions for the **COUNTY'S** Personnel: For instruction of the **COUNTY'S** operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involved.

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.

1. Before Substantial Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two draft copies of each manual to the **PROJECT MANAGER** for review. Include a complete index or table of contents for each manual.

    a. The **PROJECT MANAGER** will return one copy of the draft with comments within fifteen days of receipt.

2. After final inspection, make corrections or modifications to comply with the **PROJECT MANAGER's** comments. Submit the specified number of copies of each approved manual to the **PROJECT MANAGER** within fifteen days of receipt of the comments.

B. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the **COUNTY'S** operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide white heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the cover and spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

    a. Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
    b. Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
3. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
4. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 20 pound 8-1/2" by 11", white bond paper.
5. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.

    a. Where oversize drawings are necessary, fold the drawings to the same size as the text pages and use as a foldout.
    b. If drawings are too large to be used practically as a fold- out, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section, and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:

    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.

5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual Index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.

1. Title Page: Provide a title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information:

    a. Subject matter covered by the manual.
    b. Name, address and CIP number of the Project.
    c. Date of submittal.
    d. Name, address, and telephone number of the **CONSTRUCTION MANAGER**.
    e. Name and address of the **CONSTRUCTION MANAGER'S PROFESSIONAL**.
    f. Cross reference to related systems in other operating and maintenance manuals.

2. Table of Contents: After the Title Page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

    a. Where more than one volume is required to accommodate data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the Subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.
4. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract

Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.

5. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.
6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.
7. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.
8. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit three copies of each manual, in final form, on material and finishes to the **PROJECT MANAGER**. Provide one section for architectural products, including applied materials and finishes, and a second for products designed for moisture protection and products exposed to the weather.

1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:

    a. Manufacturer's catalog number.
    b. Size.
    c. Material composition.
    d. Color.
    e. Texture
    f. Reordering information for specially manufactured products.

2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture protection purposes.

1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

a. Applicable standards
b. Chemical composition
c. Installation details
d. Inspection procedures
e. Maintenance information
f. Repair procedures

D. Schedule: Provide complete information in the materials and finishes manual on the following products:

1. Landscape Irrigation System
2. Waterproofing
3. Roofing
4. Aluminum Entrances and Storefronts
5. Finish Hardware
6. Glass and Glazing
7. Paint
8. Signage (all types)

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit three copies of each manual, in final form to the **PROJECT MANAGER** for distribution.

1. Refer to Specification Sections for additional requirements on operating and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

a. Equipment or system function.
b. Operating characteristics.
c. Limiting conditions.
d. Performance curves.
e. Engineering data and tests.
f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment provide the following:

a. Printed operating and maintenance instructions.
b. Assembly drawings and diagrams required for maintenance.
c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

a. Routine operations.
b. Trouble-shooting guide.
c. Disassembly, repair and reassembly.
d. Alignment, adjusting and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

    a. Start-up procedures.
    b. Equipment or system break-in.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Instructions on stopping.
    f. Shutdown and emergency instructions.
    g. Required sequences for electric or electronic systems.
    h. Special operating Instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
7. Coordination Drawings: Provide each Contractor's Coordination Drawings.

    a. Provide as-installed color-coded piping diagrams where required for identification.

8. Valve Tags: Provide charts of valve tag numbers, with the location and function of each valve.
9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panel boards, including the following:

    a. Electric service.
    b. Controls.
    c. Communication.

C. Schedule: Provide complete information in the equipment and systems manual on products specified and as requested by the **PROJECT MANAGER**:

1. Landscape Irrigation System
2. Overhead Coiling Grilles
3. DX Units
4. Fire Sprinkler System
5. Electric-Drive Horizontal Fire Pumps.
6. Packaged Engine Generator Systems.
7. Lightning Protection

1.8 INSTRUCTIONS OF THE COUNTY'S PERSONNEL

A. Prior to final inspection, instruct the **COUNTY'S** personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01730

SECTION 01740 – WARRANTIES, BONDS, AND SERVICE CONTRACTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties. In addition, it lists those items for which a one year maintenance service contract is required as part of the **CONSTRUCTION MANAGER'S** GMP.

1. Refer to the General Conditions for terms of the **CONSTRUCTION MANAGER'S** special warranty of workmanship and materials.
2. General closeout requirements are included in Section "Project Closeout."
3. Specific requirements for warranties for the WORK and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2 through 16.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the **CONSTRUCTION MANAGER** of the warranty on the WORK that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the **CONSTRUCTION MANAGER**.

1.3 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the **COUNTY**.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the **COUNTY**.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted WORK.

B. Reinstatement of Warranty: When WORK covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that WORK covered by a warranty has failed, replace or rebuild the WORK to an acceptable condition complying with requirements of Contract Documents. The **CONSTRUCTION MANAGER** is responsible for the cost of replacing or rebuilding defective

WORK regardless of whether the **COUNTY** has benefited from use of the WORK through a portion of its anticipated useful service life.

D. **COUNTY'S** Recourse: Written warranties made to the **COUNTY** are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the **COUNTY** can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The **COUNTY** reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The **COUNTY** reserves the right to refuse to accept WORK for the Project where a special warranty, certification, or similar commitment is required on such WORK or part of the WORK, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the **PROJECT MANAGER** prior to the date certified for Substantial Completion. If the **PROJECT MANAGER'S** Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the WORK, or a designated portion of the WORK, submit written warranties upon request of the **PROJECT MANAGER**.

1. When a designated portion of the WORK is completed and occupied or used by the **COUNTY'S**, by separate agreement with the **COUNTY'S** during the construction period, submit properly executed warranties to the **PROJECT MANAGER** within fifteen days of completion of that designated portion of the WORK.

B. When a special warranty is required to be executed by the **CONSTRUCTION MANAGER**, or the **CONSTRUCTION MANAGER** and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the **PROJECT MANAGER** for approval prior to final execution.

1. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion compile three (3) copies of each required warranty and bond properly executed by the **CONSTRUCTION MANAGER**, or by the **CONSTRUCTION MANAGER'S** subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in white heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the cover and spine, to hold labels describing the contents.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the **CONSTRUCTION MANAGER**.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULE OF WARRANTIES

A. Schedule: Provide the following warranties on products and installations and those required in the Technical Specifications. In the case of conflicts, the longer of the two requested warranty periods will govern.

ITEM		**REQUIRED WARRANTY PERIOD**
1.	Termite control	5 Years
2.	Landscape	1 Year
3.	Metal Fascia Soffit	20 Years
4.	Standing Seam Metal Roof	20 Years
	a. Flashing and sheet metal	20 Years
5.	Joint Sealants:	
	a. Manufacturer	5 Years
	b. Installation	5 Years
6.	Aluminum Store Front:	
	a. Manufacturer	2 Years
	b. Finish	20 Years
7.	Wood Doors	10 Year
9.	Louvers	20 Years (Finish)
10.	Meters and Gauges	2 Years
11.	Motors	5 Years
12.	Fans	5 Years
13.	Refrigeration Compressors	5 Years
14.	Water Heaters	2 Years
15.	Temperature Control System	2 years
16.	Air Cooled Condensing Units	1 Year, (5 Years - parts only)
17.	Electric Water Cooler Compressor	5 Years
18.	Pumps	1 Year, (5 Years - parts only)
19.	Lift Stations- Pumps and Controls	2 Years, (5 Years - parts only)
20.	Transfer Switches	1 Year
21.	Air Handling Units	1 Year, (5 Years - parts only)
22.	VAV Units	1 Year, (5 Years - parts only)
23.	Fire Alarm System	2 Years
24.	Fire Sprinkler System	2 Years

3.2 MAINTENANCE SERVICE AGREEMENT OPTION

A. In addition to warranties, bonds and extended warranties, the County, at its option, may select to have the **CONSTRUCTION MANAGER (CM**) provide a Maintenance and Service Agreement which may include, but may not be limited to, the following items listed below:

1. Landscaping/Irrigation Maintenance
2. Roofing Maintenance
3. HVAC System Maintenance
4. Fire Pump Maintenance

5. Smoke and Fire Alarms Maintenance
6. Security System Maintenance

B. The Service Agreement shall be provided in accordance with the At-Risk CM Agreement. The Service Agreement shall be for one year and renewable every year, for a period of up to five years.

END OF SECTION 01740

SECTION 02070 - SITE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Work included in this section shall be performed in accordance with the following paragraphs, the General Requirements set forth in Division 1 of these specifications, and the provisions of the other Contract Documents.

1.02 DESCRIPTION OF WORK

A. Extent of site demolition work is indicated on drawings.

B. Types of Site Demolition Work: Demolition requires the site removal and subsequent off-site disposal of the following:

1. Portions of site structures, retaining walls, fences, and foundations.

2. All pavements, curbs and gutters, drainage structures, drainage pipe, utilities, site signs, and landscaping as indicated on drawings and as required to accommodate new construction.

3. Removal or abandonment of underground utilities as indicated on drawings and as required to accommodate new construction.

4. Related work specified elsewhere:

a. Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.
b. Relocation of pipes, conduits, ducts, other mechanical and electrical work are specified by respective trades.

1.03 SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for site demolition work to Architect for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

1.04 JOB CONDITIONS

A. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of site demolition. Conduct site demolition work in manner that will

minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

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

1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations may occur by Owner's removal and salvage operations prior to start of site demolition work.

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

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

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

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public around the site demolition work area.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

4. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

F. Traffic: Conduct site demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

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

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

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

1. Do not interrupt existing utilities serving occupied or used facilities, except

when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

PART 2 - PRODUCTS

Not applicable to this section.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to commencement of site demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from site demolition work; file with Architect prior to starting work.

3.02 PREPARATION

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

B. Cease operations and notify the Architect immediately if safety of any structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

C. Cover and protect site furniture and equipment to remain from soiling or damage when demolition work is performed in areas from which such items have not been removed.

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

E. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.03 DEMOLITION

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

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

C. Provide services for effective water pollution controls as required by local authorities having jurisdiction.

D. Completely fill below-grade areas and voids resulting from demolition work. Provide

fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.

E. If unanticipated elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect rearrange site demolition schedule as necessary to continue overall job progress without delay.

3.04 SALVAGE MATERIALS

A. Salvage Items: Carefully remove any salvagable items, clean, store and turn over to Owner and obtain receipt.

1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain the property of the Owner. Notify Architect if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

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

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

C. Burning of removed materials is not permitted on project site.

3.06 CLEAN-UP AND REPAIR

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

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of site demolition work. Repair adjacent construction or surfaces soiled or damaged by site demolition work.

END OF SECTION 02070

SECTION 02110 - SITE CLEARING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

B. Work included in this section shall be performed in accordance with the following paragraphs, the General Requirements set forth in Division 1 of these specifications, and the provisions of the other Contract Documents.

1.02 SECTION INCLUDES

A. Protection of existing trees.

B. Removal of trees and other vegetation.

C. Topsoil stripping.

D. Clearing and grubbing.

E. Removing above-grade improvements.

F. Removing below-grade improvements.

1.03 PROJECT CONDITIONS

A. Traffic.

1. Provide maintenance of traffic plan as indicated on drawings or as required to complete construction operations and work of this section.

B. Protection of Existing Improvements.

1. Protect improvements on adjoining properties and on Owner's property.

2. Restore damaged improvements to original condition.

C. Protection of Existing Trees and Vegetation.

1. Water trees and other vegetation: Remain within limits of contract work as required to maintain their health during the course of construction operations.

2. Provide protection for roots over 1-1/2 inch diameter: Coat cut faces with an emulsified asphalt, or other acceptable coating formulated for use on damaged plant tissues; temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.

3. Repair or replace trees and vegetation indicated to remain which are

damaged by construction operations.

4. Replace trees which cannot be repaired and restored to full growth status: Determination by arborist and/or local regulatory agency having jurisdiction.

D. Improvements on Adjoining Property.

1. Extent of work on adjacent property is indicated on drawings.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Similar items elsewhere on site or premises are to be removed only if specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner: Alter only where such roots and branches obstruct installation of new construction.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil: Whatever depths encountered should be stripped in a manner to prevent intermingling with underlying subsoil or other objectionable material; remove heavy growths of grass from areas before stripping; where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

2. Stockpile topsoil in storage piles in areas indicated or directed: Construct storage piles to provide free drainage of surface water; cover storage piles, if required, to prevent wind erosion.

C. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.

2. Use only hand methods for grubbing inside drip line of trees indicated to remain.

3. Fill depressions caused by clearing and grubbing operations with satisfactory

soil material (unless further excavation or earthwork is indicated): place fill material in horizontal layers not exceeding 6 inches loose depth and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.

3.02 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property, unless otherwise indicated.

END OF SECTION 02110

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 earthwork, compaction, grading, and asphaltic concrete paving of the Project site. This Section includes the following:

1. Preparing and grading subgrades for building slabs-on-grade and pavement.
2. Excavating and backfilling for buildings and structures.
3. Excavating and backfilling trenches within building lines.
4. Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 02480 - Landscape Work

1.3 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.

E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

F. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Contractor shall employ a qualified independent geotechnical engineering testing agency to classify and approve proposed on-site, sifted, and borrow soils, to verify that soils comply with specified requirements, to observe excavation and compaction work, and to perform required field and laboratory testing.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hours' notice to the Owner and receive written notice to proceed before interrupting any utility.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

C. Site Information: Data in geotechnical investigation report was used for the basis of the design. Report is available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. Neither the Owner nor the Architect will be responsible for interpretations or conclusions drawn from this data by the Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor′s option; however, no change in the contract sum will be authorized for such additional exploration.

2. Geotechnical Investigation: Report of Geotechnical Engineering Services, East Lake Fire Station No. 32, 6410 east Hillsborough Ave., Tampa, Florida; prepared by Terracon Consultants, Inc.,504 East Tyler Street, Tampa, Florida 33602, August 13, 2015.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. Satisfactory Soil Materials: 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 2 inches in any dimension within the upper 24” (not larger than 6” below 24” from surface), debris, waste, frozen materials, vegetation and other deleterious matter.

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

D. Backfill and Fill Materials: Suitable structural fill materials should consist of fine to medium sand with 3 to 10 percent by dry weight of material passing the U.S. Standard No. 200 sieve size, and with less than twelve (12) percent passing the No. 200 sieve, free of rubble, organics, clay, debris and other unsuitable material.

1. Backfill and fill materials may either be sifted, on-site material or material imported from off-site.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. 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 subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

1. The dewatering method shall be determined by the Contractor.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

C. Dewatering shall allow for excavation in a drained condition suitable for compaction to specified requirements.

3.3 EXCAVATION

A. Explosives: Do not use explosives.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 SITE CLEARING

A. The development area plus a margin of five (5) feet should be stripped and cleared of surface vegetation and organic or root laden topsoil, grubbed of roots greater than ½ in diameter, and stumps. Any topsoil removed from the structure and pavement areas should be stockpiled in designated locations and used in locations or areas to be grassed.

3.6 FILL PLACEMENT AND SUBGRADE PREPARATION

A. Prior to construction, the location of any existing underground irrigation, septic tanks, drainage, or other utility lines within the construction area should be established. Underground pipes shall be properly removed or plugged.

B. All foundations and any debris from the previous building shall be stripped and removed from the construction area. All vegetation, grass and roots shall also be removed. As a minimum, it is recommended that the clearing and stripping operations extend to at least five feet beyond the development perimeter.

C. The subgrade for all building and paved areas shall be prepared in accordance with the referenced Geotechnical Investigation including excavation, overexcavation, proofrolling/compaction, and fill and backfill placement.

D. A representative from a qualified geotechnical engineering firm shall be retained to provide on-site observation of earthwork and ground modification activities. Density tests shall be performed in the top of one foot of compacted existing ground, in each fill lift, and at the bottom of foundation excavations. It is important that the geotechnical engineer be retained to observe that the subsurface conditions are as discussed in the Geotechnical Investigation, and that foundation construction, ground modifications and fill placements are in accordance with the specifications in Geotechnical Investigation.

3.7 EXCAVATION FOR TRENCHES

A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.

B. All open-cut excavation areas should be properly dewatered for a period of at least 24 hours prior to the initiation of excavation operations. Following the proper dewatering operations, side slopes for temporary excavations may stand near 1½ horizontal to one vertical (1½ H:1V) for short dry periods of time to a maximum excavation depth of 4 feet. Where restrictions do not permit slopes to be constructed as recommended above, the excavation should be shored and braced in accordance with current OSHA requirements. Furthermore, open-cut excavations up to a maximum depth of 10 feet should be sloped to 3:1 (H:V) or flatter slopes or be braced using an approved bracing plan. During foundation

construction, excavated materials should not be stockpiled at the top of any slope within a horizontal distance equal to the excavation depth.

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

1. Clearance: 8 inches, minimum, each side of pipe or conduit.

D. 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 stones and sharp objects to avoid point loading.

1. For pipes or conduit less than 6 inches 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 or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.

3.8 APPROVAL OF SUBGRADE

A. Notify geotechnical engineer when excavations have reached required subgrade.

B. When geotechnical engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by the Architect or geotechnical engineer.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.

1. Fill unauthorized excavations under other construction as directed by the geotechnical engineer.

B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

3.10 UTILITY TRENCH BACKFILL

B. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.

C. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

3.11 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.

3. Provide a smooth transition between existing adjacent grades and new grades.
4. Cut out soft spots, fill low spots, and trim high spots to conform to 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.
2. Walks: Plus or minus ½ inch.
3. Pavements: Plus or minus ½ inch.

C. Grading Inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10 foot straightedge.

3.12 FIELD QUALITY CONTROL

A. Testing Agency Services: Allow geotechnical engineer to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Inspect removal of unsuitable soils and buried debris.
2. Perform field density in accordance with ASTM D 2937 or equal method as determined by geotechnical engineer.
3. Pavement and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests per lift.
4. Footing Subgrade and Pipe Trenches: Take at least 2 field density tests per 100 lineal feet in each compacted fill layer, and one field density test at each column footing in each compacted fill layer.

B. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to Owner.

3.13 PROTECTION

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

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

1. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved 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.

3.14 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 the Owner's property.

END OF SECTION 02300

SECTION 02361 – TERMITE CONTROL

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. Soil treatment with termiticide.

1.3 PERFORMANCE REQUIREMENTS

A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

1.4 SUBMITTALS

A. Product Data: For termiticide.

1. Include the EPA-Registered Label for termiticide products.

B. Product Certificates: For termite control products, signed by product manufacturer.

C. Qualification Data: For Installer of termite control products.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

E. Warranty: Special warranty specified in this Section.

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.

B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products through one source.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.7 COORDINATION

A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Termiticides:

a. Aventis Environmental Science USA LP; Termidor.
b. Bayer Corporation; Premise 75.
c. Dow AgroSciences LLC; Dursban TC; Equity.

d. FMC Corporation, Agricultural Products Group; Talstar, Prevail FT, Torpedo.
e. Syngenta; Demon TC.

2.2 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Masonry: Treat voids.
4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 02361

SECTION 02480 - LANDSCAPE WORK

PART 1 - GENERAL

1.1. DESCRIPTION

A. Scope of Work: Work of this section consists of furnishing all labor, material, equipment, transportation, etc., to complete all landscaping work as shown on the Drawings, as included in the Plant List and as herein specified. Work shall include all construction and maintenance, watering of all planting and sodded areas of this Project until accepted by the Owner.

B. Landscape Plans: The plans are not complete unless accompanied by these Specifications.

C. Errors / Omissions: If an error or discrepancy if found in the Plans and Specifications, the Subcontractor shall refer the same to the Contractor for an interpretation and decision. In resolving conflicts between the Plan and Specification, THE PLANS SHALL GOVERN over the Specifications. The Landscape Architect shall have the right to correct apparent errors or omissions in the Plans and Specifications and to make such interpretations as he or she may deem necessary for the proper fulfillment of the intent of the Plans and Specifications.

1.2. QUALITY ASSURANCE

A. Rejection: The Owner or the Landscape Architect shall have the right, during any phase of the work operations, to reject any and all work and materials which do not meet the requirements of the Plans and Specifications. Rejected work and materials shall be immediately removed from the project area and replaced with acceptable work and material within seven (7) calendar days or as approved by the Owner or the Landscape Architect.

B. Inspection: Plants shall be subject to inspection and approval at the place of growth, or upon delivery to the site, as determined by the Owner or the Landscape Architect for quality, size or variety. Such approval shall not impair the right of inspection and/ or rejection at the site during progress of the work, or after completion, for size and condition of the balls or roots, latent defects or injuries.

C. Notification: Submit notice in writing at least one (1) week prior to anticipated date, requesting inspection. If requesting an inspection by the Owner, at a site other than the construction site, the Subcontractor shall pay the Landscape Architect's and Owner's time and expenses incurred during inspection period.

D. Substitutions: Substitutions will be permitted only upon submission of sufficient proof that a plant is unavailable and upon authorization of the Landscape Architect or Owner. Under no circumstances shall unauthorized substitutions be included in the Bid Proposal.

1.3. SUBMITTAL

A. Samples: Samples of all landscape materials (topsoil, mulch, fertilizer, etc.) will be required for approval on the site or as otherwise determined by the Owner / Landscape Architect. Approved samples shall be stored on the site and protected until furnishing of materials is completed. Plant samples may be planted in permanent positions, but labeled as samples.

1.4. JOB CONDITIONS

A. Damage Protection: Protect existing buildings, walks, walls, paving, piping (and other items of construction) and plantings (trees, shrubs, ground covers, etc.) from damage. All damage resulting from negligence shall be repaired or replaced at the Contractor's expense to the satisfaction of the Owner / Landscape Architect.

1.5. PROJECT WARRANTY

A. Warranty: Provide the following warranty periods covering the life and satisfactory condition of all planted materials beginning at time of acceptance by Substantial Completion as determined by the Landscape Architect.

Trees and Palms	(1) Year
Shrubs / Groundcovers	(3) Months
Sod	(3) Months

All plants and / or grassing not found in a healthy growing condition at the end of the warranty period shall be removed from the site and replaced within ten (10) calendar days after written notice, if it is:

1. not in healthy state,
2. questionable as to its survivability and / or
3. dead.

B. Plant Replacements: All plant replacements shall be of the same species and size as specified in the Plant List. They shall be furnished, planted and mulched as specified within the Plans and Specification. Replacement plant material shall be covered under same warranty period specified in Section 1.5.A. from date of replacement, at no additional cost to the Owner.

C. Plant Damage: Damage to plant material from obvious vandalism, theft, Owner's neglect, Acts of God, or incidents beyond the Landscape Subcontractor's control shall not be covered under this warranty.

1.6. FINAL INSPECTION AND ACCEPTANCE OF WORK

A. Inspection: A final inspection shall be performed at the end of the Warranty Period for planting, construction and all other incidental work pertaining to the Work of this Section. All replacement materials and methods used at this time shall be subject to the same warranty specified in Section 1.5.A. beginning with the time of replacement and ending with the same inspection and acceptance herein described.

PART 2 - PRODUCTS

2.1. LANDSCAPE MATERIALS

A. Topsoil: Topsoil used for all earthen berms and backfill, shall be fertile and without mixture of subsoil materials. It shall be free from all heavy clay, stones, lumps, plants, roots, foreign materials, noxious grass (such as Bermuda or nut grass) or weeds. It shall not contain toxic substances which may be harmful to plant growth. The pH range shall be 6.0 to 6.5 inclusive.

B. Water: The Subcontractor is responsible for distribution of water to the areas of planting in the event the irrigation system is not functioning. In such event the Subcontractor shall be responsible for utilizing a water truck or tank for hand watering. All water necessary for planting and maintenance shall be of satisfactory quality and quantity to sustain adequate growth of plants and shall not contain harmful natural or manmade elements detrimental to plants.

C. Fertilizer: Fertilizer shall be complete, uniform in composition, dry and free flowing. Fertilizer shall be delivered to the site in the original unopened containers, each bearing the manufacturer's statement of analysis.

D. Mulch: Mulch shall be melaleuca mulch or approved equivalent as noted on the plan.

E. Sod: Grass sod shall be St. Augustine 'Floratam' and Argentine Bahia sod as shown on the Drawings, and shall be well matted with grass roots. The sod shall be taken up in rectangles, preferably 18-inches x 24-inches, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering to the roots to withstand all necessary handling.

2.2. PLANT MATERIALS

A. Plant Grading: Plant species and size shall conform to those indicated on the drawings. All plant material shall be in accordance with *Grades and Standards For Nursery Plants, Parts 1 and 2*, latest edition published by the Florida Department of Agriculture and Consumer Services. All plants shall be Florida Grade Number 1 or better, as determined by the Florida Division of Plant Industry.

All trees shall be container grown or balled and burlapped (B/B). All B/B trees shall be provided by a certified "Roots Plus Field Grower" and proof submitted to Landscape Architect and/ or Owner’s representative for verification.

If specified field dug material is not available from a Roots Plus Grower then an acceptable alternate nursery source shall be approved by the Landscape Architect prior to installation.

All plants shall meet required specifications and be healthy, vigorous, well branched and free of disease and insect eggs and larvae and shall have adequate root systems. Palms with marred or burned trunks will not be accepted. All materials shall be subject to approval by the Owner / Landscape Architect. Where any requirements are omitted from the Plant List, the plants furnished shall be normal for the variety specified. Plants

shall be pruned prior to delivery only upon the prior approval of the Landscape Architect.

B. Plant Measurements

1. Shade Trees: Overall height shall be measured from ground to the average height of canopy. Spread shall be measured to the end of branching equally across the crown which is symmetrical above the main trunk. Measurements are not to include any terminal growth. Single trunk trees shall be free of low crotches below 5 feet in height that could be points of weak limb structure or disease infestation.

2. Shrubs: Height shall be measured from the ground to the average point where mature plant growth stops. Spread shall be measured to the end of branching equally across the shrub mass. Measurements are not to include any terminal growth.

3. Palms: Requirements for the measurement of clear trunk, clear wood, gray wood, root ball diameter and depth shall comply with requirements as set forth in the latest edition of the Florida Department of Agriculture's *Grades and Standards for Nursery Plants, Part 2.* All palms shall be Florida grown.

4. Container Grown Plant Stock: All container grown materials shall be healthy, vigorous, well-rooted plants and established in the container so that the root mass will retain its shape and hold together when removed from the container. The plants shall have tops which are of good quality and are in a healthy growing condition. Root bound plants will not be accepted.

5. Collected Plant Stock: No collected stock shall be used unless specifically called for on the Plans or with written permission of the Owner / Landscape Architect.

PART 3 - EXECUTION

3.1. INSPECTION

A. Utilities (Overhead and Underground)

1. The work area may have existing utilities, such as, but not limited to, irrigation, phone, electrical and storm sewer. It shall be the responsibility of the Subcontractor to verify the location of all such utilities, structures, etc., by hand excavation or other appropriate measures before performing any work that could result in damage or injury to persons, utilities, structures, or property.

2. The Subcontractor shall take immediate steps to repair, replace, or restore all services to any utilities or other facilities which are disrupted due to his or her operations. Further, the Subcontractor shall engage any additional outside repairs on a continuous "around the clock" basis until services are restored. He or she shall also provide and operate any supplemental temporary services to maintain uninterrupted use of the facilities. All costs involved in the repairs and restoring of disrupted service resulting from negligence on the part of the Subcontractor shall be borne by the Subcontractor and he or she shall be fully responsible for any and all claims resulting from the damage.

3. Should utilities, structures, etc., be encountered which interfere with the work, the Contractor shall be consulted immediately in order for a decision to be made on the relocation of the work so it will clear the obstruction, if the obstruction cannot be relocated.

4. The Subcontractor shall not purposefully disrupt or disconnect any type of utility whatsoever without first obtaining the written permission of the Contractor. Requests for disconnection must be in writing and received by the Contractor at least 72 hours prior to the time of the requested interruption.

5. Caution: Fiber optic and other utilities may be located in various locations throughout the proposed areas of work. All subcontractors shall field verify these locations to prevent any potential damage to these lines.

6. Subcontractor is responsible for making sure that all landscape material is located to conform with local codes related to required setbacks from utility lines, easements, etc.

3.2. GRADES

A. Final Grading: It shall be the responsibility of the Subcontractor to provide the final grading so the final level for planting areas conforms to surrounding grades and is at the proper elevation with relation to walks, paving, drain structures and other site conditions, unless indicated otherwise on the Plans.

B. Plant Areas Next to Pavement: All planting areas next to pavement areas, shall conform to specifications indicated on the Plans.

3.3. DIGGING AND HANDLING

A. Balled and burlapped (B/B) plants shall be dug with firm, natural balls of soil of sufficient size to encompass the fibrous and feeding roots of the plants. No plants moved with a ball shall be planted if the ball is cracked or broken.

B. Root Balls: Protect roots or balls of plants at all times from sun and drying winds, excess water and freezing, as necessary until planting.

C. Protection of Palms:

1. Only a minimum of fronds shall be removed from the crown of Royal palm trees to facilitate moving and handling. Palm heads shall be tied with a burlap strip per the following procedure: The first (inside) row of fronds continuous to bud shall be removed. The next 3 to 4 rows shall be tied to bud for support. The remaining (lower) fronds shall be removed. Tied fronds and bud tip shall not be clipped. Burlap strip shall be left in place until the tree is well established in its new location.

2. Sabal palms: Palm fronds and bud to be "cigar cut" prior to transit to job site. The palm trunk is not to be cut. All sabal palms shall remain booted.

3.4. PLANTING PROCEDURES

A. Cleaning-up Prior to Commencing Work:

1. Clean-up work and planting areas of rubbish or objectionable matter. Mortar, concrete and toxic material shall be removed from the surface of all plant beds. These materials shall not be mixed with the soil. Should the Subcontractor find conditions beneath the soil which will in any way adversely affect the plant growth, he shall immediately call it to the attention of the Owner / Landscape Architect. Failure to do so before planting shall make the corrective measures the responsibility of the Subcontractor.

B. Obstruction Below Ground:

1. If underground construction, utilities or obstructions are encountered during the excavation of planting areas or pits, alternative locations for the plant material shall be selected by the Owner. Such changes in location shall be made by the Subcontractor without additional compensation.

C. Plant Material Layout:

1. Stake tree or plant locations from the Landscape Plans prior to digging pits, making all necessary adjustments. Large planting areas shall be scaled from the plans and plants spaced according to designated spacing on the plant list.

D. Excavation for Planting:

1. Sides of pits and trenches shall be vertical. The soil in the bottom of the pits shall be loosened to a minimum of 8" inches. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, and/or obstructions, the Owner / Landscape Architect shall be notified before planting.

2. In planting areas where soils have been compacted to a density which is detrimental to plant growth, loosen soils to allow root penetration beyond the planting pit. All plantings shall be backfilled with a 1:1 ratio of planting mix to existing soil.

3. The landscape and irrigation Subcontractor shall coordinate with all applicable trades prior to the construction of the tree wells and planter beds. This coordination is critical to determine appropriate scheduling of irrigation and tree installation in order to prevent any damage / replacement of concrete work or landscape material.

E. Fertilizer

1. Trees and Shrubs: Fertilizer shall be composed of five percent (5%) nitrogen, five percent (5%) phosphorus, two percent (2%) potassium and contain all primary and secondary trace elements.

2. Sodding: Fertilizer shall be composed of sixteen (16%) nitrogen, four percent (4%) phosphorus, eight percent (8%) potassium and contain all primary and secondary trace elements for all sodded areas.

3. Palms: Fertilizer shall be composed of twelve percent (12%) nitrogen, four percent (4%) phosphorus, twelve percent (12%) potassium and contain all primary and secondary trace elements for all palms.

4. Fertilizer shall be applied at the following rates:

Sod:
(1) 15 lbs. per 1,000 sq. ft.

Shrubs and Ground Cover:
(1) 1/3 lbs. per 3-gallon pot.
(2) 1/4 lbs. per 1-gallon pot.

Trees and Shrubs (5 feet in height and larger):
(1) 1 lb. per one (1) inch of trunk diameter.

Palms:
(1) 1 lb. per one (1) inch of trunk diameter.

F. Material Placement: Trees, shrubs and ground cover shall be set straight and at such a level, that after settlement, the plant ball will stand flush, to 1/2" below grade. Each plant shall be set in the center of the planting pit (see planting details). Planting soil shall be thoroughly "watered-in" to remove all air pockets around the root ball. DO NOT rely on the irrigation system to achieve this task. All burlap, rope wires, etc. shall be loosened from the top and sides of the ball, but no burlap shall be pulled from underneath.

G. Water Basin: A basin shall be built around all plants or trees which stand alone and are not in larger mulched beds. A water-holding soil-dam shall be built on the outside edge of the planting pit to form a basin of sufficient volume to "pond" water.

H. Pruning: Each tree shall be pruned to preserve the natural character of the plant as shown on the Drawings. All soft wood (sucker growth) and all broken or badly damaged branches shall be removed with a clean cut. All pruning cuts over 1-inch in diameter shall be painted over with an approved tree paint. All pruning shall be previously approved by the Landscape Architect.

I. Tree Guying and Bracing: Procedure shall be in accordance with sound nursery practices and by the approval of the Owner / Landscape Architect to ensure stability and maintain plants in an upright position. See planting details for specific procedure for each tree / palm requirement.

J. Mulching: Provide a two-inch (2") minimum layer of specified mulch over the entire area of each shrub bed, ground cover and vine bed, and tree pit. Mulch shall be Melaleuca mulch as noted on the plan.

K. Sodding:

1. The sod shall be planted as soon as possible after being dug, and kept moist and shaded until it is planted. Dumping from vehicles will not be permitted. Damaged sod will be rejected. Replanting shall be performed within 24 hours after time of harvesting or sod shall be stacked in an approved manner and properly moistened until

planted. Sod which has been cut for more than 72 hours shall not be used unless specifically authorized by the Owner / Landscape Architect after his inspection thereof.

2. The area over which the sod is planted shall be scraped, pulverized, or raked in all areas in order to crumble and / or remove dirt clods, rocks, and / or other debris. In addition, all areas to be sodded shall be raked smooth.

3. Fertilizer shall be spread at a rate of 15 pounds per thousand square feet of area.

4. Fertilizer shall be surface applied to newly installed sod with a mechanical spreading device capable of uniformly distributing the fertilizer at the above specified rates.

5. Soft spots and inequalities in grade shall be corrected before starting sod work.

6. Soil shall be watered before planting sod.

7. Roll all newly installed sod. Sod shall be thoroughly watered.

8. The surface shall be within 1/10 of 1 foot of proposed grade and shall be even and firm at all points. Hand raking shall be required to ensure such conditions.

9. Until Final Acceptance of the work, the Subcontractor shall, at his expense, maintain the sodded areas in a satisfactory condition. This maintenance shall include mowing, edging, and the repairing of all damaged areas and replacing areas in which the establishment of the grass does not appear to be developing satisfactorily.

10. All replanting or repair required due to the Subcontractor's negligence, carelessness, or failure to provide routine maintenance shall be performed at the Subcontractor's expense.

3.5. HERBICIDE WEED CONTROL

A. All planting and lawn areas shall be free of nut grass, torpedo grass, and other noxious weeds. "Round-up" or approved equal shall be applied to all planting areas as needed and determined on-site by the Owner / Landscape Architect for weed control.

1. Seasonal planting beds and turf areas will not only be excluded, but specifically protected from accidental broadcast of material to those areas. Ground cover beds using containerized plant materials will be treated.

2. Planting will be properly installed, backfill tamped and final watering complete for 24 hours before application. Treated areas shall be inspected by Landscape Architect prior to mulch application. Mulch will be applied after the pre-emergence weed killer is broadcast.

3. If necessary to prevent the material from lodging on the shrub foliage or the leaf axil, the Subcontractor shall temporarily tie up plant materials with twine or burlap during principle applications.

3.6. MATERIALS LIST

A. Exact quantities necessary to complete the Work shown on the Drawings shall be calculated by the Subcontractor.

3.7. MAINTENANCE PERIOD

A. SCOPE OF WORK

1. The Subcontractor is responsible for general landscape maintenance during project installation prior to Final Acceptance.

2. Additional services excluded from this contract, which shall be negotiated with Owner, include installation of supplemental mulch, fertilizer, and pesticide spraying.

END OF SECTION 02480

SECTION 02513 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Work included in this section shall be performed in accordance with the following paragraphs, the General Requirements set forth in Division 1 of these specifications, and the provisions of the other Contract Documents.

1.02 DESCRIPTION OF WORK

A. The work included under this section consists of furnishing and installing asphalt concrete paving as shown on the drawings and specified herein.

B. Refer to Division-2 section "Earthwork" for preparing of subgrade for pavements; not work of this section.

1.03 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

C. Record Drawings: At project closeout, submit record drawings depicting elevations, at a maximum 50' spacing, of the edge of pavement of roadways, driveways, parking areas, sidewalks, etc.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with Florida Department of Transportation "Standard Specifications for Road and Bridge Construction".

B. Testing and Inspection Service: Owner will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform asphalt concrete and base testing and inspection service during paving operations. Contractor to coordinate testing schedule and requirements as specified herein.

1.05 SITE CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg.F (10 deg.C), and when temperature has not been below 35 deg.F (1 deg.C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40 deg.F (4 deg.C), and when base is dry. Base course may be placed when air temperature is above 30 deg.F (-1 deg.C) and rising.

C. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS

C. General: Refer to Geotechnical Engineering Study for additional requirements.

B. Base Course: crushed concrete meeting FDOT standards for graded aggregate.

C. Asphalt Cement: AASHTO M 226 (ASTM D 3381) for viscosity-graded material and AASHTO M 20 (ASTM D 946) for penetration-graded material.

D. Prime Coat: Cut-back asphalt type; AASHTO M 82 (ASTM D 2027)MC-30, MC-70 or MC-250.

E. Tack Coat: Emulsified asphalt; AASHTO M 140 (ASTM D 977) or M208 (D 2397); SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

F. Marking Paint: Thermoplastic per F.D.O.T. specifications at driveway intersections and in rights-of-way. Fast dry traffic paint (water borne) per F.D.O.T. for lot striping and on-site traffic markings.

G. Wheel Stops: Precast, air-entrained concrete, 3,000-psi minimum compressive strength, approximately 6 inches high, 10 3/8 inches wide, and 6'-0" long. Provide chamfered corners and drainage slots on underside, and provide holes for anchoring to substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to for earthwork operations to begin.

1. Verify gradients and elevations of base are correct, and base is dry.

B. Report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

C. By beginning work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 BASE COURSE PLACEMENT

A. Perform base course construction in a manner that will drain surface properly at all times and at the same time prevent runoff from adjacent areas from draining onto base course construction.

B. Compact base material to not less than 98 percent of the Modified Proctor maximum dry density, as determined by ASTM D 1557, unless otherwise indicated on the Drawings.

C. Graded Aggregate Base (Crushed Concrete): Construct to thickness indicated on Drawings per specifications indicated in Section 204 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition. Apply in lifts or layers not exceeding 8 inches, measured loose.

3.03 APPLICATIONS

A. Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted base course. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

B. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

C. Allow to dry until at proper condition to receive paving.

D. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.04 ASPHALT CONCRETE PLACEMENT

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 deg.F (107 deg.C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and a compacted thickness as specified on the Drawings.

B. Compact asphalt concrete material to not less than 96 percent of the Marshall maximum laboratory unit weight, unless otherwise indicated on the Drawings.

C. Paver Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Design Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.05 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.06 TRAFFIC AND LANE MARKINGS

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping: Use water borne traffic lane-marking paint, factory-mixed, fast-drying, and non-bleeding.

1. Color: White.

2. Color: Blue for Handicap Parking Area.

C. Do not apply traffic and lane marking paint until layout and placement has been verified with Architect.

D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.07 WHEEL STOPS

A. Secure wheel stops to asphalt concrete surface with not less than two 7/8" diameter galvanized steel dowels embedded in precast concrete at 1/3 points. Size length of dowel to penetrate at least 16" into asphalt concrete. Drill placement holes oversize and embed dowels in hot bituminous grout material.

3.08 FIELD QUALITY CONTROL

A. General: Test in-place asphalt concrete courses for compliance with requirements for moisture, thickness, compaction, density and surface smoothness. The paving

shall be graded to prevent puddling. Repair or remove and replace unacceptable paving as recommended by Design Engineer.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

1. Base Course: 1/2", plus or minus.

2. Surface Course: 1/4", plus or minus.

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straight edge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

1. Base Course Surface: 1/4".

2. Wearing Course Surface: 3/16".

D. Site Tests: Minimum one test for every 20,000 square feet.

1. Paving Base Course: Perform testing of in-place base courses for compliance with requirements for moisture, thickness and density.

a. Moisture Content Test: ASTM D 698.
b. Mechanical Analysis Test: AASHTO T-88.
c. Plasticity Index Test: ASTM D 4318.
d. Base Material Thickness Test: Per FDOT specifications.
e. Field Density Test: ASTM D 1557.
f. Test each source of base material for compliance with FDOT specifications.

2. Asphalt Concrete Paving: Perform testing of in-place asphalt concrete paving courses for compliance with requirements for thickness, compaction, and surface smoothness.

a. Thickness Test: ASTM D 3549.
b. Compaction Test: FM 5-511.
c. Surface Smoothness Test: Testing shall be performed on the finished surface of each asphalt paving course using 10 foot straightedge applied parallel with, and at right angles to centerline of paved areas.
d. Test each source of asphalt concrete material for compliance with FDOT specifications.

END OF SECTION 02513

SECTION 02666 - POTABLE WATER SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of potable water systems work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to Division-2 section "Earthwork for Site" for excavation and backfill required for potable water systems; not work of this section.

C. Refer to Division-3 sections for concrete work required for potable water systems; not work of this section.

D. Refer to Division-15 section "Potable Water Systems" for interior building systems including interior piping, fixtures, and equipment; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with potable water piping work similar to that required for project.

C. Codes and Standards:

1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of potable water system materials and products.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for potable water system materials and products.

B. Shop Drawings: Submit shop drawings for potable water systems, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, restrain joints, and anchors. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings: At project closeout, submit record drawings of installed potable water system piping and products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for potable water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

A. Underground-Type Plastic Line Markers: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".

B. Nonmetallic Piping Label: If nonmetallic piping is used for water service, provide engraved plastic laminate, label permanently affixed to main electrical meter panel stating "THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE".

2.02 PIPES AND PIPE FITTINGS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or products are indicated, selection is Installer's option.

B. Piping: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

C. Ductile-Iron Pipe: AWWA C151, with cement mortar lining complying with AWWA C104; Class 51 unless otherwise indicated.

1. Fittings: Ductile-iron, AWWA C110; cement lined, AWWA C104; and rubber-gasket joints, AWWA C111.

D. Polyvinyl Chloride (PVC) Pipe: AWWA C900 for sizes 4" through 12"; Class 150 or 200 as specified (see plans).

1. Fittings: Ductile-iron complying with AWWA C110, cement lined, with rubber gaskets conforming to AWWA C111.

E. Polyvinyl Chloride (PVC) Pipe: ASTM D 2241, SDR 21 for sizes 2" thru 3".

1. Fittings: PVC, SDR 21 socket-type, solvent cement joints; or elastomeric gasketed joints.

F. Polyvinyl Chloride (PVC) Pipe: ASTM D 1785, Schedule 80 for sizes less than 2".

1. Fittings: PVC, Schedule 80 socket-type, solvent cement joints; or elastomeric gasketed joints.

G. Polyethylene (PE) Pipe: AWWA C901 for sizes 1/2" through 3".

1. Fittings: Copper alloy or nylon barbed insert type with 2 strap-type stainless steel clamps over pipe at each insert

2.03 VALVES

A. Gate Valves: Provide as indicated, gate valves, AWWA C500, 175 psi working pressure. Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connection. Provide inside screw type for use with curb valve box, iron body, bronze-mounted, double disc, parallel seat, non-rising stem.

1. Available Manufacturers: as approved by Hillsborough County Water, Wastewater, and Reclaimed Water Technical Manual, latest edition.

2.04 ACCESSORIES

A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.

1. Clamps, Straps, and Washers: Steel, ASTM A 506.

2. Rods: Steel, ASTM A 575.

a. Rod Couplings: Malleable-iron, ASTM A 197.

3. Bolts: Steel, ASTM A 307.
4. Cast-Iron Washers: Gray-iron, ASTM A 126.

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which potable water system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF IDENTIFICATION

A. General: During back-filling/top-soiling of underground potable water piping, install continuous underground-type plastic line markers, located directly over buried lines at 6" to 8" below finished grade.

3.03 INSTALLATION OF PIPE AND PIPE FITTINGS

A. Ductile-Iron Pipe: Install in accordance with AWWA C600 "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".

B. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's installation instructions.

C. Polyethylene Pipe: Install in accordance with manufacturer's installation instructions.

D. Depth of Cover: Provide minimum cover over piping of 12" below average local frost depth or 36" below finished grade, whichever is greater.

E. Water Service Termination: Terminate potable water piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug, blow off and sample tap for testing and piping extension into building, by work of Division 15.

3.04 INSTALLATION OF VALVES

A. General: Install valves as indicated with stems pointing up. Provide valve box over underground valves.

3.05 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer if required and water meter with by-pass valves and sand strainer.

3.06 FIELD QUALITY CONTROL

A. Site Tests:

1. Compaction:

a. Perform inspections prior to and immediately after placing bedding.
b. Perform tests as specified in Section 02200.

2. Piping: Water distribution system pipe installed below grade and outside building shall be tested in accordance with following procedures:

a. Perform the testing of pipe materials, joints, and/or other materials incorporated into the construction of water mains and force mains to determine leakage and water tightness. All pressure pipeline shall be tested in accordance with Section 4 of AWWA C600 latest edition. In the event any state or local code requires a more stringent test, the more stringent shall apply.
b. Pressure Test: After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section.
c. Leakage Test: The leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water that must be supplied into the newly laid pipeline, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipeline has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time. No pipeline installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SDP^{1/2}}{133200}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, (feet)

D = nominal diameter of pipe, (inches)

P = average test pressure during test, (psig)

d. Visible Leakage: All visible leaks shall be repaired regardless of the amount of leakage.

e. Acceptance of Installation: If any test of pipe laid in place discloses leakage greater than that specified, the Contractor shall, at his own expense, locate the leak and make repairs as necessary until the leakage is within the specified allowance. Contractor shall supply all water for testing at no additional cost to the owner.

f. Provide one copy of results of meter test and hydrostatic pressure test to the Engineer and utility company upon completion of water distribution backfilling operations.

3.07 ADJUSTING AND CLEANING

A. Disinfect distribution system with chlorine before acceptance for domestic operation. Amount of chlorine shall be such as to provide dosage of not less than 50 parts/million. Thoroughly flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours, system shall be flushed with clean water until residual chlorine content is not greater than 1.0 part/million. Open and close valves in lines being disinfected several times during contact period. After disinfection, take two consecutive days of water samples and bacteriological tests in accordance with AWWA specifications. Provide one copy of results of bacteriological tests to Engineer and utility company upon completion. Do not place distribution system in service until approval is obtained from applicable governing authorities.

END OF SECTION 02666

SECTION 02668 - FIRE WATER SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of fire water systems work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to Division-2 section "Earthwork" for excavation and backfill required for fire water systems; not work of this section.

C. Refer to Division-3 sections for concrete work required for fire water systems; not work of this section.

D. Refer to Division-15 section "Fire Protection" for interior building systems including sprinklers and standpipes; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire water system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with fire water work similar to that required for project.

C. Codes and Standards:

1. NFPA Compliance: Install fire water systems in accordance with NFPA 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".

2. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of potable water system materials and products.

3. Local Fire Department/Marshal Regulations: Comply with governing regulations pertaining to hydrants, including hose unit threading and similar matching of connections.

4. UL Compliance: Provide fire hydrants that comply with UL 246 "Hydrants for Fire-Protection Service", and are listed by UL.

5. All materials shall comply with the Hillsborough County Public Utilities Department Approved Materials List, latest edition available at https://fl-hillsboroughcounty.civicplus.com/DocumentCenter/Home/View/3904

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for fire water system materials and products.

B. Shop Drawings: Submit shop drawings for fire water systems, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, restrain joints, and anchors. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings: At project closeout, submit record drawings of installed fire water system piping and products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for fire water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

A. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work

1. Pro-Line Safety Products

2.02 PIPES AND PIPE FITTINGS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to

comply with installation requirements. Provide materials and products complying with NFPA 24 where applicable. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire water piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

B. Piping: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

C. Ductile-Iron Pipe: AWWA C151, with cement mortar lining complying with AWWA C104; Class 51 unless otherwise indicated.

1. Fittings: Ductile-iron, AWWA C110; cement lined, AWWA C104; and rubber-gasket joints, AWWA C111.

D. Polyvinyl Chloride Pipe: AWWA C900, Class 200; bell and spigot with rubber sealing ring.

1. Fittings: Ductile-iron complying with AWWA C110, cement lined, with rubber gaskets conforming to AWWA C111.

2.03 VALVES

A. Gate Valves: Provide gate valves, UL-listed, 200 psi working pressure for 12" and smaller, 150 psi for sizes larger than 12". Provide threaded, flanged, hub, or other end configurations to suit size of valve and piping connection. Provide inside screw type for use with indicator post, iron body bronze mounted, non-rising stem, solid wedge disc.

1. Available Manufacturers: as approved by Hillsborough County Public Utilities Department Approved Materials List, latest edition.

B. Indicator Posts: Provide indicator posts, UL-listed, designed for use with underground gate valves to provide above-ground means for operating valves and indicating position of valves. Provide telescopic barrel type with indicating target, intended for use with gate valves 4" through 14", with operating wrench.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering indicator posts which may be incorporated in the work include, but are not limited to, the following:

a. American-Darling Valve; Div. of American Cast Iron Pipe Co.
b. Clow Corp.; Valve Div.

c. Eddy-Iowa; Div. Clow Corp.
d. Fairbanks Co.
e. Grinnell Fire Protection Systems Co., Inc.
f. Kennedy Valve; Div. of ITT Grinnell Valve Co., Inc.
g. Mueller Co.
h. Standard Fire Protection Co.
i. Stockham Valves & Fittings Inc.
j. United States Pipe and Foundry Co.
k. Waterous Co.

E. Detector Check Valves: Provide detector check valves as indicated, UL-listed, 175 psi working pressure. Provide iron or brass bodied with weighted clapper and provisions for connection of by-pass meter around check. Contact County Water Department Official Prior to Ordering to ensure proper device is delivered.

1. Available Manufacturers: as approved by Hillsborough County Public Utilities Department Approved Materials List, latest edition.

2.04 FIRE HYDRANTS

A. General: Provide cast-iron body fire hydrants, compression type, opening against pressure and closing with pressure, base valve design, 200 psi working pressure, with 1/4" gage tapping and bronze plug in standpipe.

1. Features: Provide the following features:

a. Size: 5-1/4" valve opening.
b. Direction to Open Hydrant: Left.
c. Size and Shape of Operating and Cap Nuts: Pentagon 1-1/2" point to flat.
d. Hose Nozzles: 2-2-1/2" National Standard Thread, cap and chain.
e. Pumper Nozzles: 1-4-1/2" National Standard Threat, cap and chain.
f. Depth of Trench: 3'-6".
g. Connection to Main: 6" mechanical joint.

2. Available Manufacturers: as approved by Hillsborough County Public Utilities Department Approved Materials List, latest edition.

2.05 ACCESSORIES

A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.

1. Clamps, Straps, and Washers: Steel, ASTM A 506.

2. Rods: Steel, ASTM A 575.

3. Rod Couplings: Malleable-iron, ASTM A 197.

4. Bolts: Steel, ASTM A 307.

5. Cast-Iron Washers: Gray-iron, ASTM A 126.

PART 3 - EXECUTION

3.01 INSTALLATION OF IDENTIFICATION

A. General: During back-filling/top-soiling of underground fire water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.02 INSTALLATION OF PIPE AND PIPE FITTINGS

A. Ductile-Iron Pipe: Install in accordance with AWWA C600 "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".

B. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's installation instructions.

C. Depth of Cover: Provide minimum depth of cover over underground piping in accordance with NFPA 24, Figure A-8-11 "Recommended Depth of Cover Above Top of Underground Yard Mains".

3.03 INSTALLATION OF VALVES

A. General: Install valves as indicated. Provide post indicator for control valves.

B. Control Valves: Install post indicator valve at each connection into building, locate 40' from building outside wall, or as indicated.

C. Shutoff Valves: Install shutoff valve ahead of each hydrant.

3.04 INSTALLATION OF HYDRANTS

A. General: Install fire hydrants in accordance with AWWA M17 "Installation, Operation, and Maintenance of Fire Hydrants".

B. Location: Install fire hydrants minimum of 50'-0" from building outside wall, or as indicated.

3.05 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered. Fill pipeline 24-hrs prior to testing, and apply test pressure to stabilize system. Use only potable water. Perform the testing of pipe materials, joints, and/or other materials incorporated into the construction of water mains and force mains to determine leakage and watertightness. All pressure pipeline shall be tested in accordance with Section 4 of AWWA C600 latest edition. In the event any state or local code requires a more stringent test, the more stringent shall apply.

1. Hydrostatic Test: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.5 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure without loss for 2 hours in accordance with NFPA 24, Section 10.10.2.2

2. Visible Leakage: All visible leaks shall be repaired regardless of the amount of leakage.

3. Acceptance of Installation: If any test of pipe laid in place discloses leakage greater than that specified, the Contractor shall, at his own expense, locate the leak and make repairs as necessary until the leakage is within the specified allowance. Contractor shall supply all water for testing at no additional cost to the owner.

4. Provide one copy of results of meter test and hydrostatic pressure test to Contracting Officer and utility company upon completion of water distribution backfilling operations.

B. Operating Tests: Open and close all valves and hydrants under system water pressure. Check dry barrel hydrants for proper drainage.

1. For systems with fire pumps, run pumps during operating tests.

3.06 ADJUSTING AND CLEANING

A. Flushing: Flush underground mains and lead-in connections to sprinkler risers before connection is made to sprinklers, standpipes, or other fire protection system piping.

1. Flush at flow rate not less than that indicated in NFPA 24, or at hydraulically calculated water demand rate of the system, whichever is greater.

END OF SECTION 02668

SECTION 02670 - IRRIGATION WELL

PART 1 - GENERAL

1.1 SUMMARY

A. Submit for all required permits/ approvals to drill and install an irrigation well for the project site. This includes drilling for final water depth and quality, placing and grouting well casing, installing pump, and testing.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Tested Water Supply Well Performance Capacity: 30 GPM @ 60 PSI

B. Drill well to proper depth necessary to provide minimum performance criteria listed above. The well and casing depth shall be sufficient to guarantee that the water will not stain hard or soft surfaces following operation of the irrigation system. Any adjustments to the well depth, increased pump horsepower, water filtration or treatment processes (including rust removal devices) required by the contractor to meet these requirements must be addressed and approved prior to ordering/ installation of any material.

1.3 SUBMITTALS

A. Product Data: Submit certified performance curves and rated capacities of selected well pumps and furnished specialties for each type and size of well pump indicated.

B. Shop Drawings: Show layout and connections for well pumps.

C. Wiring Diagrams: Power, signal, and control wiring.

D. Project Record Documents: Record the following data for each water supply well:

1. Casings: Material, diameter, thickness, weight per foot of length, and depth below grade.
2. Screen: Material, construction, diameter, and opening size.
3. Pumping Test: Static water level, maximum safe yield, and drawdown at maximum yield.
4. Log: Formation log indicating strata encountered.
5. Alignment: Certification that well is aligned and plumb within specified tolerances.
6. Operation and Maintenance Data: For each well pump to include all available manuals including emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Well Driller Qualifications: An experienced water supply well driller licensed in the jurisdiction where Project is located.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

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

D. AWWA Compliance: Comply with AWWA A100 for water supply wells.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.

C. Verify with Owner that water for drilling will be available to Contractor; determine if Owner will charge Contractor for use of well drilling water.

D. Well Drilling Water: Obtain water for drilling purposes from Owner at no cost. Provide necessary piping, hoses, and/ or fittings for water supply to well location.

PART 2 - PRODUCTS

2.1 WELL CASINGS

A. Steel Casing: AWWA C200, single ply, steel pipe with threaded ends and threaded couplings for threaded joints.

B. Well Seals: Casing cap, with holes for piping and cables, that fits into top of casing and is removable, waterproof, and vermin proof.

2.2 GROUT

A. Cement: ASTM C 150, Type II.

B. Aggregates: ASTM C 33, fine and coarse grades.

C. Water: Potable.

2.3 WATER WELL SCREENS

A. Screen Material: Fabricated of ASTM A 666, Type 304 stainless-steel tube; with slotted or perforated surface and designed for well-screen applications.

1. Screen Couplings: Butt-type, stainless-steel, coupling rings.
2. Screen Fittings: Screen, with necessary fittings, closes bottom and makes tight seal between top of screen and well casing.
3. Maximum Entering Velocity: 0.1 fps.

2.4 PACK MATERIALS

A. Coarse, uniformly graded filter sand, maximum 1/8 inch in diameter.

B. Fine gravel, maximum 1/4 inch in diameter

2.5 SUBMERSIBLE-TYPE WELL PUMP

A. Pump: Goulds 33GS15, 1.5 HP submersible pump, motor, and control box.

B. Pump system components: Reference well system detail on Sheet IR1 for additional information regarding required components.

C. Pump Wiring: The Well Contractor is responsible for coordinating with the Electrical Contractor to make sure that power is available at the pump location and is 208 volt, three phase power.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Excavate for mud pit or provide aboveground structure, acceptable to authorities having jurisdiction, to allow settlement of cuttings and circulation of drill fluids back to well without discharging to on-site waterways.

B. Enlarge pilot hole and install permanent casing, screen, and grout. Install first section of casing with hardened steel driving shoe of an OD slightly larger than casing couplings if threaded couplings are used.

C. Set casing and liners round, plumb, and true to line.

D. Join casing pipe as follows:

1. Ream ends of pipe and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside casing before installation.
3. Cut bevel in ends of casing pipe and make threaded joints.
4. Clean and make solvent-cement joints.

E. Mix grout in proportions of 1 cu. ft. or a 94-lb sack of cement with 5 to 6 gal. of water. Bentonite clay may be added in amounts of 3 or 5 lb/cu. ft. for a 94-lb sack of cement. If bentonite clay is added, water may be increased to 6.5 gal./cu. ft. of cement.

F. Place grout continuously, from bottom to top surface, to ensure filling of annular space in one operation. Do not perform other operations in well within 72 hours after grouting of casing. When quick-setting cement is used, this period may be reduced to 24 hours.

G. Provide permanent casing with temporary well cap. Install with top of casing 36 inches above finished grade.

H. Develop wells to maximum yield per foot of drawdown.

1. Extract maximum practical quantity of sand, drill fluid, and other fine materials from water-bearing formation.
2. Avoid settlement and disturbance of strata above water-bearing formation.
3. Do not disturb sealing around well casings.
4. Continue developing wells until water contains no more than 2 ppm of sand by weight when pumped at maximum testing rate.

I. Install submersible-type well pumps according to HI 2.1-2.5 and provide access for periodic maintenance.

1. Before lowering permanent pump into well, lower a dummy pump that is slightly longer and wider than permanent pump to determine that permanent pump can be installed. Correct alignment problems.
2. Before lowering permanent pump into well, start pump to verify correct rotation.
3. Securely tighten discharge piping joints.
4. Connect motor to submersible pump and locate near well bottom.
   a. Connect power cable while connection points are dry and undamaged.
   b. Do not damage power cable during installation; use cable clamps that do not have sharp edges.
   c. Install water-sealed surface plate that will support pump and piping.

3.2 WELL ABANDONMENT

A. Follow well-abandonment procedures of authorities having jurisdiction. Restore ground surface to finished grade.

3.3 FIELD QUALITY CONTROL

A. Plumbness and Alignment Testing: Comply with AWWA A100, Section 8.

B. Samples, Records, and Reports: Take samples of substrata formation at 10-foot intervals and at changes in formation throughout entire depth of each water supply well. Carefully preserve samples on-site in glass jars properly labeled for identification.

C. Furnish samples of water-bearing formation to testing laboratory and well-screen manufacturer for mechanical sieve analysis.

D. Prepare reports on static level of ground water, level of water for various pumping rates, and depth to water-bearing strata.

E. Performance Testing: Conduct final pumping tests after well has been constructed, cleaned, and tested for plumbness and alignment.

1. Arrange to conduct tests, with seven days advance notice, after test pump and auxiliary equipment have been installed. Note water-level elevations referred to for each assigned datum in wells.
2. Provide discharge piping to conduct water to locations where disposal will not create a nuisance or endanger adjacent property. Comply with requirements of authorities having jurisdiction.

3. Provide and maintain equipment of adequate size and type for measuring flow of water, such as weir box, orifice, or water meter.
4. Measure elevation to water level in wells.
5. Perform two bailer or air-ejection tests to determine expected yield. Test at depths with sufficient quantity of water to satisfy desired yields.
6. Test Pump: Variable capacity test pump with capacity equal to maximum expected yields at pressure equal to drawdown in wells, plus losses in pump columns and discharge pipes.
7. Start and adjust test pumps and equipment to required pumping rates.
8. Record readings of water levels in wells and pumping rates at 30-minute maximum intervals throughout 24-hour minimum period.
9. Record maximum yields when drawdown is 60 inches above top of suction screens after designated times.
10. Operate pumping units continuously for eight hours after maximum drawdown is reached.
11. Record returning water levels in wells and plot curves of well recovery rates.
12. Remove sand, stones, and other foreign materials that may become deposited in wells after completing final tests.

F. Water Analysis Testing: Make bacteriological, physical, and chemical analyses of water from the finished well and report the results. Make analyses according to requirements of authorities having jurisdiction.

G. Start well pump and adjust controls and pressure setting. Replace damaged and malfunctioning controls and equipment.

3.4 PROTECTION

A. Water Quality Protection: Prevent well contamination, including undesirable physical and chemical characteristics.

B. Retain first paragraph below only if rotary drilling method is selected.

C. Ensure that mud pit will not leak or overflow into streams or wetlands. When well is accepted, remove mud and solids in mud pit from Project site and restore site to finished grade.

D. Provide casings, seals, sterilizing agents, and other materials to eliminate contamination; shut off contaminated water.

E. Exercise care to prevent breakdown or collapse of strata overlaying that from which water is to be drawn.

F. Protect water supply wells to prevent tampering and introducing foreign matter. Retain temporary well cap until installation is complete.

END OF SECTION 0267

SECTION 02720 - STORM SEWAGE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of storm sewage systems work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to Division-2 section "Earthwork" for excavation and back- fill required for storm sewage systems; not work of this section.

C. Refer to Division-3 sections for concrete work required for storm sewage systems; not work of this section.

D. Refer to Division-15 section "Storm Water Systems" for interior building systems including conductors, horizontal branches, and connections to roof and deck drains; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm sewage work similar to that required for project.

C. Codes and Standards:

1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.

2. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewage system materials and products.

B. Shop Drawings: Submit shop drawings for storm sewage systems, showing piping materials, size, locations, and inverts. Include details of underground structures,

C. Connections, and manholes. Show interface and spatial relationship between piping and proximate structures.

D. Record Drawings: At project closeout, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Division 1.

E. Maintenance Data: Submit maintenance data and parts lists for storm sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.01 IDENTIFICATION

A. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

1. Available Manufacturers: as approved by Hillsborough County Public Utilities Department Approved Materials List, latest edition.

2.02 PIPES AND PIPE FITTINGS

A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same materials and weight/class as pipes, with joining method as indicated.

B. Reinforced Concrete Pipe: ASTM C 76, Class III unless otherwise indicated.

1. Fittings: Reinforced concrete, same strength as adjoining pipe, tongue-and-groove gasketed joints complying with ASTM C 443.

C. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D 3033, Type PSM, SDR 35.

1. Fittings: PVC, ASTM D 3033 or D 3034, solvent cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2564; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.

D. Polyethylene Pipe: ASTM 3350 (ADS N-12 Series 35 Corrugated or approved equal) meeting AASHTO M 252, M 294-97 or M P7-97.

1. Fittings: ASTM F477, ASTM D 1149 (Series 35 Fittings) Watertight joints, install in accordance with ASTM D 2321 and manufacturer's recommendations.

2.03 STORM SEWER MANHOLES

A. General: Provide precast reinforced concrete storm sewer man-holes as indicated, complying with ASTM C 478.

1. Top: Precast concrete, of concentric cone, eccentric cone, or flat slab top type, as indicated.
2. Base: Precast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated.

3. Steps: Ductile-iron or aluminum, integrally cast into manhole sidewalls.

4. Frame and Cover: Ductile-iron, heavy-duty, indented top design, with lettering cast into top reading "STORM” or “STORM SEWER", diameter as indicated.

5. Pipe Connectors: Resilient, complying with ASTM C 923.

2.04 CATCH BASINS

A. General: Provide catch basins as indicated.

B. Precast Reinforced Concrete: Size as indicated, flat slab top, base riser section with integral floor.

1. Steps: Not applicable

2. Frame and Grate: Ductile-iron, flat grate, heavy-duty, size as indicated.

3. Pipe Construction: Resilient, complying with ASTM C923.

C. Polyethylene Basins: Size as indicated. 8" through 24" diameter drain basins.

1. Grate: 8" through 24" diameter, H-20 DOT rated (cast iron available).

2. Pipe Construction: ADS N-12 Series 35 or approved, dual walled, smooth interior equal.

2.05 OUTFALLS

A. General: Construct of cast-in-place concrete as indicated. Provide rip-rap as indicated to prevent washout of outfall discharge.

2.06 TRENCH DRAIN SYSTEM - Not applicable

2.07 CLEANOUTS

A. General: Provide as indicated, pipe extension to grade with ferrule and countersunk cleanout plug. Provide round cast-iron access frame over cleanout, with heavy-duty secured scoriated cover with lifting device for pavement areas. Provide concrete pad where specified.

PART 3 - EXECUTION

3.01 INSTALLATION OF IDENTIFICATION

A. General: During back-filling/top-soiling of storm sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.02 INSTALLATION OF PIPE AND PIPE FITTINGS

A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B . Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.

D. Place bell ends or groove ends of piping facing upstream.

E. Install gaskets in accordance with manufacturer's recommendation for use of lubricants, cements, and other special installation requirements.

F. Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".

G. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

H. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

3. Flush lines between manholes if required to remove collected debris.

I. Joint Adaptors: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purposes.

J. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 8" thick brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.

K. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2' of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and reinspect.

3.03 TRENCH DRAIN SYSTEM - Not applicable

3.04 TAP CONNECTIONS - Not applicable

3.05 BACKFILLING

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

1. To minimize local area traffic interruptions, allow no more than 100' between pipe laying and point of complete backfilling.

3.06 FIELD QUALITY CONTROL

A. Testing: Perform visual testing of completed piping only. All pipes shall be cleaned by flushing with water prior to testing. A high velocity jet or other methods may be necessary. Visual testing by lamping shall be performed to verify accuracy of alignment, pipe deflection and freedom from debris and obstruction. The full diameter of the pipe should be visible when viewed between consecutive structures. Any failed pipe section locations shall be reported to the Engineer. Failed pipe sections shall be repaired or replaced and retested until within specified allowances as directed by the Engineer.

END OF SECTION 02720

SECTION 02730 - SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of sanitary sewage systems work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to Division-2 section "Earthwork" for excavation and backfill required for sanitary sewage systems; not work of this section.

C. Refer to Division-3 sections for concrete work required for sanitary sewage systems; not work of this section.

D. Refer to Division-15 section "Soil and Waste Systems" for interior building systems including drain, waste and vent piping; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for project.

C. Codes and Standards: Comply with all local codes and standards of the regulatory agency having jurisdiction for selection and installation of sanitary sewage system materials and products.

D. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary sewage system materials and products.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for sewage system materials and products.

B. Shop Drawings: Submit shop drawings for sanitary sewage systems, showing piping materials, size, locations, and inverts. Include details of underground structures, connections, and manholes. Show interface and spatial relationship between piping and proximate structures.

C. Record Drawings: At project closeout, submit record drawings of installed sanitary sewage piping and products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for sanitary sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.01 IDENTIFICATION:

A. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

1. Available Manufacturers: as approved by Hillsborough County Public Utilities Department Approved Materials List, latest edition.

2.02 PIPES AND PIPE FITTINGS

A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

B. Polyvinyl Chloride (PVC) Gravity Sewer Pipe: ASTM D 3033, Type SDR 26.

1. Fittings: PVC, ASTM D 3033 or ASTM D 3034, solvent-cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2564; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.

C. Polyvinyl Chloride (PVC) Force Main Pipe: ASTM 2241, SDR 21 for sizes 4" through 12".

1. Fittings: Ductile-iron (DI) mechanical joint complying with AWWA C110 and ANSI Standard A21.10 and A21.4, cement lined, with rubber gaskets conforming to AWWA C111.

D. Polyvinyl Chloride (PVC) Force Main Pipe: ASTM D 1785, Schedule 80 for sizes ½" thru 3".

1. Fittings: PVC, Schedule 80 socket-type, solvent cement joints; or elastomeric gasketed joints.

2.03 SANITARY SEWER MANHOLES - Not applicable

2.04 CLEANOUTS

A. General: Provide as indicated, pipe extension to grade with ferrule and countersunk cleanout plug. Provide round cast-iron access frame over cleanout, with heavy-duty secured scoriated cover with lifting device for pavement areas. Provide concrete pad where specified.

PART 3 - EXECUTION

3.01 INSTALLATION OF IDENTIFICATION

A. General: During back-filling/top-soiling of sanitary sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.02 INSTALLATION OF PIPE AND PIPE FITTINGS

A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.

D. Place bell ends or groove ends of piping facing upstream.

E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

F. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

G. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

2. Flush lines between manholes if required to remove collected debris.

H. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

I. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 8" thick brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.

J. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2' of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and reinspect.

3.03 SANITARY MANHOLES – Not Applicable

3.04 TAP CONNECTIONS

A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

B. Use commercially manufactured wyes for branch connections. Field cutting into piping will not be permitted. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3000 psi 28-day compressive strength concrete.

C. Drop manhole connections shall be provided for any gravity mains entering at a vertical distance of 2.0 feet or more above the outgoing channel invert.

D. In cases where the vertical distance between manhole inverts is less than 2.0 feet, a drop pipe is not required, but a channel shall be constructed to guide the flow into the outgoing channel. The bottom flow channel in the manhole base shall be formed of 4,000 psi 28-day compressive strength concrete. Cut off pipes at inside face of the manhole. Changes of direction in the flow channel shall be laid out in a smooth curve of the longest possible radius which is tangent to the centerlines of adjoining pipelines.

3.05 BACKFILLING

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.06 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction. All pipes shall be cleaned by flushing with water prior to testing. A high velocity jet or other methods may be necessary.

1. Visual testing of gravity lines shall be performed by lamping to verify accuracy of alignment, pipe deflection and freedom from debris and obstruction. The full diameter of the pipe should be visible when viewed between consecutive manholes. Any failed pipe section locations shall be reported to the Engineer. Failed pipe sections shall be repaired or replaced and retested until within specified allowances as directed by the Engineer.

2. Exfiltration or leakage testing of gravity lines shall be performed by bulkheading the sewer under test at the manhole at the lowest end and filling the sewer with clear water until the water is up a minimum of two feet above the cleanout at the highest point in the system, or to the crown of the manhole at the highest point in the system. Leakage will be the measured amount of water added to maintain the level in the highest end structure. Tests shall be carried on a minimum of four hours with readings at 30-minute intervals. The quantity of leakage for any section of the sewer shall not exceed 50 gallons/mile of pipe/day/inch pipe diameter.

3. Infiltration testing of gravity lines shall be performed when the groundwater level is a minimum of two feet above the crown of the sewer at the highest point in the test section. Infiltration tests will be made by measuring the infiltrated amount of water at a temporary bulkhead set up in the last invert of the sewer system. The bulkhead shall be pulled and the infiltrated water collected and measured. Tests shall be carried on a minimum of four hours. The quantity of infiltrated water for any section of the sewer shall not exceed 50 gallons/mile of pipe/day/inch pipe diameter.

4. Exfiltration or leakage testing of force mains shall be tested in accordance with Section 4 of AWWA C600 latest edition. The force main shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing and not less than 1.25 times the working pressure at the highest point along the test section. Leakage is defined as the quantity of water that must be supplied into

the newly laid pipeline, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipeline has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time. No pipeline installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SDP^{1/2}}{133200}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, (feet)

D = nominal diameter of pipe, (inches)

P = average test pressure during test, (psig)

5. Visible Leakage: All visible leaks shall be repaired regardless of the amount of leakage.

6. Acceptance of Installation: If any test of pipe laid in place discloses leakage greater than that specified, the Contractor shall, at his own expense, locate the leak and make repairs as necessary until the leakage is within the specified allowance. Contractor shall supply all water for testing at no additional cost to the owner.

7. Provide one copy of results of the tests to the Engineer and utility company upon completion of backfilling operations.

END OF SECTION 02730

SECTION 02731 - SANITARY SEWAGE PUMP STATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

1. The work included under this section consists of furnishing and installing a submersible wastewater pumping station consisting of submersible pumps, controls, hatch covers, fast-out assemblies, guide rails, liquid level controls, control panel, electrical connections, meter base, wet well, valve box, and all necessary appurtenances, as shown on the drawings and specified herein, complete and ready for operation.

1.02 SUBMITTALS

A. Pump Submittals: The Contractor shall provide six sets of shop drawings prepared by the manufacturer and submitted to the Design Engineer for review prior to the manufacture of the equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, curves showing complete pump performance from shutoff to at least 15 percent below rated head conditions, brake horsepower and NPSH required, and a copy of the manufacturer's warranty shall be included.

B. Manuals: Operating, maintenance, and repair manuals (4 copies) for all major equipment and items shall be submitted to the Design Engineer prior to acceptance.

C. Shop Drawing and Certifications:

1. Manholes - showing all details of construction along notarized certificates of manufacture stating conformance to all applicable standards and specifications.

2. Access Covers.

3. Control panels - layout, schematic, parts list and electrical requirements. Electrical requirements to be coordinated with Design Engineer through certification letter or other means.

4. Wall sleeves and link seal.

5. Notarized certificates of manufacture for PVC and DIP stating conformance to applicable standards and specifications, along with recent control test data, and identification of pipe classes.

6. List of subcontractors, material manufacturers, and suppliers.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for project.

C. Codes and Standards: Comply with all local codes and standards of the regulatory agency having jurisdiction for selection and installation of sanitary sewage system materials and products.

D. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary sewage system materials and products.

1.04 GUARANTEE

A. All equipment shall be guaranteed against defects in material and workmanship for a period of one year from the date of Owner's final inspection and acceptance, to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

1.05 SPARE PARTS

A. Spare parts for routine maintenance and repair as recommended by the equipment manufacturer shall be provided by the Contractor.

PART 2 - PRODUCTS

2.01 SUBMERSIBLE PUMPS

A. General: The pump shall be as follows or an approved equal:

1. Manufacturer and Model Number EBARA 32DGU61.5

2. Pump Size 1-1/4 discharge

3. Capacity (GPM)20.6 GPM

4. Total Head (Feet)29.4 Feet

5. Impeller Size or Number 3-3/4 DIAMETER (97mm)

6. Motor H.P. Required 5 H.P.

7. Speed (RPM)3800 RPM

8. Motor Electrical Requirements 230 Volts, THREE Phase

B. Pump Design: Each Pump shall be designed with a close coupled electric motor which permits continuous operation with the pump totally submerged, and capable of operating with the motor completely above the pumped media liquid level.

C. Construction: All major parts, such as the pump casing, seal housing, motor housing, motor and cap, sliding bracket, and impeller, shall be of gray iron and shall be painted with red primer and finished with an epoxy acrylic paint. All nuts, bolts, and miscellaneous hardware in contact with pumped material shall be stainless steel (Type 316). All other construction standards shall be in accordance with the governmental agency having jurisdiction.

D. Impeller: The impeller shall be capable of handling solids, fibrous material, heavy sludge and other matter found in normal sewage applications. The impeller shall be statically and dynamically balanced.

E. Motor: The electric motor shall be NEMA Design B with Class F insulation, and designed for continuous duty. The cable entry seal design shall be such to insure a watertight and submersible installation. Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be sized to allow motor voltage conversion without replacing the cable.

F. Protective devices: If required by the manufacturer for pump warranty, each motor shall incorporate an ambient temperature compensated overheated sensing device and a moisture sensing device wired in series. The protective devices shall be wired into the pump controls in such a way that if either device operates, the pump will shut down.

2.02 LIQUID LEVEL CONTROLS

A. Liquid level sensors with electrical cables (of the proper lengths) shall be provided to control the pumps based upon the control level elevations as shown on the drawings.

B. The liquid level sensors shall meet the standards of the governmental agency having jurisdiction.

PART 3 - EXECUTION

3.01 PUMP STATION INSTALLATION

A. Installation: Install pump station and all appurtenances according to the pump station manufacturer’s published instruction in the location as shown on the Drawings.

3.02 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed lift station in accordance with local authorities having jurisdiction. Initial start up shall be performed by a qualified representative of the pump manufacturer/supplier. It shall be the responsibility of the representative to supervise the startup and instruct the Owner in the proper operation and maintenance procedures for the entire pump station.

END OF SECTION 02731

SECTION 02810 – UNDERGROUND IRRIGATION SYSTEM

PART 1 - GENERAL

1.1. CONTRACT PROVISIONS

A. The Subcontractor shall furnish all materials, supplies, tools, labor, transportation, and equipment required to complete the work of installing the irrigation system, including the warranty, in accordance with the Contract Documents.

B. All materials, installation methods, and design criteria provided by the Subcontractor shall be in strict accordance with the current "Uniform Plumbing Code", "Uniform Mechanical code", state statutes and prevailing county and/ or municipal ordinances.

C. The Subcontractor shall not willfully install the irrigation system as specified in the Contract documents when it is obvious in the field that there are obstructions, grade differences and/ or discrepancies in area dimensions or specifications that are not accounted for on the Plans. The Subcontractor shall not proceed until such conditions are brought to the attention of the Landscape Architect and Contractor.

D. Any and all substitutions, changes, additions or deletions to the Contract Documents shall be expressly approved by the Owner through written addendum and copies created by the Contractor and / or Landscape Architect.

E. Overhead, underground and surface utilities, structures and vegetation are in the area of the work and must be protected against damage during the progress of the work. The Subcontractor shall be held responsible and liable for any damages incurred resulting from his negligence.

F. The subcontractor shall be responsible and liable for the protection and safety against injury of property and persons on or about the project site during the term of his work. The Subcontractor shall provide a properly maintain necessary warning signs and lights, barricades, railings and other safeguards. The Subcontractor shall conform with the current “Occupational Safety and Compensation, vehicle and occupational liability insurance.

G. The Subcontractor shall visit the project site to examine such conditions as soils, vegetation, utilities, structures, water supply, etc., as they will influence the work pursuant to bid submission and/ or contract execution.

H. It shall be the responsibility of the Subcontractor to determine and acquire any and all permits and licenses required relevant to the irrigation contract and to assume the cost for such. Inspections required by local ordinances during the course of construction shall be arranged by the contractor as required. On completion of the work, satisfactory evidence shall be furnished to the Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

I. The Subcontractor shall include in his bid all costs (excluding deposits) for utility connections, unless otherwise specifically stated in the bid proposal and Contract Documents.

1.2. RELATED DOCUMENTS

A. All provisions of Contract, including General and Special Provisions and Irrigation Drawings, apply to work specified in this Section.

1.3. SUBMITTALS

A. Submit to the Landscape Architect samples, manufacturers' technical data, and installation instructions for all components of the underground sprinkler system if different from the materials specified on the Drawings.

B. Prior to Final Acceptance, the Subcontractor shall furnish the Contractor with a record drawings of "as-built" conditions to be submitted in a digital format (PDF) at the same scale as the original irrigation plan document. All change orders and field changes shall be shown. All remote control and isolation valves shall be dimensioned from two permanent points of reference. Record drawings shall include:

1. Location of water supply (water meter or effluent).
2. Tie-in and General Contractor furnished electrical service and disconnects.
3. Location of gate and zone valve controller and other control equipment.
4. Routing and sizing of all sprinkler pipe.
5. Location and type of all sprinkler heads.
6. Routing of zone control valve electrical wiring.

C. The Subcontractor shall provide as part of this contract the following tools:

1. Two (2) sets of special tools required for adjusting, cleaning or disassembling each type of sprinkler and valve supplied on this project.
2. Two (2) sets of keys for each controller.
3. Two (2) quick coupler keys with matching hose swivels.
4. Two (2) valve keys for the operation of the isolation valves.

D. Two operation/service manuals covering all major equipment used on this project shall be furnished to the Landscape Architect for approval. Manuals will be hard cover, three ring binders and include the following information:

1. Catalog sheets and exploded views of equipment, including part numbers.
2. Operation and maintenance instructions for all equipment.
3. Listing of major equipment with names, addresses, and phone numbers of local-manufacturer's representatives.
4. Warranty information on all major equipment.

E. The Contractor shall confirm that the proposed pump for the irrigation system will meet the specified operating parameters for flow, pressure, and water quality. Any adjustments to the pump size and/ or increase in well depth required shall be reviewed and approved prior to ordering and/ or installation of the proposed equipment.

1.4. DEFINITIONS AND ABBREVIATIONS

A. The definitions and abbreviations given here below shall be considered a part of these specifications and shall apply to the interpretation and execution thereof.

1. Owner: shall refer to Hillsborough County Fire Rescue.

2. Landscape Architect: shall refer to Hardeman Kempton and Associates, Inc.

3. Contractor: shall refer to the General Contractor providing construction of this proposed facility.

4. Subcontractor: shall refer to the Landscape / Irrigation contractor who has a direct contract with the General Contractor to perform a portion of the Work at the site.

5. Project: The project as referenced herein shall be that tract of real property where the irrigation system is to be installed.

6. P.S.I.: Static water pressure shall be given as pounds per square inch, abbreviated P.S.I., and where one (1) P.S.I. shall equal 2.31 feet of head.

7. G.P.M.: Volume of water shall be given as gallons per minute abbreviated G.P.M.

8. Zone: A zone shall be defined as a group of heads operating at the same time downstream under a common control valve. A zone shall be derived as further described hereinafter on the basis of available water pressure and volume and physical location/ orientation.

9. P.V.C.: P.V.C. shall denote the abbreviation for polyvinyl chloride material used in the manufacture of pipe and fittings as further specified hereinafter.

10. Contract Documents: For the purposes of bid submission, contract agreement, and execution of the work, the contract documents shall be binding upon all parties and shall include but not be limited to applicable plans, details, schedules, specifications and bidder instructions.

11. Equivalency: Relevant to manufacturer product lines specified herein, equivalents shall be of like type, manufacture, design, materials, operation and performance. They shall be approved by the Landscape Architect.

12. The Plans: Irrigation Design and/ or specifications provided by the Owner of Landscape Architect. In the event of conflict between the plans and the written specifications, the plans shall prevail.

13. P.O.C.: Water source(s) for this irrigation system shall be referred to as the point of connection abbreviated P.O.C.

14. A.S.T.M.: Abbreviation for the American Society for Testing Materials.

15. A.W.W.A.: Abbreviation for the American Water Works Association.

PART 2 - PRODUCTS

2.1. MATERIALS

A. All major equipment has been specified and listed on the drawings. Materials not named shall be subject to approval or rejection by the Landscape Architect. All material shall be of new stock and best grade of its kind. It shall be as specified unless otherwise specifically approved by the Landscape Architect. In all cases, workmanship and material shall conform to or exceed the requirements and codes of the municipalities having jurisdiction on the project.

2.2. PVC PIPE

A. General: Plastic pipe shall be rigid, high impact, Type I, unplasticized polyvinyl chloride extruded from virgin parent material, mainline piping shall be SCH 40 PVC and lateral line piping shall be class 160 PVC unless otherwise required by local governing code. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles or dents. All plastic pipe shall be continuously and permanently marked with:

1. Manufacturer's name.
2. Nominal pipe size.
3. Pressure rating
4. NSF approval
5. Schedule or class
6. Date of extrusion

2.3. PIPE FITTINGS AND CONNECTORS

A. Main Line Fittings: Plastic pipe fittings to be installed shall be Schedule 40 injection molded from virgin Type I high impact unplasticized rigid Polyvinyl chloride (P.V.C.) molding compound, unless otherwise specified on the plans.

B. Lateral Line Fittings: Plastic pipe fittings to be installed shall be Schedule 40 injection molded from virgin Type I high impact unplasticized rigid Polyvinyl Chloride (P.V.C.) molding compound, unless otherwise specified on the plans.

C. Threaded PVC Nipples: Shall be Schedule 80 PVC.

D. Shrub Head Risers: Risers for shrub spray heads are to be Schedule 40 PVC pipe, unless otherwise specified on the plans.

E. ½" Sprinkler Head Connectors: Shall be an 18 inch long flexible connection, Rain Bird SP-100 Flex Pipe or equal. Unless otherwise specified on the plans.

F. 3/4" Sprinkler Head Connectors: Shall be an 18 inch long flexible connection, Rain Bird SP-100 Flex Pipe or equal. Unless otherwise specified on the plans.

G. 1" Sprinkler Head Connectors: Shall be a three elbow swing joint made from PVC SCH 40 Marlex elbows and PVC SCH 80 Nipples, unless otherwise specified on the plans.

2.4. SOLVENT CEMENT

A. Provide solvent cement and primer for PVC solvent weld pipe and fittings as recommended by the pipe and fitting manufacturer.

2.5. VALVES

A. Electric Control Valves: Globe configuration valves operated by low-power (24 volt) solenoid, normally closed, manual flow adjustment and 200 PSI working controller with respect to the type of control, voltage, amperage and "normal" sequence positioning. Control valves shall be Rainbird PGA Series.

B. Isolation Gate Valves: Gate Valves shall be iron body with resilient wedge, equipped with a square operating nut, Matco 10RT or approved equal.

C. Quick Coupling Valve: Brass, 2 piece construction, with locking rubber cover. Rain Bird #33DLRC.

2.6. VALVE BOXES

A. General: Tapered rib reinforced enclosures manufactured from structural foam, chemically inert and resistant to moisture, ultraviolet light, corrosion and temperature changes. Lids shall be of same material and green in color.

B. Control Valves: Carson 1419B-12.

C. Gate Valves: Carson 910-12.

D. Wire Splices: Carson 910-12.

E. Drip Valve Assemblies: Carson 1324B-12L.

2.7. SPRINKLER HEADS

A. General: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray shown on drawings at available water pressure.

B. ½" Inlet Pop-up Spray Head: Removable nozzle with fixed or adjustable spray pattern, with screw-type flow adjustment and stainless steel retraction spring. Rain Bird 1806 / Rain Bird 1812.

C. 3/4" Inlet Pop-up Rotor Head: Gear driven, full circle and adjustable part circle. Hunter PGP / Hunter PGJ.

2.8. DRIP TUBING

A. Heavy wall flexible tube with one (1) GPH pressure compensating emitters factor installed at 12 inch spacing. Netafim TLDL9-12.

2.9. AUTOMATIC CONTROLLER

A. Automatic controller shall be of the size and type as shown on the drawing. Controller shall be capable of "water budgeting each program and shall be compatible with a "rain shut off" device. Install a Rain Bird ESP-4M (exterior model) or approved equivalent.

2.10. AUTOMATIC RAIN SHUT OFF DEVICE

A. Hunter 'Wireless' Rain-Clik.

2.11. 110 VOLT SURGE PROTECTION

A. Advanced Protection #TE-110-JR.

2.12. SLEEVES AND CONDUIT

A. Sleeves shall be PVC SCH 40 or cast iron pipe of adequate diameter to accommodate the pipe(s) or wire(s) with sufficient free play to allow removal and reinstallation without binding. Minimum sleeve size shall be 2".

2.13. CONTROL WIRING

A. Shall be direct burial, single strand, size AWG 12/ 14 as specified, UL Listed, type U.F., 600 volt wire. Use red for pilot (hot) wire and white for common wire. Use blue for spare wires.

2.14. WATER SOURCE

A. Irrigation well: Drill one well and install a Goulds 33GS15 Series, 1.5 HP (or approved equivalent) submersible pump. Design output of 30 GPM @ 60 PSI is required.

B. Electrical: 208 volt/ 3 PHASE power required for well installation. Coordinate with electrical engineer.

C. Reference Specification Section 02670 Irrigation Well and Irrigation well detail on sheet IR1..

PART 3 – EXECUTION

3.1. SYSTEM DESIGN

A. The drawings are generally diagrammatic. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings and sleeves which may be required. The Subcontractor shall carefully investigate the structural and finished conditions affecting all of the work and plan his work accordingly.

B. The location of heads are approximate. Make minor adjustments as necessary to avoid plantings and other obstructions and to obtain covers. In no case shall head spacing exceed a distance equal to 60% of the manufacturer's effective diameter rating if the sprinklers are placed in a square of rectangular pattern nor 70% if in an equilateral triangular pattern. Irrigation shall provide 100% coverage with "head-to-head" spacing.

C. The Subcontractor shall comply with pipe sizes indicated on the drawings. No substitutions of smaller pipes will be permitted. Maximum water velocity shall not exceed 5.0 feet per second in the main line and 6.0 feet per second in the lateral lines.

3.2 PIPE INSTALLATION

A. Trenching:

1. Trenches shall be dug straight. Trench bottoms shall be at true gradient providing support to pipe through its entire length. Trench bottoms shall be free from rocks, clods, debris, and sharp-edged objects. The minimum depth of lines measured to top of pipe, unless otherwise indicated on plans, shall be as stated herein.

   a. Main lines and quick coupler lines shall be 24 inches.
   b. Lateral sprinkler lines shall be 12 inches.
   c. Provide minimum cover of 18 inches for all control wiring.
   d. Drip tubing shall be installed at grade and covered with mulch.

2. All trenching or other work under the limb spread of any and all plants shall be done by the Subcontractor by hand or by other methods so that no limbs or branches are damaged in any way.

B. Sleeves and Conduit:

1. All pipe and wiring routed under areas to be paved shall be placed in separate sleeves extending twelve (12) inches beyond the edges of the pavement. Sleeves have been provided by the General Contractor. Refer to the plans for sleeve locations.

3.3 PIPING:

A. Storage and Transportation: Pipe shall be handled and stored in a manner to prevent damage. The plastic pipe and fittings shall be stored under cover, and shall transported in a vehicle with a bed long enough to allow the length of pipe to lie flat so as not to be subject to undue bending or concentrated external load at any point. Any plastic pipe that has been dented or damaged shall not be used.

B. Cleaning Requirement: Clean interior of pipe thoroughly and remove all dirt or foreign matter before lowering pipe into trench. Keep pipe clean during operations by plugs or other approved methods. All offsets shall be made with fittings. All water lines shall be thoroughly flushed out before valves or sprinkler heads are installed.

C. Install P.V.C. pipe in dry weather when temperature is above 40°F in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours at temperature above 40°F before testing, unless otherwise recommended by manufacturer.

D. All P.V.C. pipe and fittings shall be installed by the Subcontractor as recommended by the pipe manufacturer. The Subcontractor shall assume full responsibility for the correct installation.

E. Pipe Joints, in general, shall be formed by competent tradesmen specifically trained in the type of work required and using tools and equipment recommended by the manu-

facturers of the pipe, fittings and equipment.

3.4 THRUST BLOCKING

A. All main line shall have thrust blocks at all tees, bends, changes in size or at the end of pipe lines, as specified in the plans. All wires shall be kept free from concrete by the Subcontractor and placed outside of the thrust block. Thrust blocks shall be poured against undisturbed ground. No precast thrust blocks will be allowed.

3.5 FITTINGS

A. Solvent Welded P.V.C. Fittings: Install as per manufacturer's recommendations. B.

Ductile Iron Gasket Joint Fittings: Install as per manufacturer's recommendations.

C. Galvanized Steel Pipe and Fittings: Threads shall be sound, clean cut, and well fitting. threaded joints shall be made up with the best quality pure joint compound or lead paste, carefully and smoothly placed on the male threads only, throughout the system. Any leaky joints shall be remade with new material. Use of thread cement or caulking to make joints tight will not be permitted. All cut ends shall be remade to full bore before assembly.

D. Plastic to Steel Connections: Male thread plastic to female thread steel shall be used. The same shall apply to plastic and brass or other metal. In no case shall metal be screwed into a plastic fitting. A non-hardening pipe dope such as "Permatex No. 2" or equal, shall be used on threaded plastic to metal joints, and only light wrench pressure should be used.

3.6 WIRING

A. Wiring shall occupy pipe trenches whenever possible. Lay the wire(s) along the bottom of the pipe. Where more than one (1) wire is placed in a trench, all wires shall be taped together at intervals of twenty (20) feet.

B. An expansion curl shall be provided within three (3) feet of each wire connection and at least every two hundred (200) feet in length. Expansion curls shall be formed by wrapping at least twelve (12) turns of wire around a pipe 1" (or more) in diameter, then withdrawing pipe.

C. All splices shall be made with King Technology (King 6) silicone-filled safety connectors. All wire splices must be enclosed in a valve box for easy inspection and servicing.

D. All control wiring routed beneath or through pavement, walks, curbs and/ or other structural elements shall be run through P.V.C. SCH 40 conduit of sufficient diameter for wire pulling.

E. Install two (2) spare wires from each controller to the furthest valve in each direction from that controller. A pair of spare wires should pass every valve box on the system. Leave a "pig-tail" loop with thirty-six (36) inches of excess spare wire in every valve box.

F. Where multiple valves are to be connected to a single controller station, a separate hot wire should be installed from the controller to each valve. Multiple valves tied to a

single hot wire will be accepted.

3.7 BACKFILLING

A. Backfill material shall be approved soil, free from large rocks (over 1 inch in size), debris or sharp objects. In general, the material removed from excavation may be used. All excavated rocky material shall be removed from the site and suitable fill material, approved by the Landscape Architect, obtained for backfill.

B. Backfilling shall be done when pipe is not in an expanded or contracted condition due to temperature extremes. Cooling of the pipe can be accomplished by operation of the system for a short time before backfill, or by backfilling in the early part of the morning before the heat of the day.

C. Long runs of P.V.C. pipe shall be snaked in the trench to allow for contraction.

D. Backfill shall follow excavation with the least possible delay. Open trenches shall be adequately protected to cause the least possible hazard to an interference with people and animals.

E. The Subcontractor shall hand place the first six (6) inches of backfill (or to the top of pipe) and have it compacted so as to secure the position of the pipe and wire. Backfill shall be compacted by tamping while soil is moist (not wet). The operation shall be repeated until finished grade of back filled trenches matches that of adjacent soil.

3.9. ELECTRIC CONTROL VALVES

A. Adjust the flow control on all electric control valves to limit the down stream pressure to the recommended operating pressure for the sprinkler/ nozzle combination used on each zone.

B. Whenever possible, locate valves in plant bed areas for best concealment and accessibility.

C. Valves are to be large enough to accommodate maintenance and operations of valves. Provide a three (3) inch deep sump of one-half (½) inch diameter gravel at bottom of valve pit.

3.10. SPRINKLER HEADS

A. Sprinkler heads shall be installed in a plumb position at intervals not to exceed the maximum spacings specified by the manufacturer for project conditions, or as indicated on the drawings.

B. Heads in turf areas shall be installed six (6) inch maximum away from the edge of the curb or walk. All heads shall be installed on flexible connectors or swing joints and shall allow for vertical adjustment of heads. Four (4) inch pop-up spray heads or pop-up rotors (where appropriate) shall be used in turf areas.

C. Where pop-up spray or rotor heads are installed in low ground cover areas, including mass plantings of dwarf shrubs (not exceeding sixteen (16) inches in height at maturity), use twelve (12) inch pop-up heads installed with the top of the sprinkler head six (6) inches above grade.

D. Where pop-up spray or rotor heads are installed in tall shrubs, hedges or mass plantings of large shrubs (exceeding sixteen (16) inches in height at maturity), use four (4) inch pop-ups heads installed above grade with the top of the sprinkler head flush with the surrounding plant material. Install on P.V.C. SCH 40 risers. Support all risers with a #5 rebar stake (from base of sprinkler to eighteen (18) inches below grade) fastened with nylon cable tires. All risers and other above ground piping and fixtures shall be painted with a permanent flat brown enamel paint.

E. Pop-up heads adjacent to vehicle pavement that is not curbed shall be installed with concrete donut protectors set flush with the top of the heads. Heads installed adjacent to pedestrian curbs or walks shall be installed six (6) inches away from the curb or walk. Where adjacent to buildings, fences or similar structures, heads shall be installed six (6) inches away from the structure.

3.11. AUTOMATIC CONTROLLER

A. Unless otherwise noted on the plan, the 120 volt electrical power to the automatic controller location to be furnished by others. The irrigation contractor shall make all connections in the low-voltage system between the automatic controller and the valves.

B. Each controller shall be properly grounded with the use of one or more 5/8" x 8" copper clad ground rods and AWG #6 bare copper wire. The resistance from the ground rod to earth shall be ten (10) ohms or less. Install a 110 volt, TE-110-JR surge protector per manufacturer's recommendations.

C. Install a Hunter Wireless Rain Clik rain shut device per manufacturer's recommendations. Provide adequate clearance from overhangs, trees, etc. to allow for proper operation.

3.12. PUMP/ WELL

A. All permits shall be obtained by the pump/ well Contractor prior to installation. Refer to Plans for layout and specifications. Coordinate electrical connections as required.

B. For the irrigation system the well contractor shall discuss the anticipated well depth and water quality with the Landscape Architect. The potential for well water high in iron content that results in staining must be prevented. Any adjustments to the well depth, increased pump horsepower, water filtration or treatment processes (including rust removal devices) may be required by the contractor to meet these requirements and must be addressed prior to ordering/ installation of any material.

3.13. GENERAL

A. In no event shall the Subcontractor cover up or otherwise remove from view any work under the contract without prior approval of the Contractor, Landscape Architect, and / or Owner. Any work covered prior to inspection shall be opened to view by the Subcontractor at his expense. Notify the Landscape Architect and Contractor in writing when testing will be conducted, and conduct tests in presence of the Landscape Architect and Contractor.

B. The entire sprinkler system shall be guaranteed for reasons other than neglect, abuse,

accidental damage, undue weather conditions and/ or any other Acts of God, by the contractor to give complete and satisfactory service as to materials and workmanship for a period of one (1) year from the date of final acceptance of the work by the Owner.

C. Should any trouble develop within the specified guarantee period which in the opinion of the Owner is due to inferior or faulty materials and/ or workmanship, the trouble shall be corrected without delay by the Subcontractor, to the satisfaction of any at no expense to the Owner.

D. Any and all damage to rain water drains, water supply lines, gas lines and/ or other service lines, shall be repaired and made good by the Subcontractor at no extra cost to the Owner. It is the responsibility of the Subcontractor to be aware of the location of all utilities of other permanent or non-permanent installations and to protect these installations from any damage whatsoever.

3.14. LEAKAGE TESTING

A. All Main Lines shall be tested prior to backfill of joints. Slowly fill the main line piping with water, taking care to purge the air from it by operating all of the control valves one or more times and/ or such other means as may be necessary. Allow the pipe to sit full of water for twenty-four (24) hours to dissolve remaining trapped air. Use a metering pump to elevate the water pressure to 100 PSI and hold water for a period of two (2) hours. PVC solvent-weld pipe connections should have no leakage. If the test indicates leaks in the system, locate and repair the leak, then retest the pipeline until it passes the test. Any covered pipe found to leak, shall be excavated and repaired at the Subcontractor's expense.

B. Operational Testing: The entire installation shall be placed in operation by the Subcontractor and tested in the presence of the Owner or the Contractor for proper functioning as a whole. Location and arc of heads shall be adjusted if required to eliminate any dry spots, over-water or spillage on adjacent areas and to prevent over spray onto walks, roadways and buildings as much as possible.

END OF SECTION 02810

SECTION 02810 – UNDERGROUND IRRIGATION SYSTEM

PART 1 - GENERAL

1.1. CONTRACT PROVISIONS

A. The Subcontractor shall furnish all materials, supplies, tools, labor, transportation, and equipment required to complete the work of installing the irrigation system, including the warranty, in accordance with the Contract Documents.

B. All materials, installation methods, and design criteria provided by the Subcontractor shall be in strict accordance with the current "Uniform Plumbing Code", "Uniform Mechanical code", state statutes and prevailing county and/ or municipal ordinances.

C. The Subcontractor shall not willfully install the irrigation system as specified in the Contract documents when it is obvious in the field that there are obstructions, grade differences and/ or discrepancies in area dimensions or specifications that are not accounted for on the Plans. The Subcontractor shall not proceed until such conditions are brought to the attention of the Landscape Architect and Contractor.

D. Any and all substitutions, changes, additions or deletions to the Contract Documents shall be expressly approved by the Owner through written addendum and copies created by the Contractor and / or Landscape Architect.

E. Overhead, underground and surface utilities, structures and vegetation are in the area of the work and must be protected against damage during the progress of the work. The Subcontractor shall be held responsible and liable for any damages incurred resulting from his negligence.

F. The subcontractor shall be responsible and liable for the protection and safety against injury of property and persons on or about the project site during the term of his work. The Subcontractor shall provide a properly maintain necessary warning signs and lights, barricades, railings and other safeguards. The Subcontractor shall conform with the current “Occupational Safety and Compensation, vehicle and occupational liability insurance.

G. The Subcontractor shall visit the project site to examine such conditions as soils, vegetation, utilities, structures, water supply, etc., as they will influence the work pursuant to bid submission and/ or contract execution.

H. It shall be the responsibility of the Subcontractor to determine and acquire any and all permits and licenses required relevant to the irrigation contract and to assume the cost for such. Inspections required by local ordinances during the course of construction shall be arranged by the contractor as required. On completion of the work, satisfactory evidence shall be furnished to the Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

I. The Subcontractor shall include in his bid all costs (excluding deposits) for utility connections, unless otherwise specifically stated in the bid proposal and Contract Documents.

1.2. RELATED DOCUMENTS

A. All provisions of Contract, including General and Special Provisions and Irrigation Drawings, apply to work specified in this Section.

1.3. SUBMITTALS

A. Submit to the Landscape Architect samples, manufacturers' technical data, and installation instructions for all components of the underground sprinkler system if different from the materials specified on the Drawings.

B. Prior to Final Acceptance, the Subcontractor shall furnish the Contractor with a record drawings of "as-built" conditions to be submitted in a digital format (PDF) at the same scale as the original irrigation plan document. All change orders and field changes shall be shown. All remote control and isolation valves shall be dimensioned from two permanent points of reference. Record drawings shall include:

1. Location of water supply (water meter or effluent).
2. Tie-in and General Contractor furnished electrical service and disconnects.
3. Location of gate and zone valve controller and other control equipment.
4. Routing and sizing of all sprinkler pipe.
5. Location and type of all sprinkler heads.
6. Routing of zone control valve electrical wiring.

C. The Subcontractor shall provide as part of this contract the following tools:

1. Two (2) sets of special tools required for adjusting, cleaning or disassembling each type of sprinkler and valve supplied on this project.
2. Two (2) sets of keys for each controller.
3. Two (2) quick coupler keys with matching hose swivels.
4. Two (2) valve keys for the operation of the isolation valves.

D. Two operation/service manuals covering all major equipment used on this project shall be furnished to the Landscape Architect for approval. Manuals will be hard cover, three ring binders and include the following information:

1. Catalog sheets and exploded views of equipment, including part numbers.
2. Operation and maintenance instructions for all equipment.
3. Listing of major equipment with names, addresses, and phone numbers of local-manufacturer's representatives.
4. Warranty information on all major equipment.

E. The Contractor shall confirm that the proposed pump for the irrigation system will meet the specified operating parameters for flow, pressure, and water quality. Any adjustments to the pump size and/ or increase in well depth required shall be reviewed and approved prior to ordering and/ or installation of the proposed equipment.

1.4. DEFINITIONS AND ABBREVIATIONS

A. The definitions and abbreviations given here below shall be considered a part of these specifications and shall apply to the interpretation and execution thereof.

1. Owner: shall refer to Hillsborough County Fire Rescue.

2. Landscape Architect: shall refer to Hardeman Kempton and Associates, Inc.

3. Contractor: shall refer to the General Contractor providing construction of this proposed facility.

4. Subcontractor: shall refer to the Landscape / Irrigation contractor who has a direct contract with the General Contractor to perform a portion of the Work at the site.

5. Project: The project as referenced herein shall be that tract of real property where the irrigation system is to be installed.

6. P.S.I.: Static water pressure shall be given as pounds per square inch, abbreviated P.S.I., and where one (1) P.S.I. shall equal 2.31 feet of head.

7. G.P.M.: Volume of water shall be given as gallons per minute abbreviated G.P.M.

8. Zone: A zone shall be defined as a group of heads operating at the same time downstream under a common control valve. A zone shall be derived as further described hereinafter on the basis of available water pressure and volume and physical location/ orientation.

9. P.V.C.: P.V.C. shall denote the abbreviation for polyvinyl chloride material used in the manufacture of pipe and fittings as further specified hereinafter.

10. Contract Documents: For the purposes of bid submission, contract agreement, and execution of the work, the contract documents shall be binding upon all parties and shall include but not be limited to applicable plans, details, schedules, specifications and bidder instructions.

11. Equivalency: Relevant to manufacturer product lines specified herein, equivalents shall be of like type, manufacture, design, materials, operation and performance. They shall be approved by the Landscape Architect.

12. The Plans: Irrigation Design and/ or specifications provided by the Owner of Landscape Architect. In the event of conflict between the plans and the written specifications, the plans shall prevail.

13. P.O.C.: Water source(s) for this irrigation system shall be referred to as the point of connection abbreviated P.O.C.

14. A.S.T.M.: Abbreviation for the American Society for Testing Materials.

15. A.W.W.A.: Abbreviation for the American Water Works Association.

PART 2 - PRODUCTS

2.1. MATERIALS

A. All major equipment has been specified and listed on the drawings. Materials not named shall be subject to approval or rejection by the Landscape Architect. All material shall be of new stock and best grade of its kind. It shall be as specified unless otherwise specifically approved by the Landscape Architect. In all cases, workmanship and material shall conform to or exceed the requirements and codes of the municipalities having jurisdiction on the project.

2.2. PVC PIPE

A. General: Plastic pipe shall be rigid, high impact, Type I, unplasticized polyvinyl chloride extruded from virgin parent material, mainline piping shall be SCH 40 PVC and lateral line piping shall be class 160 PVC unless otherwise required by local governing code. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles or dents. All plastic pipe shall be continuously and permanently marked with:

1. Manufacturer's name.
2. Nominal pipe size.
3. Pressure rating
4. NSF approval
5. Schedule or class
6. Date of extrusion

2.3. PIPE FITTINGS AND CONNECTORS

A. Main Line Fittings: Plastic pipe fittings to be installed shall be Schedule 40 injection molded from virgin Type I high impact unplasticized rigid Polyvinyl chloride (P.V.C.) molding compound, unless otherwise specified on the plans.

B. Lateral Line Fittings: Plastic pipe fittings to be installed shall be Schedule 40 injection molded from virgin Type I high impact unplasticized rigid Polyvinyl Chloride (P.V.C.) molding compound, unless otherwise specified on the plans.

C. Threaded PVC Nipples: Shall be Schedule 80 PVC.

D. Shrub Head Risers: Risers for shrub spray heads are to be Schedule 40 PVC pipe, unless otherwise specified on the plans.

E. ½" Sprinkler Head Connectors: Shall be an 18 inch long flexible connection, Rain Bird SP-100 Flex Pipe or equal. Unless otherwise specified on the plans.

F. 3/4" Sprinkler Head Connectors: Shall be an 18 inch long flexible connection, Rain Bird SP-100 Flex Pipe or equal. Unless otherwise specified on the plans.

G. 1" Sprinkler Head Connectors: Shall be a three elbow swing joint made from PVC SCH 40 Marlex elbows and PVC SCH 80 Nipples, unless otherwise specified on the plans.

2.4. SOLVENT CEMENT

A. Provide solvent cement and primer for PVC solvent weld pipe and fittings as recommended by the pipe and fitting manufacturer.

2.5. VALVES

A. Electric Control Valves: Globe configuration valves operated by low-power (24 volt) solenoid, normally closed, manual flow adjustment and 200 PSI working controller with respect to the type of control, voltage, amperage and "normal" sequence positioning. Control valves shall be Rainbird PGA Series.

B. Isolation Gate Valves: Gate Valves shall be iron body with resilient wedge, equipped with a square operating nut, Matco 10RT or approved equal.

C. Quick Coupling Valve: Brass, 2 piece construction, with locking rubber cover. Rain Bird #33DLRC.

2.6. VALVE BOXES

A. General: Tapered rib reinforced enclosures manufactured from structural foam, chemically inert and resistant to moisture, ultraviolet light, corrosion and temperature changes. Lids shall be of same material and green in color.

B. Control Valves: Carson 1419B-12.

C. Gate Valves: Carson 910-12.

D. Wire Splices: Carson 910-12.

E. Drip Valve Assemblies: Carson 1324B-12L.

2.7. SPRINKLER HEADS

A. General: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray shown on drawings at available water pressure.

B. ½" Inlet Pop-up Spray Head: Removable nozzle with fixed or adjustable spray pattern, with screw-type flow adjustment and stainless steel retraction spring. Rain Bird 1806 / Rain Bird 1812.

C. 3/4" Inlet Pop-up Rotor Head: Gear driven, full circle and adjustable part circle. Hunter PGP / Hunter PGJ.

2.8. DRIP TUBING

A. Heavy wall flexible tube with one (1) GPH pressure compensating emitters factor installed at 12 inch spacing. Netafim TLDL9-12.

2.9. AUTOMATIC CONTROLLER

A. Automatic controller shall be of the size and type as shown on the drawing. Controller shall be capable of "water budgeting each program and shall be compatible with a "rain shut off" device. Install a Rain Bird ESP-4M (exterior model) or approved equivalent.

2.10. AUTOMATIC RAIN SHUT OFF DEVICE

A. Hunter ‘Wireless’ Rain-Clik.

2.11. 110 VOLT SURGE PROTECTION

A. Advanced Protection #TE-110-JR.

2.12. SLEEVES AND CONDUIT

A. Sleeves shall be PVC SCH 40 or cast iron pipe of adequate diameter to accommodate the pipe(s) or wire(s) with sufficient free play to allow removal and reinstallation without binding. Minimum sleeve size shall be 2".

2.13. CONTROL WIRING

A. Shall be direct burial, single strand, size AWG 12/ 14 as specified, UL Listed, type U.F., 600 volt wire. Use red for pilot (hot) wire and white for common wire. Use blue for spare wires.

2.14. WATER SOURCE

A. Irrigation well: Drill one well and install a Goulds 33GS15 Series, 1.5 HP (or approved equivalent) submersible pump. Design output of 30 GPM @ 60 PSI is required.

B. Electrical: 208 volt/ 3 PHASE power required for well installation. Coordinate with electrical engineer.

C. Reference Specification Section 02670 Irrigation Well and Irrigation well detail on sheet IR1.

PART 3 – EXECUTION

3.1. SYSTEM DESIGN

A. The drawings are generally diagrammatic. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings and sleeves which may be required. The Subcontractor shall carefully investigate the structural and finished conditions affecting all of the work and plan his work accordingly.

B. The location of heads are approximate. Make minor adjustments as necessary to avoid plantings and other obstructions and to obtain covers. In no case shall head spacing exceed a distance equal to 60% of the manufacturer's effective diameter rating if the sprinklers are placed in a square of rectangular pattern nor 70% if in an equilateral triangular pattern. Irrigation shall provide 100% coverage with "head-to-head" spacing.

C. The Subcontractor shall comply with pipe sizes indicated on the drawings. No substitutions of smaller pipes will be permitted. Maximum water velocity shall not exceed 5.0 feet per second in the main line and 6.0 feet per second in the lateral lines.

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A. Trenching:

1. Trenches shall be dug straight. Trench bottoms shall be at true gradient providing support to pipe through its entire length. Trench bottoms shall be free from rocks, clods, debris, and sharp-edged objects. The minimum depth of lines measured to top of pipe, unless otherwise indicated on plans, shall be as stated herein.

   a. Main lines and quick coupler lines shall be 24 inches.
   b. Lateral sprinkler lines shall be 12 inches.
   c. Provide minimum cover of 18 inches for all control wiring.
   d. Drip tubing shall be installed at grade and covered with mulch.

2. All trenching or other work under the limb spread of any and all plants shall be done by the Subcontractor by hand or by other methods so that no limbs or branches are damaged in any way.

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1. All pipe and wiring routed under areas to be paved shall be placed in separate sleeves extending twelve (12) inches beyond the edges of the pavement. Sleeves have been provided by the General Contractor. Refer to the plans for sleeve locations.

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A. Storage and Transportation: Pipe shall be handled and stored in a manner to prevent damage. The plastic pipe and fittings shall be stored under cover, and shall transported in a vehicle with a bed long enough to allow the length of pipe to lie flat so as not to be subject to undue bending or concentrated external load at any point. Any plastic pipe that has been dented or damaged shall not be used.

B. Cleaning Requirement: Clean interior of pipe thoroughly and remove all dirt or foreign matter before lowering pipe into trench. Keep pipe clean during operations by plugs or other approved methods. All offsets shall be made with fittings. All water lines shall be thoroughly flushed out before valves or sprinkler heads are installed.

C. Install P.V.C. pipe in dry weather when temperature is above 40°F in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours at temperature above 40°F before testing, unless otherwise recommended by manufacturer.

D. All P.V.C. pipe and fittings shall be installed by the Subcontractor as recommended by the pipe manufacturer. The Subcontractor shall assume full responsibility for the correct installation.

E. Pipe Joints, in general, shall be formed by competent tradesmen specifically trained in the type of work required and using tools and equipment recommended by the manufacturers of the pipe, fittings and equipment.

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A. All main line shall have thrust blocks at all tees, bends, changes in size or at the end of pipe lines, as specified in the plans. All wires shall be kept free from concrete by the Subcontractor and placed outside of the thrust block. Thrust blocks shall be poured against undisturbed ground. No precast thrust blocks will be allowed.

3.5 FITTINGS

A. Solvent Welded P.V.C. Fittings: Install as per manufacturer’s recommendations.

B. Ductile Iron Gasket Joint Fittings: Install as per manufacturer’s recommendations.

C. Galvanized Steel Pipe and Fittings: Threads shall be sound, clean cut, and well fitting. threaded joints shall be made up with the best quality pure joint compound or lead paste, carefully and smoothly placed on the male threads only, throughout the system. Any leaky joints shall be remade with new material. Use of thread cement or caulking to make joints tight will not be permitted. All cut ends shall be remade to full bore before assembly.

D. Plastic to Steel Connections: Male thread plastic to female thread steel shall be used. The same shall apply to plastic and brass or other metal. In no case shall metal be screwed into a plastic fitting. A non-hardening pipe dope such as "Permatex No. 2" or equal, shall be used on threaded plastic to metal joints, and only light wrench pressure should be used.

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A. Wiring shall occupy pipe trenches whenever possible. Lay the wire(s) along the bottom of the pipe. Where more than one (1) wire is placed in a trench, all wires shall be taped together at intervals of twenty (20) feet.

B. An expansion curl shall be provided within three (3) feet of each wire connection and at least every two hundred (200) feet in length. Expansion curls shall be formed by wrapping at least twelve (12) turns of wire around a pipe 1" (or more) in diameter, then withdrawing pipe.

C. All splices shall be made with King Technology (King 6) silicone-filled safety connectors. All wire splices must be enclosed in a valve box for easy inspection and servicing.

D. All control wiring routed beneath or through pavement, walks, curbs and/ or other structural elements shall be run through P.V.C. SCH 40 conduit of sufficient diameter for wire pulling.

E. Install two (2) spare wires from each controller to the furthest valve in each direction from that controller. A pair of spare wires should pass every valve box on the system.

Leave a “pig-tail” loop with thirty-six (36) inches of excess spare wire in every valve box.

F. Where multiple valves are to be connected to a single controller station, a separate hot wire should be installed from the controller to each valve. Multiple valves tied to a single hot wire will be accepted.

3.7 BACKFILLING

A. Backfill material shall be approved soil, free from large rocks (over 1 inch in size), debris or sharp objects. In general, the material removed from excavation may be used. All excavated rocky material shall be removed from the site and suitable fill material, approved by the Landscape Architect, obtained for backfill.

B. Backfilling shall be done when pipe is not in an expanded or contracted condition due to temperature extremes. Cooling of the pipe can be accomplished by operation of the system for a short time before backfill, or by backfilling in the early part of the morning before the heat of the day.

C. Long runs of P.V.C. pipe shall be snaked in the trench to allow for contraction.

D. Backfill shall follow excavation with the least possible delay. Open trenches shall be adequately protected to cause the least possible hazard to an interference with people and animals.

E. The Subcontractor shall hand place the first six (6) inches of backfill (or to the top of pipe) and have it compacted so as to secure the position of the pipe and wire. Backfill shall be compacted by tamping while soil is moist (not wet). The operation shall be repeated until finished grade of back filled trenches matches that of adjacent soil.

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A. Adjust the flow control on all electric control valves to limit the down stream pressure to the recommended operating pressure for the sprinkler/ nozzle combination used on each zone.

B. Whenever possible, locate valves in plant bed areas for best concealment and accessibility.

C. Valves are to be large enough to accommodate maintenance and operations of valves. Provide a three (3) inch deep sump of one-half (½) inch diameter gravel at bottom of valve pit.

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A. Sprinkler heads shall be installed in a plumb position at intervals not to exceed the maximum spacings specified by the manufacturer for project conditions, or as indicated on the drawings.

B. Heads in turf areas shall be installed six (6) inch maximum away from the edge of the curb or walk. All heads shall be installed on flexible connectors or swing joints and shall

allow for vertical adjustment of heads. Four (4) inch pop-up spray heads or pop-up rotors (where appropriate) shall be used in turf areas.

C. Where pop-up spray or rotor heads are installed in low ground cover areas, including mass plantings of dwarf shrubs (not exceeding sixteen (16) inches in height at maturity), use twelve (12) inch pop-up heads installed with the top of the sprinkler head six (6) inches above grade.

D. Where pop-up spray or rotor heads are installed in tall shrubs, hedges or mass plantings of large shrubs (exceeding sixteen (16) inches in height at maturity), use four (4) inch pop-ups heads installed above grade with the top of the sprinkler head flush with the surrounding plant material. Install on P.V.C. SCH 40 risers. Support all risers with a #5 rebar stake (from base of sprinkler to eighteen (18) inches below grade) fastened with nylon cable tires. All risers and other above ground piping and fixtures shall be painted with a permanent flat brown enamel paint.

E. Pop-up heads adjacent to vehicle pavement that is not curbed shall be installed with concrete donut protectors set flush with the top of the heads. Heads installed adjacent to pedestrian curbs or walks shall be installed six (6) inches away from the curb or walk. Where adjacent to buildings, fences or similar structures, heads shall be installed six (6) inches away from the structure.

3.11. AUTOMATIC CONTROLLER

A. Unless otherwise noted on the plan, the 120 volt electrical power to the automatic controller location to be furnished by others. The irrigation contractor shall make all connections in the low-voltage system between the automatic controller and the valves.

B. Each controller shall be properly grounded with the use of one or more 5/8" x 8" copper clad ground rods and AWG #6 bare copper wire. The resistance from the ground rod to earth shall be ten (10) ohms or less. Install a 110 volt, TE-110-JR surge protector per manufacturer’s recommendations.

C. Install a Hunter Wireless Rain Clik rain shut device per manufacturer’s recommendations. Provide adequate clearance from overhangs, trees, etc. to allow for proper operation.

3.12. PUMP/ WELL

A. All permits shall be obtained by the pump/ well Contractor prior to installation. Refer to Plans for layout and specifications. Coordinate electrical connections as required.

B. For the irrigation system the well contractor shall discuss the anticipated well depth and water quality with the Owner and/ or Landscape Architect. The potential for well water high in iron content that results in staining must be prevented. Any adjustments to the well depth, increased pump horsepower, water filtration or treatment processes (including rust removal devices) may be required by the contractor to meet these requirements and must be addressed prior to ordering/ installation of any material.

3.13. GENERAL

A. In no event shall the Subcontractor cover up or otherwise remove from view any work under the contract without prior approval of the Contractor, Landscape Architect, and / or Owner. Any work covered prior to inspection shall be opened to view by the Subcontractor at his expense. Notify the Landscape Architect and Contractor in writing when testing will be conducted, and conduct tests in presence of the Landscape Architect and Contractor.

B. The entire sprinkler system shall be guaranteed for reasons other than neglect, abuse, accidental damage, undue weather conditions and/ or any other Acts of God, by the contractor to give complete and satisfactory service as to materials and workmanship for a period of one (1) year from the date of final acceptance of the work by the Owner.

C. Should any trouble develop within the specified guarantee period which in the opinion of the Owner is due to inferior or faulty materials and/ or workmanship, the trouble shall be corrected without delay by the Subcontractor, to the satisfaction of any at no expense to the Owner.

D. Any and all damage to rain water drains, water supply lines, gas lines and/ or other service lines, shall be repaired and made good by the Subcontractor at no extra cost to the Owner. It is the responsibility of the Subcontractor to be aware of the location of all utilities of other permanent or non-permanent installations and to protect these installations from any damage whatsoever.

3.14. LEAKAGE TESTING

A. All Main Lines shall be tested prior to backfill of joints. Slowly fill the main line piping with water, taking care to purge the air from it by operating all of the control valves one or more times and/ or such other means as may be necessary. Allow the pipe to sit full of water for twenty-four (24) hours to dissolve remaining trapped air. Use a metering pump to elevate the water pressure to 100 PSI and hold water for a period of two (2) hours. PVC solvent-weld pipe connections should have no leakage. If the test indicates leaks in the system, locate and repair the leak, then retest the pipeline until it passes the test. Any covered pipe found to leak, shall be excavated and repaired at the Subcontractor's expense.

B. Operational Testing: The entire installation shall be placed in operation by the Subcontractor and tested in the presence of the Owner or the Contractor for proper functioning as a whole. Location and arc of heads shall be adjusted if required to eliminate any dry spots, over-water or spillage on adjacent areas and to prevent over spray onto walks, roadways and buildings as much as possible.

END OF SECTION 02810

SECTION 02821 - CHAIN-LINK FENCES

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. Chain-Link Fences: Industrial

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:

   a. Wind Speed: 140 mph.
   b. Fence Height: 4 feet.
   c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
   d. Wind Exposure Category: B

2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences.

1. Fence posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.

B. Shop Drawings: Show locations of fences, posts, rails, tension wires, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include details of post anchorage, attachment, bracing, and other required installation clearances.

C. Product Certificates: For each type of chain-link fence, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences 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: Manufacturer is responsible for fence engineering, including preparation of data for chain-link fences including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Preinstallation Conference: Conduct conference at Project site with general contractor, Owner’s representative, and Architect.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Heights as indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.148 inches (9 gauge).

a. Mesh Size: 2 inches.
b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied after weaving.
c. Polymer Coating: ASTM D 668, Class 2a or 2b over metallic-coated steel wire.

1. Color: Black, complying with ASTM F 934.

2. Selvage: Twisted top and knuckled bottom.

2.2 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: 4 feet.
3. Strength Requirement: Light 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 and as follows:

a. Top Rail: 1.625 inches, minimum.
b. Line Post: 2.00 inches, minimum.
c. End, Corner and Pull Post: 3.00 inches, minimum.

B. Coating for Steel Framing:

a. Metallic Coating:

1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.

b. Provide polymer coating over metallic coating for all framing.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:

1. Location: Extended along bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

1. Metallic Coating: Type II, zinc coated galvanized by hot-dip process, with the following minimum coating weight:

a. Class 2: Not less than 1.2 oz./sq. ft. of uncoated wire surface.
b. Matching chain-link fabric coating weight.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

C. Rail and Brace Ends: Attach rails securely to each 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 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 shorter than full height of chain-link fabric. Provide one bar for each 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: 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric, and polymer coating to match chain link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

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, and terminal posts. Do not exceed intervals of 100 feet 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 specified.

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 3 inches below grade to allow covering with surface material.

3. Posts Set into Voids in Concrete Pavement: Core drill holes not less than 4 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

C. Terminal Posts: Locate terminal end and corner 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 o.c., maximum.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 6 feet 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. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.

1. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. 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.

H. Center Rail: Provide center rail at all corners of 4 foot high fencing.

I. Bottom Rails: Install, spanning between posts, at multipurpose courts only.

1. Where fencing encloses playcourts, the bottom rail is to be installed so that the bottom is level with the top of the concrete slab, with the fabric extending 2” below the bottom of the rail.

J. Chain-Link Fabric: Apply fabric outside of enclosing framework typically. Apply to inside at multipurpose courts only. Leave 2 inches 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.

K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, and pull posts with tension bands spaced not more than 15 inches o.c.

L. 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 o.c. and to braces at 24 inches o.c.

M. 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.

END OF SECTION 02821

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 specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete work includes the following:

1. Foundations and footings.
2. Slabs-on-grade.
3. Foundation walls.
4. Building frame members.
5. Equipment pads and bases.
6. Setting of anchor bolts, frames, and other items to be embedded in concrete.
7. Dowels for masonry walls.
8. Equipment pads.
9. Laboratory field testing services.
10. Concrete curbs, walks, and pavements.

C. Related work specified elsewhere:

1. Furnishing miscellaneous steel shapes and plates embedded in concrete.
2. Furnishing anchor bolts for structural steel.
3. Furnishing piping, sleeves and conduit embedded in concrete.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, vapor retarders, admixtures, joint systems, curing compounds, and others if requested by Architect.

C. Shop drawings reviewed and stamped by General Contractor for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures” showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

D. Laboratory test reports for concrete materials and mix design test.

E. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

F. Concrete Mix Design Data: Submit, not less than 21 days prior to placing of concrete, the following proposed concrete mix design data:

1. Intended usage and location for each type.
2. Mix design for each type.
3. Cement content in pounds per cubic yard.
4. Coarse and fine aggregate in pounds per cubic yard.
5. Water-cement ratio by weight.
6. Cement type and manufacturer.
7. Slump range.
8. Air content range.
9. Admixture types and manufacturers.
10. Percent of admixtures by weight.
11. Strength test data required to establish mix design.

1.4 QUALITY ASSURANCE

A. Provide all materials and perform all work in accordance with ACI 301 “Specifications for Structural Concrete for Buildings” and the reference specifications listed therein.

B. Where the provisions of this specification conflict with those of any reference specification, the provisions of these specifications govern.

C. The applicable provisions of the latest issue of the following ACI and CRSI Standards are made a part of these specifications. Where the provisions of any reference specification conflict with those of ACI 301, the more stringent provisions govern.

ACI NUMBER	TITLE
301	Specification for Structural Concrete.
302.1R	Recommended Practice for Concrete Floor and Slab Construction.
304.R	Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
304.2R-91	Placing concrete by pumping methods.
305.R	Recommended Practice for Hot Weather Concreting
308	Recommended Practice Curing Concrete
309.R	Recommended Practice for Consolidation of Concrete
315	Manual of Standard Practice for Detailing Reinforced Concrete Structures

318-89 & 89R	Building code requirements for reinforced concrete
347	Recommended Practice for Concrete Formwork
70-56	Guide for Use of Epoxy Compounds - Committee 503 Report
75-18	Concrete committee 503 report. Cold weather concreting.

CRSI NUMBER	TITLE
63	Recommended Practice for Placing Reinforcing Bars

D. Concrete Testing Service: Contractor shall retain a testing agency acceptable to Architect to perform material evaluation tests. Contractor will bear cost of tests, including cost of any retests due to failure of concrete to meet specified requirements.

E. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement - ASTM C 150, Type I. Type III may be used where authorized by the Engineer.

B. Air-Entraining Admixtures - ASTM C 260, Darax AEA, W.R. Grace & Company, SIKA AER, SIKA, MB-AE10, Master Builders, AMEX, American Admixtures Corp. Air Mix, Euclid Chemical Corp.

C. Water-Reducing Admixtures - ASTM C 494, Type A. WRDA with Hycol, W.R. Grace & Company Plastocrete, SIKA, Pozzolith 300N, Master Builders, Lubricon 300, American Admixtures.

D. No accelerators, retarders or admixtures containing chlorides will be permitted.

E. Use fresh, clean and drinkable water for concrete.

F. For normal weight concrete use coarse and fine aggregate to conform to ASTM C33.

G. Super Plasticizer ASTM C494 Type F or G where authorized by the Engineer.

H. Fly-ash ASTM C618 Type “F” maximum 20% by weight. Do not use for architectural concrete. Do not use for slabs-on-grade.

2.2 PROPORTIONING

A. Concrete Strength – See structural drawings for minimum concrete compressive strength at 28 days.

B. Properties:

1. Provide concrete having the general properties specified for each class of concrete shown on drawings to provide workability and consistency so concrete can be worked readily into forms and around reinforcement without segregation or bleeding, and to provide an average compressive strength adequate to meet acceptance requirements of ACI 301.

2.3 PRODUCTION OF CONCRETE

A. Concrete must be batched, mixed and transported in accordance with specifications for ready-mixed concrete ASTM C 94.

B. Slump Limits: proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps and sloping surfaces: Not more than 3 inches.
2. Reinforced foundation systems: Not less than 3 inches and not more than 5 inches.
3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-3 inch slump concrete.
4. Slabs and beams: Not less than 3 inches and not more than 5 inches.
5. Other concrete: No more than 4 inches.

C. Provide at the site, delivery tickets for each batch of concrete showing the following:

1. Batch number, volume and date
2. Time of loading
3. Design 28-day compressive strength
4. Concrete type
5. Cement content in pounds per cubic yard
6. Water content in pounds per cubic yard
7. Admixtures in amount per cubic yard
8. Maximum amount of water that may be added at the job site

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Restrict the addition of mix water at the job site. Do not add water without the approval of the general contractor and do not exceed slump limitations or total allowable water-to-cement ratio. Use cold water from the truck tank and remix to achieve consistency. The reports shall indicate how much water was added at the job site. Note on delivery ticket amount of water added and name of person authorizing.

F. During hot weather, conform to the detailed recommendations of ACI 305.

2.4 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

2.5 REINFORCEMENT

A. GENERAL

1. Details of concrete reinforcement and accessories not covered herein or shown on drawings to be in accordance with ACI 315.

2. Reinforcement is to be secured in proper position and thoroughly clean of loose rust, scale, grease or other coatings.

B. REINFORCING MATERIALS

1. Unless otherwise indicated, for all reinforcing shown provide deformed bars conforming to ASTM A 615, or a 616 Grade 60.
2. Smooth dowels - ASTM A 615 and A 616, plain bars having a minimum yield strength of 60,000 psi.
3. Welded wire fabric - ASTM A 185 plain wire fabric in flat sheets.
4. Plain wire to conform to ASTM A 82.
5. Accessories to conform to ACI 315.
6. Where reinforcing rods are used as supports, use rods no lighter than No. 5.
7. Where concrete surfaces are exposed, make those portions of all accessories in contact with the concrete surface or within 1/2 inch thereof, of plastic or stainless steel.

C. FIBROUS REINFORCING

1. Reinforcing fibers to be virgin 100% polypropylene or nylon collated fibers, per ASTM C1116, specifically manufactured for use in concrete, containing no reprocessed olefin materials, with the following minimum physical characteristics:

    a. Specific gravity: 0.92
    b. Modulus of elasticity: 500-700 KSI
    c. Tensile strength: 70-110 KSI
    d. Fiber length: multi-design gradation, 3/4" min.

2. Reinforcing fibers to be supplied by the following approved manufacturers:

    a. "FIBERSTRAND 100", Euclid Chemical Company
    b. "FIBERMESH", Fibermesh, Inc.
    c. "FORTA SUPER-NET", Forta Corporation
    d. "NYCON FIBERS", Nycon, Inc.
    e. “MASTERFIBER M100,” BASF

3. Fibers to be added in manufacturer's approved amount with a minimum of 1.5 pounds per cubic yard for poly and 1.0 pounds per cubic yard for nylon.
4. Concrete to be batched and mixed in accordance with fiber manufacturer's recommendations for uniform and complete dispersion of fiber bundles into single strands within concrete.
5. Reinforcing fibers may be used in concrete slabs-on-grade in lieu of WWF with approval of the engineer. Fibers will not be permitted in Apparatus Area or Maintenance Bays slabs.
6. Submit product data for review and approval.

2.6 RELATED MATERIALS

A. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.

B. Plastic Vapor Retarder: ASTM E 1745, Class A, not less than 15 mils thick per ACI 302.2R-06. Include manufacturer’s recommended pressure-sensitive joint tape.

1. Products:

    a. Fortifiber Corporation; “Moistop Ultra 15”
    b. Reef Industries, Inc.; “Griffolyn 15-Mil”
    c. Stego Industries, LLC; “Stego Wrap, 15-Mil.”
    d. Viper; “Vapor Check 15-Mil.”
    e. W.R. Meadows; “Perminator 15-Mil.”

2. Pipe Boots

    a. Construct pipe boots from vapor retarder material and pressure sensitive tape per vapor retarder manufacturer’s instructions.

C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

D. Liquid Curing, and Sealing and Hardening Compounds for application on floor slab in Apparatus Area 101, exterior concrete aprons and walks, and other slabs as scheduled on drawings.

1. Curing Compound: (required, unless properly used moisture-retaining sheet materials or water spray curing is provided for at least 72 hours) One of the following:

   a. “Day-Chem Sil Cure J-13”, Dayton Superior Chemical Division
   b. “Kure-N-Harden”, Sonneborn

2. Sealing and Hardening Compound:

   a. “Day-Chem Sure-Hard J-17”, Dayton Superior Chemical Division
   b. “Kure-N-Harden”, Sonneborn

E. Expansion Joint Filler: 1/2" thick closed cell polyethylene foam filler conforming to ASTM D 3575, with pre-scored removable top strip.

1. “Deck-O-Foam Expansion Joint Filler, “ Deck-O-Seal.

F. Metal Keyed Control Joints: Galvanized steel keyed joint with removable plastic cap to create straight void at top of joint for sealing.

1. “QuicKey”, BoMetals, Inc, Catalog # 2000 with removable, 1/2 “ deep by 13/32 “ wide plastic cap.

G. Epoxy Adhesive (Bonding Agent): ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Spec-Bond 100, Conspec Marketing and Mfg. Co.
   b. Euco Epoxy System #452, Euclid Chemical Co.
   c. Concresive Liquid LPL, Master Builders, Inc.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials, vapor retarder, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 301 and 347 limits:

1. Form Design shall be performed by a Professional Engineer registered in the State of Florida.
2. Earth cuts may be used as footing forms for vertical surfaces. Increase size by 2 inches.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

1. Chamfer all exposed tie beam-to-masonry wall joints using quarter-round molding in bottoms of forms.

F. Removal strength: The concrete will be presumed to have reached its removal strength when additional test cylinders (paid for by the Contractor) are field cured along with the concrete they represent and have reached the specified strength.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

1. Forms and shoring are the responsibility of the General Contractor.

3.3 VAPOR RETARDER INSTALLATION

A. General: Place vapor retarder sheeting in position with longest dimension parallel with direction of pour.

B. Lap vapor retarder over footings and seal to foundation walls.

C. Lap joints 6 inches and seal with manufacturer's recommended pressure-sensitive tape. Repair all punctures. Seal tightly around penetrations such as pipe and conduit using manufacturer’s pipe boot.

D. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all four sides with tape.

3.4 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

1. Minimum concrete coverage for reinforcing unless otherwise indicated on the Drawings, shall be:

a. Sides and bottoms of footings and grade beams: 3".
b. Top of footings and grade beams: 2".
c. Columns and Beams: 1-1/2"
d. Slabs: 3/4" from top, interior; 1-1/2” from top, exterior.

E. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one spacing of cross wires plus 2 inches. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Chair welded wire fabric at 3’-0” o.c., max. in each direction.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to architect.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements of floors and slabs.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

E. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Provide 1/2" expansion joint filler as specified herein.
2. Provide sealant over all isolation and expansion joints.
3 Joint sealants are specified in Division 7 Section "Joint Sealants."

F. Contraction (Control) Joints in Slabs-on-Grade: Construct joints to form panels of patterns as shown. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and locate to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

1. Saw joints in slabs before the formation of uncontrolled cracking (i.e., cracking that occurs at locations other than construction, control, expansion or contraction joints) and as soon as the concrete has hardened sufficiently to permit curing without chipping, spalling, or tearing. Saw joints both during the day and night as required. In no event shall saw cuts be made more than 6 hours after placement of concrete.

a. Saw joints for a depth equal to at least one-fourth of slab thickness.

b. Fill sawed joints within the building with self-leveling elastomeric sealant after concrete has cured and dried.

2. If concrete cracks at locations other than construction, control, expansion or contraction joints, the Contractor may be required to remove and replace the defective work (cracked concrete) at no additional cost to the Owner.

3.6 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Install dovetail anchor slots in concrete structures as indicated on drawings.

C. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.7 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. Notification: Notify Architect at least 48 hours prior to pouring any concrete.

B. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

C. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

1. Unless otherwise shown or indicated, provide minimum concrete protective covering for reinforcement as follows:

a. Concrete deposited against the ground, 3".

b. Formed surfaces exposed to weather or in contact with the ground, 2" for reinforcing bars No. 6 or larger, and 1/2" for reinforcing bars No. 5 or smaller.

c. Interior surfaces, 1-1/2" for beams, girders and columns, 3/4" for slabs, walls and joists.
d. See drawings for special conditions.

D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with 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 machine. 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 set. 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 to segregate.

F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
3. Maintain reinforcing in proper position on chairs during concrete placement.

G. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

H. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

I. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Pan formwork to provide Class D finish.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when

surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where a polyurethane floor coating is to be applied, or where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

D. Trowel and Medium Broom Finish: Required at Apparatus Area 101, concrete aprons, and where “non-slip” broom finish is indicated for concrete walks, ramps, or steps, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a medium broom.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and 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 to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.12 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

C. Curing Methods: Cure concrete by curing compound, by moisture-retaining cover curing, sprinkling, or by combining these methods, as specified.

D. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

E. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Do not use membrane-forming curing compounds for curing surfaces to receive the following coverings, unless it has been demonstrated that such compounds will not prevent bond of:

    a. Carpet
    b. Flexible flooring
    c. Ceramic tile
    d. Other specified floor systems

3. Apply sealing and hardening compound in accordance with manufacturer’s written instructions and as follows:

    a. Do not apply compound until horizontal joint sealants in slabs have been installed and fully cured.
    b. Thoroughly clean slab of all dirt and contaminants and allow to dry thoroughly prior to application of compound.

F. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.13 SHORES AND SUPPORTS

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.

B. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted.

3.14 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

D. Formwork and facing forms for members such as grade beams, foundation walls and spread footings not supporting the weight of concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from the removal operations.

3.15 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

B. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.4.Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective

areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3.17 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Sampling and testing for quality control during concrete placement shall include the following:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

    a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
    b. Air Content: ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
    c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below, when 80 deg F and above, and one test for each set of compressive-strength specimens.
    d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
5. Strength level of concrete will be considered satisfactory if every average of any three consecutive compressive strength tests equals or exceeds specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

B. Test results shall be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.18 ACCEPTANCE OF STRUCTURE

A. GENERAL

1. Acceptance of structure will be made in conformance with ACI 301, except that contractor must pay all costs incurred for providing any additional testing or analysis required when strength of structure is considered potentially deficient.

B. CRACKS

1. The contractor will be required to restore without cost to the owner any concrete except for slabs-on-grade which develops cracks within a period of one year after placement which has not been caused by action of the owner or others in overstressing the concrete.

2. Repair the cracks by means that will restore the cracked members to their designed strength and appearance by acceptable methods which will not impair the appearance of the affected surfaces, if exposed. Such repairs must be performed using suitable epoxy cements employed by an organization having satisfactorily demonstrated ability in the techniques necessary to effect such repairs, or by other acceptable methods.

END OF SECTION 03300

SECTION 04810 - UNIT MASONRY 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 unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Brick.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Wood nailers and blocking built into unit masonry are specified in Division 6 Section "Rough Carpentry."
2. Hollow metal frames in unit masonry openings are specified in Division 8 Section "Steel Doors and Frames."

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Samples for verification of the following:

1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the Project. Label samples to indicate type and amount of colorant used.
3. Accessories embedded in the masonry.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, except where more stringent requirements are shown or specified.

1. A.C.I. 530-05: Building Code Requirements for Masonry Structures.
2. A.C.I. 530.1-05: Specifications for Masonry Structures.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

C. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Pre-Installation Meeting:

1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, General Contractor, Masonry Sub-Contractor and Manufacturer’s Representative or Distributor.
2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.
4. Distribute minutes to attendees within 72 hours.

F. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockup on site in the location as directed by Architect.
2. Mockup shall be approximately 4'-0" high by 6'-8" long.
3. Build mockup of typical wall area comprised of 8” thick concrete block backup wythe, grout-filled collar joint, horizontal joint reinforcing, and 4” brick veneer including colored mortars.
4. Clean exposed faces of mockups with masonry cleaner indicated.
5. Notify Architect one week in advance of the dates and times when mockups will be constructed.
6. Protect accepted mockups from the elements with weather-resistant membrane.

7. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

    a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
    c. When directed, demolish and remove mockups from Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

    1. Extend cover a minimum of 48 inches down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

    1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
    2. Protect sills, ledges, and projections from mortar droppings.
    3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, control joints (sash blocks), bonding, and other special conditions.
2. Provide square-edged units for outside corners.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Weight Classification: Normal weight.
2. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:

   a. 8 inch nominal: 7-5/8 inch actual.
   b. 12 inch nominal: 11-5/8 inch actual.

3. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
4. Compressive strength = 2000 psi, minimum, based on net area; f'm = 1500 psi minimum.

2.2 BRICK

A. Face Brick Standard: ASTM C 216 and as follows:

1. Grade SW.
2. Type FBS.
3. Size: Based upon standard modular dimensions of 2-1/4" x 3-5/8" x 7-5/8":

   a. Manufacturer: Hanson Brick Company Inc., Pine Hall Brick, Triangle Brick, or Cherokee Brick and Tile Company.

4. Color and Texture:

   a. Running bond units to be one of the following:
      1) "Red Semi Smooth Flash", Hanson Brick

2) "Manchester", Pine Hall Brick
3) "Flashed Wirecut", Triangle Brick
4) "Natchez", Cherokee Brick and Tile Company

5. For sills and similar applications where brick surfaces are exposed to view which otherwise would be concealed, provide uncored solid units with all exposed surfaces finished.

2.3 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C 91.

1. Provide colored pigmented mortars for brick work. Use premixed colored masonry cements of formulation required to produce colors indicated, or if not indicated, as selected from manufacturer's standard formulations.

B. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

C. Aggregate for Grout: ASTM C 404.

D. Water: Potable.

2.4 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

1. Billet steel complying with ASTM A 615.

a. Grade 60.

2.5 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

A. Materials: Comply with ASTM A 951 and requirements indicated below for basic materials and with requirements indicated under each item of joint reinforcement, tie and anchor, for size and other characteristics:

1. Hot-dip galvanized steel wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. Per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.

B. Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner and tee units. Fabricate from cold-drawn steel wire complying the ASTM A 82, with deformed continuous side rods and plain cross rods, into units with widths of approximately 2" less than nominal width of walls and partitions as required to position side rods for full embedment in mortar with mortar coverage of not less than 5/8" on joint faces exposed to exterior, and not less than ½" elsewhere.

Provide the following type of joint reinforcing unless otherwise indicated.

1. For single wythe walls, provide ladder type with cross rods spaced not more than 16” o.c.
2. For brick veneer-on-block walls, provide ladder type with cross rods spaced not more than 16” o.c. with adjustable wall tie eye sections welded on at 16” o.c. Provide rectangular adjustable wire wall tie pintle sections fitted into eye sections to extend within 1” of exterior face of brick veneer. Provide Hohmann & Barnard, Inc. #270 Ladder LOX-ALL Adjustable Eye-Wire or equal wall system.
3. Wire size for side and cross rods: No. 9.

C. Dovetail Slots and Anchors: Maintain continuity of brick veneer anchoring system at all formed and poured reinforced concrete columns by providing dovetail slots and anchors.

1. Dovetail slots to be 22 gauge, hot-dipped galvanized steel, spaced 16” o.c. maximum. Slots shall extend the full height of the brick veneer. Provide Hohmann & Barnard, Inc. #305 Dovetail Slots or equal.
2. Dovetail Anchors to be triangular units, 3/16” diameter by 4-1/2” in length from dovetail or in length as required to position outside of anchor at approximate center of block veneer. Anchors shall be hot-dip galvanized. Provide Hohmann & Barnard, Inc. #303 Dovetail Anchors or equal.

D. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. AA Wire products Co.
2. Heckman Building Products, Inc.
3. Hohmann & Barnard, Inc.
4. Masonry Reinforcing Corp. of America
5. National Wire Products Corp.

2.6 MISCELLANEOUS TIES AND ANCHORS

A. Corrugated Wall Ties: Hot dipped galvanized steel, 7/8" wide by 7" long; 22 gage.

B. Anchor Bolts: Steel bolts complying with ASTM A 307; with ASTM A 563hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, straight.
3. Nonheaded bolts, bent in manner indicated.

2.7 EMBEDDED FLASHING MATERIALS

A. Flexible, self-sealing wall flashing.

1. Description: Self-sealing, self-healing, fully adhering, composite flexible flashing consisting of 32 mil thick pliable and highly adhesive rubberized asphalt

compound bonded completely and integrally to 8 mil thick, high-density, four plies of cross-laminated polyethylene film to produce an overall 40 mil thickness in rolls 75 feet long; protected from contamination from dust or dirt by a silicone-coated release sheet, to be removed immediately before installation.

2. Width: 12, 18, or 36 inches as required by flashing conditions and details.
3. Manufacturer: W.R. Grace – "Perm-A-Barrier Wall Flashing."

B. Termination Mastic

1. Description: Rubberized asphalt-based mastic for use in sealing flashing membrane terminations and punctures.
2. Manufacturer: W.R. Grace – "Bituthene Mastic".

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MASONRY WALL INSULATION, SINGLE WYTHE WALLS

A. For single wythe masonry walls requiring thermal insulation, provide nontoxic foamed-in-place masonry wall insulation, R value of not less than 6.0 in 8" concrete masonry, with a density of 125 lbs. or greater. Insulation shall be non-combustible, shall have a Class A flame spread rating, shall be formaldehyde-free, and shall meet all applicable state and federal insulation standards.

1. Insulation shall be installed only by applicators who have been trained and certified by the insulation manufacturer.
2. Subject to compliance with specifications; provide insulation by one of the following:

   a. Tailored Chemical Products, Inc.: "Core-Fill 500".
   b. Thermco: "Thermco Foam".
   c. C.P. Chemical Co., Inc.: "Tripolymer Foam Insulation".

2.10 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.11 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. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for job-mixed mortar; and ASTM C 1142 for ready-mixed mortar, of types indicated below:

1. Use Type S mortar for concrete masonry applications.
2. Use Type N mortar for brick masonry applications.
2. Include admixture and follow admixture label instructions.

C. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency at time of placement that will completely fill spaces intended to receive grout.

1. Minimum Compressive Strength: 2500 psi at 28 days.
2. Slump Range: 8" minimum - 11" maximum.
3. Aggregate size: 1/4" maximum for coarse grout.
4. Provide fine grout at collar joints of brick veneer-on-block walls.

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 unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

B. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern unless otherwise noted on drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond; do not tooth. Clean exposed surfaces of set masonry, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Build nonload-bearing interior partitions full height of story to underside of roof structure above and as follows:

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

   a. Brick head joints shall be completely filled and formed by buttering all four sides of the ends of brick unit.
   b. “Slushing” brick head joints is unacceptable.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
5. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 BRICK COLOR RANGE

A. Lay brick in strict accordance with manufacturer’s printed instructions to assure even distribution of color range.

B. Mingle brick from two or more cubes unless otherwise directed by manufacturer.

3.7 BONDING OF MULTIWYTHE MASONRY

A. Use individual pintle ties installed in eyelets of horizontal joint reinforcing to bond wythes together. Provide ties spaced not to exceed 16” o.c. horizontally and 16” o.c. vertically. Stagger ties in alternate courses.

B. Collar joints between brick veneer and concrete block shall be 1” wide, actual, and shall be filled solid with fine grout. Do not “slush” collar joints with masonry mortar.

C. At reinforced concrete columns, embed dovetail slots into concrete as indicated on drawings at 16 inches o.c. horizontally. Install dovetail anchors into slots at 16 inches o.c. vertically and extend into brick veneer.

3.8 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.

a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in standard concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

A. Form control joints in brick veneer as follows:

1. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section “Joint Sealants”. Keep joint free and clear of mortar.

3.11 LINTELS

A. Install galvanized steel lintels where indicated. Provide minimum of 8” bearing at each end of lintel.

A. Provide masonry lintels where shown and wherever openings of more than 1’-0” for brick size units and 2’-0” for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Provide minimum of 8” bearing at each end of lintel.

3.12 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.

3.13 INSTALLATION OF FILLED CELL MASONRY

A. All filled cell masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled with grout.

B. Units shall be laid with full face shell mortar beds. All head joints shall be continuously filled with mortar for a distance from the face of the wall or unit not less than the thickness of the longitudinal face shells. Cross webs adjacent to vertical cores to be filled shall be fully bedded with mortar to prevent leakage of grout.

C. All mortar fins or other obstructions or debris shall be removed from the insides of the walls of the cells to be filled with grout. All cells to be filled shall be filled solidly with grout.

D. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet

2. Do not exceed the following pour heights for fine grout:

a. For 1 inch wide collar joints between brick veneer and concrete block, pour height of 18 inches.

3. Provide saw-cut cleanout holes 4 inches by 4 inches for grout pours over 48 inches in height.

a. Provide cleanout holes at each vertical reinforcing bar.

3.14 INSULATION FOR SINGLE-WYTHE WALLS

A. At single wythe masonry walls, pump foamed-in-place insulation into concrete block cores so as to fill void spaces completely. Limit lifts of insulation to one-story in height, but not-to-exceed 15’-0”.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry at least daily as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
3. Clean exposed brick surfaces as recommended by BIA Technical Notes 20 – “Cleaning Clay Products masonry.”

END OF SECTION 04810

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. Framing with dimension lumber.
2. Wood furring, grounds, nailers, and blocking.
3. Plywood roof sheathing

B. Related Sections include the following:

1. Division 6 Section “Metal-Plate-Connected Wood Trusses.”

1.3 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.

PART 2 - PRODUCTS

2.1 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. 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.

C. 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 thickness or less, unless otherwise indicated.

2.2 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.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. 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.
3. Wood floor plates installed over concrete slabs directly in contact with earth.

C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.

2.3 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

B. Light-Framing (2”-4” thick, 2”-4” wide): construction grade.

C. Studs (2”-4” thick, 2”-6” wide, 12’ and shorter): No. 2 structural light framing grade, Southern Yellow Pine graded under WWPA, WCLIB, SPIB, or NLGS rules.

D. Structural Joists and Planks (2”-4” thick, 5” and wider): Any species and grade complying with requirements for allowable unit stresses.

1. Fb (minimum extreme fiber stress in bending)…1,200 psi in single member.
2. E (minimum modules of elasticity)…….1,600,000 psi

E. Concealed Boards: Standard grade, any species graded under WWPA rules or No. 3 grade Southern Yellow Pine graded under SPIB rules.

F. Lumber for Miscellaneous Uses: Unless otherwise indicated, provide Standard grade lumber for support of other work, including cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: 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.

2.5 PLYWOOD ROOF SHEATHING

A. APA Rated Plywood Roof Sheathing: Exposure 1 sheathing.

1. Span Rating: Not less than 32/16.
2. Thickness: Not less than 5/8 inch.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacturer.

1. For all rough carpentry related to roofing and roof accessories, 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. 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.

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. 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. "Table 2306.1--Fastening Schedule," of the Florida Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use hot-dip galvanized or stainless-steel nails where rough carpentry is related to roofing or roof accessories, in ground contact, or in area of high relative humidity.

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. Provide pressure treated wood grounds in gypsum drywall and plaster partitions for support of plumbing fixtures, toilet accessories, fire extinguisher cabinets and brackets, wall-mounted fixtures and furnishings, and hardware.

1. Provide solid wood grounds, minimum 2 x 4 lumber, in all partitions scheduled to receive wall-mounted door bumpers. Position directly behind and centered on bumpers. Screw attach securely to metal studs.

3.3 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AF & PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Install framing members of size and at spacing indicated.

C. Do not splice structural members between supports.

3.4 WOOD NAILERS, EDGING, AND BLOCKING FOR ROOF ACCESSORIES:

A. Provide wherever shown and where required for attachment of other work. Form to shapes, as shown, and cut as required for true line and level on work to be attached. Coordinate location with other work involved.

B. Where wood members are doubled, ends shall be lapped and thoroughly spiked to each other and to bearing members, maintaining structural integrity, using ring-shank nails.

C. Where wood members abut concrete, securely fasten to same by bolts or lag screws on staggered centers. Heads of all bolts or lag screws shall be provided with large-head washers.

D. Round corners of wood plates where flashing occurs.

E. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

F. Holes drilled oversized or wallowed out shall be redrilled.

G. For fastening wood to:

1. Metal. Countersunk flat head No. 10 self tapping, self drilling, metal screws, at 4" o.c., staggered; utilizing appropriate size bolt and nut where possible.
2. Wood. Ring-Shank nails, 3/8" round heads at 12" o.c., staggered; 1-1/4" minimum substrate penetration.
3. Plywood. Annular thread nails, 3/8" round heads at 8" o.c. staggered with full penetration.
4. New Masonry or Concrete. 3/4" diameter by 12" long with 3" hook anchor bolts and Hughes WSH 1093 washers, spaced 2'-8" apart, staggered if nailer or blocking is wider than 6 inches.
4. Existing Structural Concrete and Precast Concrete. Countersunk, flat head, threaded, self-tapping masonry screws (“Tapcons”), at 8" o.c., staggered; 1/1/2" minimum substrate penetration.

3.5 ROOF SHEATHING INSTALLATION

A. Nail to wood trusses with nails of size and spacing indicated on structural drawings. Space panels 1/8” apart at edges and ends. Provide plywood dips.

B. Refer to Structural Drawings for nailing requirements.

END OF SECTION 06100

SECTION 06176 - METAL-PLATE-CONNECTED WOOD TRUSSES

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 wood roof trusses and truss accessories.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:

a. Roof Trusses: Vertical deflection under total load of 1/240 of span.
b. Roof Trusses: Vertical deflection under live load of 1/360 of span.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.

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. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. Qualification Data: For metal-plate manufacturer, professional engineer, fabricator, and Installer.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.

D. Comply with applicable requirements and recommendations of the following publications:

1. TP1 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF & PA's "National Design Specifications for Wood Construction" and its "Supplement."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified. Top chords must be 2 x 6, minimum.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of the following grade and species:

1. Grade for Chord Members: No. 2.
2. Grade for Web Members: Same grade as indicated for chord members.
3. Species: Southern Pine; SPIB.

2.2 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:

B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180) coating designation; Designation SS, Grade 33, and not less than 0.036 inch (0.9 mm) thick.

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. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.4 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Truss Tie-Downs (Hurricane Ties): As indicated on structural drawings.

2.5 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. Before installing, splice trusses delivered to Project site in more than one piece.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

M. Contractor is solely responsible for all truss bracing during construction.

END OF SECTION 06176

SECTION 06410 - PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Extent of plastic laminate casework is indicated on Drawings. Work includes:

1. Plastic laminate finished casework.
2. Plastic laminate countertops.
3. Solid-surfacing material (“quartz”) countertops.
4. Cabinet hardware.

1.3 QUALITY ASSURANCE

A. AWI Quality Standard: Comply with applicable requirements of “Architectural Woodwork Quality Standards, Illustrated, 8th Edition, Version 1.0, 2003”, Section 400, published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

1.4 SUBMITTALS

A. Quality Certification: Submit manufacturer’s (Fabricator’s) certification, stating that the fabricated work complies with quality grades and other requirements indicated.

B. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale casework sections and details, attachment devices, and other components.

C. Cabinet hardware: one unit of each type and finish.

D. Plastic laminate: manufacturer’s sample chain.

E. Solid-surfacing materials, 2 inches square.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect casework during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until painting, wetwork, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, casework must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for casework installation areas. Do not install casework until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed casework within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of casework shall determine optimum moisture content and required temperature and humidity conditions.

C. Field measurements: Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing casework; show recorded measurements on approved shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND FABRICATION METHODS

A. Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern, and finish indicated for each application. Provide plastic laminate by one of the following; color selection by Architect.

1. Formica.
2. Nevamar.
3. Wilsonart.

B. Acrylic Latex Sealant with Silicone: Colored acrylic latex caulk with silicone for sealing joints between casework and building and between countertops and backsplashes. Color shall be selected by Architect to match color of laminated plastic surfaces. All products used in this section shall comply with the limits for VOC content as described in Section 01352 paragraph 2.5. Verify the VOC content of the following products:

1. “Form Fill Adhesive Caulk”.
2. “ColorRITE Caulking Spectrum”.
3. “Color Flex”; Kampel.

C. Lumber and Panel Materials: Comply with AWI Section 400-G-8 requirements for lumber and panel product requirements, unless specific core material is identified herein.

1. Panel materials for cabinet bodies, doors, drawer fronts, and countertops shall be softwood veneer core plywood as follows. No particleboard or fiberboard shall be

used as a substrate for laminated plastic except at the doors to the Bunk Room personnel lockers.

a. Plywood shall be made:
   (1) 95% void-free.
   (2) 3/4" thick / Seven (7) Ply.
   (3) 3/8" thick / Three (3) Ply.
   (4) Exposure I: Exterior waterproof glue.
   (5) Classification: APA Group I, (Fir, Odorless Virola)
   (6) Appearance Grades: (Installation Applications)
      A-A Exposed & Semi-Exposed Surface Laminate Base: Two (2) Sides
      A-C Exposed & Semi-Exposed Surface Laminate Base / Concealed Surface Laminate Base

b. Plywood to be used for Casework Sub-Base Platform:
   (1) 95% void-free.
   (2) 3/4" thick / Seven (7) Ply.
   (3) Exposure I: Exterior waterproof glue.
   (4) Classification: APA Group I, (Southern Pine)
   (5) Pressure Treated to 0.25 retention.
   (6) Appearance Grade: (Installation Application).
      B-C Exposed Surface for Vinyl Base / Concealed Surface

D. Solid-Surfacing Material: Homogenous solid sheets of quartz-based fabricated stone.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Caesarstone USA, Inc.: "Caesarstone."
   b. Cambria: "Cambria"
   c. Cosentino: "Silestone."
   d. E.I. du Pont de Nemours and Company: "Zodiaq."

2. Type: Standard type.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.
4. Finish: Polished.

E. Design and Construction Features: Comply with details shown for profile and construction of casework; and, where not otherwise shown, comply with applicable quality standards.

F. Shop-Cut Openings: Fabricate casework with shop-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar item openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.2 PLASTIC LAMINATE FINISHED CASEWORK

A. Grade: AWI Custom Grade.

B. Cabinet Construction: Flush overlay, conforming to AWI Section 400-G-7. Conform to the following requirements:

1. Cabinet Body Sides, Dividers, Tops, Bottoms, Fixed Shelves and Stretchers: Not less than 3/4" thick. Provide stretchers at top of base cabinet.
2. All adjustable shelves shall be constructed using minimum 3/4" thick 9-ply Luan veneer plywood. Shelves shall have GP-50 type laminated plastic on both faces, and it shall be applied in the same machine direction on both faces. Shelves shall be edge banded with GP-50 type laminated plastic on all 4 sides.
3. Backs: Not less than 1/4" thick.
4. Drawer Fronts: Not less than 3/4" thick.
5. Drawers: Sides, subfronts and backs: Not less than ½" thick; bottoms: not less that 1/4" thick. Provide box type construction with front, bottom and back lock shouldered in sides and secured with glue and mechanical fasteners.
6. Doors: Not less than 3/4" thick, typical.
    a. At doors to Bunk Room personnel lockers only, provide ¾" thick MDF in lieu of plywood.
7. Door and Drawer Front Edge Banding: PVC edge banding, 3mm. thick, matching laminate in color, pattern, and finish.
8. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect wall cabinet tops and bottoms and base cabinet bottoms and stretchers to ends and dividers by means of mechanical fasteners. Rabbet tops, bottoms and backs into end panels.
9. Subbase: Not less than 1-1/2" thick, 4-1/2" high, recessed 2-1/2" from cabinet fronts and exposed ends. Cover with base as scheduled on drawings.
10. All base and wall cabinets wider than 36 inches shall have a full height center divider. Omit divider in base cabinets containing sinks.

C. Exposed Surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:

1. Horizontal surfaces: GP-50 (0.050" nominal thickness).
2. Vertical Surfaces: GP-28 (0.028" nominal thickness). Doors must have same laminate on both faces.

D. Semi-Exposed Surfaces: Finish semi-exposed surfaces as follows, unless otherwise indicated.

1. Plastic laminate, CL-20; white in color.

E. Concealed Surfaces: Finish concealed surfaces without plastic laminate with two coats of shellac or clear sanding sealer.

F. Fabricate all exposed edges of casework, including edges of doors and drawers when open, with matching plastic laminate.

2.3 PLASTIC LAMINATE COUNTERTOPS

A. General: Except as otherwise indicated, provide separate plastic laminate countertops (installed on other casework or other support system as indicated) to comply with requirements for casework for plastic laminate finish.

B. Grade: AWI custom grade.

C. All countertops containing plumbing fixtures shall be constructed with shop sanded exterior grade plywood, minimum 3/4" thick. Edge details shall conform to AWI Section 400C, with 1-1/2" wide face.

D. Standard .02" phenolic back-up sheet required wherever unsupported area exceeds 6 sq. ft. and core is 3/4" thick; 8 sq. ft. and core is 1" thick; 10 sq. ft. And core is 1-1/8" or thicker.

E. There shall be no seams in laminate within 24" of sink cutouts.

F. Wire Management Grommets: Provide where indicated on drawings.

1. Grommet sets shall include a plastic grommet to fit a 2" diameter hole, with a retractable, self-storing slot cover. Color: black.
2. Manufacturer: Outwater Plastics Industries, Inc., part #31 BK, or Doug Mockett & Company, Inc., part no. TG.

2.4 SOLID SURFACING – MATERIAL COUNTERTOPS

A. Grade: Custom

B. Quartz Solid Surfacing – Material Thickness: ¾ inch.

C. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer’s written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application where indicated on drawings.

D. Drill holes in countertops for plumbing fittings in shop.

2.5 CABINET HARDWARE

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as “door hardware” in other sections of these specifications.

B. Hardware Standards: Except as otherwise indicated, comply with ANSI A156.9 “American National Standard for Cabinet Hardware”.

1. Quality Level: Type 2 (institutional), unless otherwise indicated.
2. Quality Certification: Where available, provide cabinet hardware bearing the BHMA certification label, affixed either to hardware or its packaging, showing compliance with BHMA Cabinet Hardware Standard 201.

C. Cabinet Hardware Schedule: Refer to schedule included as last pages of this section for specific hardware and accessory items required for casework.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Prior to installation of casework, examine shop fabricated work for completion, and complete work as required, including removal of packing.

3.2 INSTALLATION

A. Installer: The installation of all work of this section shall be by the fabricator of the plastic laminate casework.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops).

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor casework to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

E. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

F. Countertops: Anchor securely to base units and other support systems as indicated.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Sealant: Caulk exposed joints between casework and building and between laminated plastic countertops and backsplashes with colored acrylic latex caulk with silicone. Color shall be selected by Architect to match color of laminated plastic surfaces.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

A. Repair damaged and defective casework wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace casework. Adjust joinery for uniform appearance.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Clean casework on exposed and semi-exposed surfaces.

D. Protection: Installer of casework shall advise Contractor of procedures required to protect casework during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

3.4 CABINET HARDWARE SCHEDULE

A. Finish: Of all hardware shall be US26 polished chrome unless noted otherwise.

B. Manufacturers: Provide products by the following manufacturers or approved equal.

1. Adjustable shelving supports - K & V (Knape & Vogt), #345, for 5 mm hole; nickel-plated steel.

2. Hinges – 5 knuckle, 2-3/4" reveal overlay type with hospital tips and adjustable screw holes – Rockford #375, or Weber Knapp #M25R4-0-9-091. Provide US26D dull chrome finish. Provide Rockford #7036 at Bunk Lockers.

3. Catches - Stanley #SP41, magnetic type (US28).

4. Pulls – Sugatsune America #EC-100/M EC Series Handle, 303 stainless steel, mirror finish.

5. Box and File Drawer Slides - Knape & Vogt No. 8400 (100-pound class) telescoping, full extension, ball bearing slide; anochrome finish.

6. File Drawer File Brackets – Kinetron Corporation Kine Flex file bracket system #KHFB with top mount movable brackets that slide over edge of drawer frame, and 5/8" file bars. Provide 1 set per drawer.

7. Lazy Susans – Rev-A-Shelf #RAS-5472-32-CR, 32" Diameter Kidney Lazy Susan 2-Shelf Set, polished chrome steel, with telescoping shaft. No substitutions.

8. Locks - Key operated, pin tumbler, dead bolt type. Provide CompX National Locks or Corbin Cabinet Lock, US 26D finish.

9. Drawers:

   1 set.....Slides.....8400
   1.....Pull.....EC-100/M
   1……Lock……Where indicated on drawings: National C8179

10. Cabinet Doors (single):
    (Doors 48" high and over shall carry 3 or more hinges per door)

    1 pair.....Hinge.....375
    1.....Catch.....41
    1.....Pull.....EC-100/M
    1.....Lock.....Where indicated on drawings: National C8173 (7/8" cylinder length) x strike.

11. Cabinet Doors (pairs):
    (Doors 48" high and over shall carry 3 or more hinges per door.)

    2 pair.....Hinges.....375
    2.....Catch.....41
    2.....Pulls.....EC-100/M
    1.....Lock.....Where indicated on drawings: National C8173 (7/8" cylinder length) x strike.

12. Door Locks:

    a. Key all personnel lockers individually. Provide 2 keys per lock; provide master key system.

13. Coat Hooks for Personnel Lockers: Sugatsune America, Inc. polished stainless steel hook No. EL-25. Provide one hook on inside of every personnel locker door; mount at same height as clothes rod and center hook on door. Secure with stainless steel screws.

14. Clothes Rods for Personnel Lockers: Knape and Vogt No. 750-1 chrome-look round steel tubing, 1-1/16" O.D.; wall thickness .075". Mounting Flanges: Knape and Vogt No. 734 CHR – chrome-look finish.

END OF SECTION 06410

SECTION 07141 - COLD FLUID-APPLIED WATERPROOFING

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. Polyether waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including, but not limited to, the following:

a. Surface preparation.
b. Minimum curing period.
c. Special details.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Show locations and extent of waterproofing.
2. Include details for substrate joints and cracks, penetrations, inside and outside corners, and other termination conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, or when temperatures are less than 5 deg F above dew point.
2. Do not apply waterproofing in rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials within one year.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials**,** and protection course, from single source from single manufacturer.

2.2 SINGLE-COMPONENT POLYETHER WATERPROOFING

A. Single-Component, Polyether Waterproofing**:** ASTM C 836 and coal-tar free.

1. Products: Subject to compliance with requirements, provide the following:

a. Chem Link Products, LLC; BARR Liquid Waterproof Membrane.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer. It is the applicator's responsibility to determine if a primer is required due to substrate conditions.

C. Joint Sealant: Single component polyether sealant, as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

2.4 PROTECTION COURSE

A. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

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. Henry Company; Asphalt Protection Board.
b. Soprema, Inc; Sopraboard.
c. W. R. Meadows, Inc; Protection Course.

2. Thickness: 1/8 inch nominal.
3. Adhesive: Rubber-based solvent type recommended in writing by waterproofing manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect and general contractor shall be notified in writing and corrections made.

B. Condition of Masonry Surfaces:

1. The concrete masonry surfaces shall be sound and shall be free of fins, ridges, voids, or holes.
2. Control joints and/or expansion joints shall have been properly installed at strategic points to control cracking caused by deflection and shrinkage.
3. Voids, and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the surrounding areas.

3.2 SURFACE PREPARATION

A. The concrete masonry surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.

B. Install a 1” face, 45 degree cant of NovaLink or DuraLink polyether sealant at all angle changes an inside corners.

C. All cracks over 1/16” in width and all moving cracks less than 1/16” in width shall be saw cut to ¼” minimum in width and depth. Clean, prime and fill saw cuts flush with NovaLInk or DuraLink polyether sealant.

D. All moving cracks over 1/16” wide and all expansion joints less than 1” wide shall be cleaned, primed, fitted with a backing rod and caulked with NovaLink or DuraLink polyether sealant. For larger joints, contact Chem Link representative.

E. Allow all sealant to cure a minimum of 24 hours.

F. Apply a 6” wide, 45 mils thick stripe-coat of BARR centered over all sealed cracks, hairline cracks, joints and outside corners.

G. Apply a 45 mil thick stripe-coat of BARR over sealant cants and extending 4” onto the footing.

H. Allow all detail work to cure overnight.

3.3 APPLICATION

A. Priming: Shall be per membrane manufacturer’s instructions. Primer is not required for adhesion to dry, non-porous concrete or masonry. However, if pinhole and blistering problems occur as a result of air and/or moisture vapors emitted from the masonry and environmental conditions, contact the Chem Link representative for further instructions.

B. Wipe all detail work with a cloth wet with isopropyl alcohol solvent.

C. BARR Membrane: Apply in one uniform coat at the rate of one gallon minimum per 50 square feet per gallon or as needed in order to obtain a minimum thickness of 30 wet mils. Allow to cure until second coat can be applied without disrupting the initial coat, typically 24 hours. Apply another coat of BARR at the rate of 50 square feet per gallon or 30 wet mils and allow to cure.

D. In the event the entire surface is not completed in one day, prior to beginning application the next working day clean an area 6” wide along the edge of the previously applied membrane with a cloth wet with isopropyl alcohol solvent. New work shall overlap the existing work by 6”.

3.4 PROTECTOIN COURSE

A. Install protection board as shown on drawings. Comply with waterproofing manufacturer’s recommendations for adhesion of protection course to membrane.

END OF SECTION 07141

SECTION 07180 – POLYURETHANE DECK COATING

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 polyurethane waterproofing coating system where indicated on the Drawings.

1.3 SUBMITTALS

A. Product data:

1. Manufacturer's specifications and other data needed to prove compliance with the specified data.
2. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
3. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.

1.4 QUALITY ASSURANCE

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

B. Applicator Qualifications:

1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

C. Convene a pre-installation job-site conference four weeks prior to commencing work of this Section:

1. Secure attendance by Architect, contractor, applicator, and authorized representatives of the coating system manufacturer and interfacing trades.

2. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

B. Maintain the products in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.6 SUBSTRATE CONDITIONS

A. General:

1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, and other contaminants which may inhibit application or performance of the waterproofing coating system.
2. Using suitable abrasive methods, remove reside of curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, loose material and other contaminants from concrete surfaces to receive the work of this Section.

B. Concrete: Provide surfaces that are smooth with finish equal to one that is light steel troweled followed by a fine hair broom.

1.7 WARRANTY

A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship for a period of two years following date of Substantial Completion. Warrant that installed coating system shall be free of defects including adhesive failure, cohesive failure, weathering deficiencies and waterproofing failure resulting from substrate cracking up to 1/16 inch.

1. Manufacturer's standard warranty covering materials.
2. Applicator's standard warranty covering workmanship.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide a complete liquid applied polyurethane waterproofing coating system having the following minimum attributes:

1. System designed for waterproofing decks subject to pedestrian traffic.
2. Comply with ASTM C957-91 and provide a Class A fire rating on concrete substrates.
3. Color to be selected by Architect from manufacturer's standard color range.
4. Acceptable products:

    a. Vulkem 350/351 (No Substitutions)

2.2 ACCESSORIES

A. Primer: As recommended by coating system manufacturer.

B. Aggregate: 40-50 mesh silica sand; local aggregate approved by coating manufacturer

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Applicator shall examine the areas and conditions under which work of the Section will be performed.

1. Verify conformance with manufacturer's requirements.
2. Report unsatisfactory conditions in writing to the Architect.
3. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Surface preparation and detailing procedures to be in accord with waterproof coating system manufacturer's instructions and recommendations except where more stringent requirements are indicated.

B. Clean all deck surfaces to receive coating system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive sealants, detailing materials or coatings immediately prior to installation.

C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.

D. Install ¼" diameter backer rod into corner of all horizontal-to-vertical junctures and cover with one inch detail cant of "Vulkem 921" polyurethane sealant.

E. Prime surfaces in accord with manufacturer's instructions.

3.3 APPLICATION

A. Install waterproof coating system in accordance with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated.

1. Grid deck surfaces to assure proper coverage rates and verify coating wet-film mil thickness with gauges as work progresses.
2. Retain empty product containers during course of work to aid in determining whether completed coating system complies with manufacturers average thickness requirements.

B. Verify proper dry condition of substrate using method recommended by coating system manufacturer; perform adhesion checks prior to general application of coating system using field adhesion test method recommended by manufacturer.

C. Mask off adjoining surfaces not to receive coating system, including all surrounding walls above 4 inch wall base.

D. Wipe clean all detail coats with white rags wetted with Xylene solvent; do not saturate detail coat.

E. Apply coating base coat uniformly and allow to cure in accord with manufacturer's instructions.

F. Feather edge when entire area cannot be completed in one day; clean area 6" wide along edge of coating with Xylene solvent on clean white rags prior to startup on next working day; use interlaminary primer per manufacturer's instructions as needed; overlap existing work by 6" with new work.

G. Apply coating system finish coat in accordance with manufacturer's instructions.

a. Immediately broadcast aggregate into wet material at rate recommended by manufacturer and backroll to evenly distribute and totally encapsulate.
b. Allow to cure per manufacturer's instructions.

H. Extend deck coating system 4" above slab to create an integral wall base.

3.4 PROTECTION AND CLEAN-UP

A. Promptly remove primer or coating material from adjacent surfaces with MEK, Toluene or Xylene; leave work area in broom clean condition.

B. Allow competed Work to cure 24 hours before opening to pedestrian traffic.

END OF SECTION 07180

SECTION 07210 - BUILDING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Concealed thermal building insulation.
3. Concealed acoustical building insulation.

B. Related Sections include the following:

1. Division 4 Section “Unit Masonry Assemblies” for foamed-in-place masonry wall insulation.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:

1. Glass-Fiber Blanket Insulation

a. CertainTeed Corporation
b. Johns Manville Corporation
c. Knauf Fiber Glass
d. Owens Corning

2. Polyisocyanurate Board Insulation:

a. Atlas Roofing Corporation
b. Dow Chemical Company
c. Rmax, Inc.

3. Slag-Wool / Rock-Wool Fiber Sound Attenuation Insulation:

a. Fibrex, Inc.
b. Partek Insulations, Inc.
c. USG Interiors, Inc.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

B. Faced, Glass-Fiber Blanket (Batt) Insulation: ASTM C 665, Type II (Blankets with kraft paper vapor retarder membrane facing on one face), Class C. Provide blankets with R-19 rating, approximately 6.25" thick.

C. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core faced on both sides with aluminum foil to comply with referenced standard and with other requirements indicated below:

1. ASTM Standard: ASTM C 1289, Type 1, Class 1 or 2.
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches.
3. Conditioned R-value: 5.0 minimum, per ASTM C 1289 and ASTM C 518.
4. Thickness: 3/4 - inch unless otherwise indicated on drawings.

D. Unfaced Mineral-Fiber Blanket Insulation: Sound attenuation insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).

1. Mineral-Fiber Type: Fibers manufactured from slag wool or rock wool.
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
3. Thickness: 3", unless otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply insulation to produce thickness indicated.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass - Fiber Blanket Insulation: Install as follows:

1. Set kraft facing toward plywood roof sheathing.

2. Place blankets in cavities formed by framing members to produce a friction fit between edge of insulation and framing members.

a. Provide galvanized chicken wire as required to hold insulation in place between roof trusses.

C. Polyisocyanurate Board Insulation: Install as follows:

1. Attach boards to masonry and concrete wall substrates by adhesive attachment. Seal joints between boards with aluminum foil tape.

D. Slag-Wool / Rock-Wool Fiber Sound Attenuation Insulation

1. Install in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.5 PROTECTION

A. General: Protect installed insulation and radiant barriers 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 07210

SECTION 07411 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels installed on plywood decks.
2. Installer-fabricated fascia trim.
3. Installer-fabricated gutters and downspouts
4. Concealed fastenings, flashings, edge metal, trim, cleats, sealants, filler, etc. required for a complete, weathertight installation.

B. Base and counterflashing at roof-wall intersection is specified in Section 07620 – Sheet Metal Flashing and Trim.

C. Modified bitumen roofing system for cricket is specified in Section 07521 – SBS Modified Bituminous Sheet Roofing.

1.3 DEFINITIONS

A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete, weathertight roofing system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at the following test-pressure difference:

1. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.

2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

D. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: No water penetration at 20 lbf/sq.ft.
2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

F. Provide panels that comply with the requirements of the Florida Building Code and which carry Florida Product Approval numbers.

G. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

H. Wind Loads: Provide roof panel systems including anchorage capable of withstanding wind load design pressures calculated according to the requirements of ASCE 7-10.

1. Ultimate wind velocity (Vult) = 245 MPH.
2. Risk Category IV.
3. Exposure Category C.
4. Maximum allowable panel deflection = 1/180.

a. Allowable roof panel design pressures (ASD pressures) are as follows. They have been calculated by multiplying the ultimate wind pressures by a factor of .6:

1) MAIN ROOF

a) Zone 1 (Main Roof): - 80.7 psf
b) Zone 2 (Perimeter): -140.5 psf (5’ – 4” Edge Zone)
c) Zone 3 (Corners): -140.5 psf

2) OVERHANGS AND CANOPIES

a) Zone 2 (Perimeter): -140.5 psf
b) Zone 3 (Corners): -140.5 psf

3) Positive pressure throughout all zones = +50.8 psf

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. 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, ambient; 180 deg F, material surfaces.

J. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.
b. Gutters.
c. Downspouts

C. Samples for Initial Selection: For each type of metal roof 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 Roof Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- long Samples for each type of accessory.

E. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data with exact clip spacing and anchorage signed and sealed by the qualified Florida professional engineer responsible for their preparation.

F. Qualification Data: For qualified Installer.

G. State of Florida Product Approval number.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

I. Field quality-control reports.

J. Maintenance Data: For metal roof panels to include in maintenance manuals.

K. Warranties: Samples of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Panel installer shall have a minimum of three (3) years experience in the installation of concealed clip architectural standing seam metal roofing and show evidence of successful completion of at least three (3) projects of similar size, scope, and complexity.
2. Must be State of Florida certified roofing/sheet metal contractor.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

D. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, metal roof panel installer, metal roof panel manufacturer's representative, lightning protection system installer, and installers whose work interfaces with or affects metal roof 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 roof panel and soffit panel installation, including manufacturer's written instructions.
4. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for metal roof panel assembly during and after installation.

9. Confirm schedule for roof inspections (minimum of three) to be made by roof panel manufacturer.
10. Review roof observation and repair procedures after metal roof panel installation.
11. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies 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, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Twenty 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 roof 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: Twenty years from date of Substantial Completion.

C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: 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: Twenty years from date of Substantial Completion.
2. Warranted Wind Velocity: 157 mph sustained velocity on the Saffir-Simpson Hurricane Wind Scale, with no exemptions or exclusions. Wind velocity, or loads noted in 1.4 - Performance Requirements, shall be noted in writing on the warranty document.

PART 2 - PRODUCTS

2.1 ROOF PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.

B. Panel Sealants:

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 wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 ROOF UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
3. Products: Subject to compliance with requirements, provide one of the following:

    a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
    b. Grace Construction Products; Ultra.
    c. Henry Company; Blueskin PE200 HT.
    d. Metal-Fab Manufacturing, LLC; MetShield.
    e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.3 MISCELLANEOUS MATERIALS

A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 STANDING-SEAM METAL ROOF PANELS

A. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together.

B. 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. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 330 and E 331.
2. Subject to compliance with requirements, provide one of the following:

    a. “Stand ‘N Seam Metal Roofing”, Fabral.
    b. “Zip-Rib Standing Seam Panel”, Merchant & Evans, Inc.
    c. “Tite-Loc Plus”, Petersen Aluminum Corporation.

3. Material: Aluminum sheet, 0.032-inch thick.

    a. Exterior Finish: fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range, including metallic and Energy Star colors.

4. Joint Type: As standard with manufacturer.

    a. Where joint includes a batten cap, the cap shall be run continuous, without seams or joints, for the full length of the adjoining panels. Caps shall be same material, thickness, finish, and color as roof panels.

5. Panel Coverage: 18 inches.
6. Panel Height: 2 – 2.5 inches.
7. Clips: Stainless steel; two-piece type to accommodate expansion and contraction of roof panels.

2.5 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible.
3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum .040 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

2.6 FABRICATION, GENERAL

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. 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 roof panel side laps with a bead of elastomeric sealant that provides a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the 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. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.7 GUTTER, FASCIA, AND DOWNSPOUT FABRICATION

A. General: Fabricate fascia, gutters and downspouts to profiles indicated on drawings. Shop-fabricate work to greatest extent possible. Comply with details shown and with requirements of SMACNA “Architectural Sheet Metal Manual”.

B. Material: Aluminum sheet with “Kynar 500” fluoropolymer coating in thicknesses as follows:

1. Fascia: .040 Inch.
2. Gutters: .050 inch, with .063 inch hangers.
3. Downspouts: .040 Inch.

C. Hanging Gutter: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant.

1. Fabricate gutters for watertight performance.

2. Fasten gutter hangers to front and back of gutter.
3. Loosely lock straps to front gutter bead and anchor to roof deck.
4. Install gutter with expansion joints not exceeding 50 feet apart. Install expansion-joint caps.

D. Downspouts: Downspouts shall be continuous without joints.

1. Provide hangers of same material as downspouts with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at maximum of 48 inches o.c. in between.

2.8 METAL FINISHES

A. Fluoropolymer Coating: Manufacturer's standard two-coat, thermo-cured, full-strength 70 percent "Kynar 500" coating with suspended mica flakes consisting of a primer and a minimum 0.75-mil dry film thickness top coat with a total minimum dry film thickness of 0.9-mil and minimum 30 percent reflective gloss when tested in accordance with ASTM D523.

1. Durability: Provide coating that has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 in accordance with ASTM D4214; and without fading in excess of 5 Hunter units.
2. Color: As selected by the architect from the manufacturer's full range of colors including metallics.

a. Fascia, gutters, and downspouts may differ in color from metal roof panels.

3. 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.

2.9 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs and other suitable fasteners designed to withstand design loads.

B. Accessories: Provide components required for a complete fascia and soffit panel system, including trim, copings, sills, corner units, flashings, sealants, gaskets, fillers, and similar items. Match materials and finishes of panels.

1. Sealing Tape: Pressure sensitive 100 percent solids polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
2. Join Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

C. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Entirety of roof area.

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.

1. Point of Fixity: Fasten each panel along a single line of fixing located at ridge.
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Install metal roof panels as follows:

1. Commence panel installation and complete at least 10% but no more than 20% of the installation for initial inspection by a facility-authorized representative of the panel manufacturer.
2. Field cutting of metal panels by torch is not permitted.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Provide metal closures at rake edges rake walls and each side of ridge and hip caps.
5. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
6. Install ridge and hip caps as metal roof panel work proceeds.
7. End Splices: Not allowed.
8. Install metal flashing to allow moisture to run over and off metal roof panels.

D. Fasteners:

1. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Prepare joints and apply sealants to comply with panel manufacturer’s requirements.

3.4 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to roof sheathing with wood screws.
2. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.5 FASCIA INSTALLATION

A. Comply with manufacturer's instructions for assembly and installation. Install in accordance with approved shop drawings.

B. Isolate dissimilar metals and masonry or concrete from metals with bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate, and panels.

C. Limit exposed fasteners to extent indicated on shop drawings.

D. Anchorage shall allow for temperature expansion/contraction movement without stress or elongation of panels or anchors.

E. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with SMACNA standards, using continuous cleats where indicated on drawings.

F. Installed fascia shall be true to line and plane and free of dents and physical defects with a minimum of oil canning.

G. Form joints in linear metal to allow for ¼ inch minimum expansion at 20"-0" o.c. maximum and 8'-0" from corners. Provide 6 inch wide back-up plate at intersections. Form plates to profile of sheet metal item.

3.6 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof,

form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Connect downspouts to underground drainage system as indicated on drawings.

E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories at least twice during installation. Report results in writing, with photographs of installation progress.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation

B. Instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

C. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07411

SECTION 07521 - SBS-MODIFIED BITUMINOUS SHEET ROOFING

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 for application to the cricket portion of the roof:

1. Two-ply modified bituminous membrane roofing with mineral granule surfacing, applied over a base sheet.
2. Modified bituminous sheet flashing.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section "Flashing and Sheet Metal" for metal counter flashings.
2. Division 7 Section “Metal Roof Panels” for standing seam metal roof panels and peel-and-stick underlayment.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. UL Listing: Provide modified bituminous sheet roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.

C. Florida Product Approval Number: Provide modified bituminous membrane roofing system and component materials that carry a Florida Product Approval Number and/or Miami-Dade Notice-of-Approval (NOA) indicating that the system can resist the following wind uplift pressure:

1. -98psf.

1.5 SUBMITTALS

A. Product data for each type of product specified. Include data substantiating that materials comply with requirements.

B. LEED Submittals:

1. Product Test Reports for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.

C. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:

1. Base flashings, and membrane terminations.
2. Base sheet fastening patterns.

D. Samples of the following:

1. 12-by-12-inch-square samples of each color modified, bituminous, mineral-surface cap sheets to be exposed as finished roof surface.
2. 12 x 12 inch square samples of modified, bituminous flashing sheets.
3. 2 base sheet fasteners of each type, length, and finish.

E. Installer Certification: Submit written certification from manufacturer of modified bituminous sheet roofing system certifying that Installer is approved by manufacturer to install specified roofing system. Provide copy of certification to Architect before award of roofing work.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet, bitumen, and membrane flashings, from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.

B. Installer Qualifications: Engage an experienced Installer (Roofer) who is certified by modified bituminous sheet roofing system manufacturer as qualified to install manufacturer's roofing materials.

1. Installer's Field Supervision: Require Installer to maintain a full-time supervisor/foreman on job site during times that modified bituminous sheet roofing work is in progress and who is experienced in installation of roofing systems similar to type and scope required for this Project.

C. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor’s Association (NRCA), and follow torch safety practices as required by the contractor’s insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA

guidelines after roofing material application has been suspended for the day.

D. Preapplication Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; lightning protection system installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

E. Submit certification by the manufacturer of the system materials used that these Specifications and the Drawing Details are acceptable to them for the deck and surfacing to which they are to be applied.

1. If details for any manufacturer's systems proposed in the Contract Documents are not acceptable to the manufacturer, submit corresponding details proposed for the particular application, together with the manufacturer's reasons for not accepting the conditions depicted in the Specifications or Drawings. No alternate details will be considered without evidence of valid objections on the part of the manufacturer to the contract requirements.

F. Inspection: Prior to, during installation and at completion of the installation, an inspection shall be made by a representative of the manufacturer in order to ascertain that the roofing system has been installed according to their published specifications, standards and details.

1. Warranty will be issued upon approval of the installation.
2. Manufacturer's inspection reports shall be forwarded to the Architect concurrently with Applications for Payment for the periods during which they occurred.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle roofing sheets in a dry, well-ventilated, weathertight place to ensure no possibility of significant moisture pickup. Store rolls of felt and other sheet materials on end on pallets or other raised surface.

B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather or other moisture sources.

C. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit unit of Work to be installed in accordance with manufacturers' recommendations and warranty requirements.

1.9 ROOFING MEMBRANE WARRANTY AND MEMBRANE FLASHING ENDORSEMENT

A. Furnish written warranties with membrane flashing endorsements which shall extend from the Date of Substantial Completion as certified by the Architect for a period set forth below, and which shall cover any and all necessary labor and material for repair or replacement work required to keep and maintain the roofing membrane and membrane flashing work in a watertight and first class condition, at no additional cost to the Owner. Warranties and endorsements shall not be pro-rated by design or inflation. These warranties and endorsements shall be limited to cover ordinary wear and tear caused by the elements and to defects due to faulty materials or workmanship.

These warranties shall be furnished independently by each of the following:

1. For a period of two (2) years after the Date of Substantial Completion of the project, by:

   a. The roofing installer.

2. For a period of twenty (20) years after the Date of Substantial Completion of the project (20 year no-dollar-limit warranty), by:

   a. The manufacturer of the roofing products.

3. For a period of one (1) year after the Date of Substantial Completion of the Project, by:

   a. The Contractor.

B. Damages to the building or to its contents during construction and prior to the date of completion of the roofing work shall be borne by the responsible individuals (or firms), excepting the manufacturer, if caused by defects in workmanship. This includes the Contractor and the Roofing Installer.

C. Damages to the building or to its contents due to defect in workmanship after the Date of Substantial Completion and for a period of two (2) years thereafter shall be severally borne by the responsible firm(s) (Contractor, Roofing Installer), excepting the manufacturer.

D. The above described warranties and endorsements shall be delivered to the Owner (via the Architect) by the Contractor prior to any obligation of the Owner to reduce the retainage on payments due the Contractor.

E. No lesser terms of the "standard" warranties or guarantees by the manufacturer shall apply to this Contract if less stringent than the requirements of this Section. The requirements set forth herein shall be set forth in writing in the signed warranties provided to the Owner under this Contract.

1. Warranty shall cover damage to the modified bitumen roofing system caused by hurricane force winds up to the 190mph design wind velocity noted on the drawings, and resulting uplift pressure up to (-)98psf.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET ROOFING SYSTEM

A. Modified Bitumen membrane/Fully Adhered:

1. General:

a. Performance: provide roofing materials recognized to be of generic type and manufacturer indicated and tested to show compliance with indicated performances.

2. Membrane Manufacturer:

a. General: Only the modified bitumen roofing manufacturers listed herein may provide the products specified.

b. For all applications, provide a 2-ply SBS modified bitumen elastomeric roofing system for cold adhesive or cold adhesive and torch-down installation over a mechanically fastened base sheet. The materials of the membrane roofing shall conform to the following requirements:

1. Base Sheet: smooth, fiberglass scrim reinforced/polyester mat composite impregnated with SBS modified bitumen. Minimum thickness 91 mils; minimum weight per square 60 lbs.
2. First Ply-smooth SBS fiberglass or polyester reinforced, 90 mils (average) thick membrane, weight 60 lbs. per 100 sq. ft. (average).

3. Cap Ply - SBS fiberglass reinforced, 114 mils minimum (average) thickness with white granular, “cool roof” surface. Weight 96 lbs. per 100 sq. ft. minimum (average).
4. Flashings - SBS fiberglass or polyester reinforced, 98 mils (minimum) cap thickness, faced with embossed aluminum foil, weight 90 lbs. per 100 sq. ft. (minimum) cap weight, or mineral faced as standard with membrane manufacturer.

c. Modified Bitumen Roofing Manufacturers: Subject to conformance to specifications including warranty requirements, provide one of the following systems:

1. Siplast Paradiene 20/30 CR FR TG, consisting of a base sheet of Siplast Paradiene 20 PR mechanically fastened to deck substrate, an inter ply of Paradiene 20 Base; and a cap ply of Paradiene 30 CR FR TG Cap, with Veral aluminum-surfaced flashing system applied over Paradiene 20 flashing base ply.
2. Garland Versiply 40/Stressply EUV System, consisting of a base sheet of Garland Versiply 40 mechanically fastened to deck substrate; an inter ply of Garland Versiply 40 bonded to the base ply with Green-Lock solvent-free cold adhesive; and a cap ply of Garland Stressply EUV Mineral 155 mil SBS membrane surfaced with highly reflective “Starburst” white mineral. Flashing system shall be per Garland’s recommendations.

d. The Contractor shall immediately, upon application of roofing membrane cap plies, install loose white granules into exposed black asphalt. Professional workmanship shall be required to keep the roof’s white cap sheet and flashing looking aesthetically pleasing upon completion of Project. Voids, air pockets, ridges, and wrinkles are not acceptable as a finished product.

3. Related Materials:

a. Pipes or vents shall be jacketed. Jackets shall be formed from minimum 4 lb. Lead sheet with minimum 4 in. flanges and extend into the vent a minimum of 1-1/2 in.

2.3 MISCELLANEOUS MATERIALS

A. Mastic Sealant: Polyisobutylene (plain or bituminous modified), nonhardening, nonmigrating, nonskinning, and nondrying.

B. Asphalt Primer: ASTM D41.

C. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to plywood substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. With installer present, examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

1. Verify that wood blocking and nailers are securely anchored to roof deck at roof penetrations and terminations.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."

B. Start installation of modified bituminous membrane roofing in presence of roofing system manufacturer's technical personnel.

C. Cooperate with inspection and test agencies engaged or required to perform services in connection with installing modified bitumen sheet roofing system.

D. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of modified bituminous sheet roofing system work.

E. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.

F. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

G. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets. Provide temporary covering of two plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work.

3.3 BASE-SHEET INSTALLATION

A. Install lapped base-sheet course, extending sheet over and terminating as shown on drawings. Attach base sheet as follows:

1. Mechanically fasten to substrate. Space fasteners as required by specified wind uplift pressure.

3.4 BASE-PLY (INTER PLY) SHEET INSTALLATION

A. Install modified bitumen base-ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align base-ply sheets without stretching. Extend sheets over deck and terminate as shown on drawings.

1. Embed each base-ply sheet in a continuous void-free application of cold adhesive to form a uniform membrane.

3.5 SBS-MODIFIED BITUMINOUS CAP SHEET INSTALLATION

A. Install modified bituminous roofing membrane cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.

1. Adhere Garland cap sheet to substrate in cold-applied adhesive, or
2. Torch apply Siplast cap sheet to substrate.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
2. Apply roofing membrane granules to cover exuded bead at laps while bed is hot.

C. Install roofing membrane sheets so side and end laps shed water.

3.6 FLASHING AND STRIPPING INSTALLATION

A. Install flashing at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application: Adhere backer sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
3. Flashing Sheet Application: Adhere Garland flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer, or
4. Flashing Sheet Application: Torch apply Siplast flashing sheet to substrate.

B. Counter-Flashings: Counter flashings to be coordinated with modified bitumen roofing work are specified in other Sections.

3.7 PROTECTING ROOFING

A. Protect roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report, with copies to Architect and Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 07521

SECTION 07620 – SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Extent of flashings is indicated on the drawings.

B. Type of work specified in this Section includes the following:

1. Metal flashing for metal roof panel installation:

a. Reglet and counterflashings at intersections of roof and masonry walls.

C. Metal roof panels, edge metal, fascia, soffits, gutters, and downspouts are specified in Section 07411 “Metal Roof Panels”.

1.3 JOB CONDITIONS

A. Do not proceed with the installation of flashing and sheet metal work until curb and substrate construction, cant strips, blocking and other construction to receive work is completed.

B. The Installer must examine the substrate and the conditions under which flashing and sheet metal work is to be performed, and notify the Contractor, in writing, of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Fasteners: Aluminum or Series 300 stainless steel.

C. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

2.2 REGLET AND COUNTERFLASHING SYSTEM

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated. Provide manufacturer's standard accessories including prefabricated corners, wind clips, and foam end pieces.

B. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

1. Provide wind-restraint clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following in minimum .025" aluminum:

1. Fry Reglet Corporation; "STX Reglet."
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company.

PART 3 – EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Comply with manufacturer's instructions and recommendations for handling and installation of flashing.

B. Performance: Coordinate the work with other work for the correct sequencing of items which make up the entire system of weatherproofing or waterproofing and rain drainage. It is required that the flashing be permanently watertight, and not deteriorate in excess of manufacturer's published limitations.

3.2 INSTALLATION OF METAL WORK

A. Provide for thermal expansion of all exposed flashings as follows:

1. 10'-0" maximum spacing and located 2'-0: from corners and intersections.

B. Isolate dissimilar metals such as galvanized steel and aluminum by application of bituminous coating to prevent metal to metal contact.

3.3 FLASHINGS AT ROOF-TO-WALL INTERSECTIONS

A. Install manufactured reglets to receive counterflashing according to manufacturer's instructions, parallel to roof slope and true to line.

B. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 6 inches and bed with sealant.

END OF SECTION 07620

SECTION 07841 – FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes firestopping and smokesealing for the following:

1. At the head of fire-resistance-rated and smoke-resistant walls abutting the underside of structural floor and roof decks, and the perimeter of such walls at abutting construction.
2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
4. Sealant joints in fire-resistance-rated construction.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 15 Sections "Mechanical."
2. Division 16 Sections "Electrical."

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

1. Firestopping and smokesealing shall comply with the requirements of the Florida Building Code, 2004 edition, and NFPA 101, latest edition.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

D. For firestopping exposed to moisture and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Shop drawings detailing condition-specific materials, installation methods, and relationships to adjoining construction for each through-penetration firestop and smokeseal system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop and smokeseal configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency

performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

    a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:

    a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
    b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

D. Provide firestopping products: shall not contain asbestos. Products shall be certified by manufacturer as "asbestos free."

1.6 COORDINATION

A. Coordinate with plumbing, mechanical, electrical, and other trades to ensure that pipe, conduit, cable, and other items which penetrate fire-rated or smoke barrier construction have been permanently installed, and sleeved when necessary, prior to installation of firestops and smokeseals.

B. Schedule and sequence the work to assure that partitions and other construction which would conceal or enclose penetrations are not erected prior to the installation of firestops and smokeseals.

1.7 WARRANTY AND CERTIFICATION

A. Contractor shall provide the following notarized affidavit jointly signed by corporate officers, with titles noted, of both the Contractor and material applicator:

"We the undersigned certify that firestops and smokeseals have been installed in accordance with Contract Document requirements and manufacturer's instructions, and that materials used meet firestopping and smokesealing requirements of the Contract Documents".

B. Manufacturer shall provide the following certification, executed by the appropriate person, with title and department noted:

"Products provided by (manufacturer) for the (name of project) are composed of the same ingredients and formulation or are of the same components and identical construction as products that have been tested by (the testing agency) for various fire resistive and other performance ratings, and when properly applied or installed in accordance with (manufacturer) instructions will perform in a manner consistent with results obtained in the tests conducted by (the testing agency)".

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

a. Semirefractory fiber (mineral wool) insulation.
b. Ceramic fiber.
c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
d. Fire-rated formboard.
e. Joint fillers for joint sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

C. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.

E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.

G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.

I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant.

J. Acoustical Sealant (for use only in assemblies indicated to be smoke resistant; not for firesafing of assemblies with fire resistance ratings): ASTM C919 and ASTM C834, water-based, highly elastic caulking; non-bleeding and staining, permanently flexible. Flame spread 0, smoke developed 0.

K. Products: Subject to compliance with requirements, provide one of the following:

1. Endothermic, Latex Sealant:

   a. Fyre-Shield, Tremco Inc.

2. Endothermic, Latex Compounds:

   a. Flame-Safe FS500/600 Series, W.R. Grace.
   b. Flame-Safe FS900/FST900 Series, W.R. Grace.

3. Intumescent Latex Sealant:

   a. Metacaulk 1000, The RectorSeal Corporation.
   b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
   c. Bio Fireshield 500+, The RectorSeal Corporation.
   d. Bio Fireshield Bio-BF150, The RectorSeal Corporation.

4. Intumescent Putty:

   a. Pensil 500 Intumescent Putty, General Electric Co.
   b. SpecSeal Series SSP, Specified Technologies, Inc.
   c. Fire Barrier Moldable Putty, 3M Fire Protection Products.
   d. Bio Fireshield Fire Rated Putty, The RectorSeal Corporation.

5. Intumescent Wrap Strips:

   a. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
   b. Bio Fireshield Wrap Strip, The RectorSeal Corporation.

6. Job-Mixed Vinyl Compound:

   a. USG Firecode Compound, United States Gypsum Co.

7. Mortar:

   a. Bio Fireshield K-2 Firestop Mortar, The RectorSeal Corporation
   b. Bio Fireshield K-10 Firestop Mortar, The RectorSeal Corporation
   c. KBS-Mortar Seal, International Protective Coatings Corp.

8. Pillows/Bags:

   a. Bio Fireshield Firestop Pillows, The RectorSeal Corporation
   b. KBS Sealbags, International Protective Coatings Corp.

9. Silicone Foams:

    a. Pensil 200 Foam, General Electric Co.

10. Silicone Sealants:
    a. Pensil 100 Firestop Sealant, General Electric Co.
    b. Metacaulk 835+, The RectorSeal Corporation.
    c. Fyre-Sil, Tremco Inc.
    d. Fyre-Sil S/L, Tremco Inc.
    e. Bio Fireshield Biotherm 100 & 200, The RectorSeal Corporation

11. Acoustical Sealant

    a. Sheetrock Acoustical Sealant, U.S. Gypsum Company.
    b. PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
    c. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.

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 firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

    1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
    2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
    3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping’s seal with substrates.

3.3 INSTALLING FIRESTOPS AND SMOKESEALS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration and head-of-wall firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

1. In non-fire-rated, smoke-resistant assemblies, install resilient sealant, either acoustical or fire-resistant type, to completely fill all voids at through-penetrations and head-of-wall intersections to block the passage of smoke. In no event shall drywall compound be used for this purpose.

C. Install fill materials for through-penetration and head-of-wall firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces

adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

    a. Control and expansion joints in unit masonry.
    b. Control and expansion joints in Portland cement plaster.
    c. Perimeter joints between materials listed above and frames of doors and windows.
    d. Control and expansion joints in ceiling and overhead surfaces.
    e. Other joints as indicated.

2. Exterior joints in horizontal traffic surfaces as indicated below:

    a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    b. Other joints as indicated.

3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    e. Other joints as indicated.

4. Interior joints in horizontal traffic surfaces as indicated below:

    a. Control and expansion joints in cast-in-place concrete slabs.
    b. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section “Flashing and Sheetmetal” for sealants used in sheetmetal work.
2. Division 8 Section “Glass and Glazing” for sealants used in glazing.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data from manufacturers for each joint sealant product required.

C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

E. Provide and maintain a file of manufacturer’s instructions for each of the products used.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants in existing interior concrete pavement to occur prior to application of clear concrete sealing compound where indicated or scheduled on drawings.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

B. Products: Subject to compliance with requirements, provide one of the products specified.

C. Single Part Pourable Urethane Sealant for use in horizontal joints in floor slabs, sidewalks, and concrete pavement. Provide one of the following:

1. “Vulkem 45"; Mameco International, Inc.
2. “NR-201 Urexpan”; Pecora Corp.
3. “Sonolastic SL1"; Sonneborn brand by BASF Building Systems.

D. Single Part Nonsag Urethane Sealant for use in sealing hollow metal door frames to adjoining wall surfaces, roof flashing and edge metal installations, and general purpose exterior sealing except where silicone is specified:

1. “Vulkem 921”; Tremco.
2. “Dynatrol 1”; Pecora Corp.
3. “Sika Flex-1a”; Sika Corp.
4. “Sonolastic NP 1”; Sonneborn brand by BASF Building Systems.

E. Medium-Modulus Neutral-Curing Silicone Sealant for use in all exterior masonry control and expansion joints, and for perimeter sealing of aluminum windows and storefronts.

1. 791; Dow Corning (accommodates joint movement of ±50 percent).

   a. Apply to masonry and concrete with Dow Corning 1200 Primer.

2. “Sonolastic 150”; Sonneborn brand by BASF Building Systems.

2.3 LATEX JOINT SEALANTS

A. Acrylic-Emulsion Sealant: Manufacturer’s standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent. Provide at intersections of interior door and window frames and adjoining wall surfaces.

1. “AC-20"; Pecora Corp.
2. “Sonolac”; Sonneborn Building Products.

2.4 ACOUSTICAL JOINT SEALANT

A. Acoustical sealant for Exposed and Concealed Joints: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Install at perimeter joints around all electrical boxes in acoustically-rated walls and all drywall ceilings throughout Music Building 1 and Building 1 Addition, and elsewhere as indicated on drawings.

B. Manufacturer – Provide one of the following:

1. AC-20FTR Acoustical and Insulation Sealant; Pecora Corporation
2. Sheetrock Acoustical Sealant; USG Corp.

2.5 MILDEW – RESISTANT SILICONE SEALANT

A. One-part mildew-resistant interior sealant designed to seal nonporous interior building surfaces including tubs, sinks, lavatories, and urinals at perimeter intersection with finished walls.

B. Manufacturer – Provide one of the following:

1. Dow Corning 786 Mildew-Resistant Silicone Sealant.
2. Sanitary SCS1700 Sealant; G.E. Silicones

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of either material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf (40 kg/cu. m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with 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 joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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 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 printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.
b. Do not stretch, twist, puncture, or tear joint fillers.
c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved 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 or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or

deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07920

SECTION 08111 - STANDARD 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. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4 Section “Unit Masonry” for building anchors into and grouting frames in masonry construction.
2. Division 8 Section “Flush Wood Doors” for solid-core wood doors installed in steel frames.
3. Division 8 Section “Door Hardware” for door hardware and weatherstripping.
4. Division 8 Section “Glazing” for glass in steel doors and sidelights.
5. Division 9 Section “Painting” for field painting primed doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Approval Numbers: Provide State of Florida Product Approval Numbers.

B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.

C. Shop Drawings:

1. In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

a. Elevations of each door design.

b. Details of doors, including vertical and horizontal edge details.
c. Frame details for each frame type, including dimensioned profiles.
d. Details and locations of reinforcement and preparations for hardware.
e. Details of each different wall opening condition.
f. Details of anchorages, accessories, joints, and connections.

2. State of Florida Product Approval must be applicable to actual door and frame sizes indicated on drawings.

3. Shop drawings shall indicate hardware locations for doors and frames based upon Steelcraft standards. No other locations are acceptable.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. 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.

1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. 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 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products.
2. CURRIES Company; an ASSA ABLOY Group Company.
3. Republic Builders Products Company.
4. Steelcraft; an Ingersoll-Rand Company.
5. Hollow Metal, Inc.
6. Amweld International, LLC

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: As indicated on Drawings.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI/SDI A250.8.

    a. Fire Door Core: As required to provide fire-protection ratings indicated.

3. Vertical Edges for Single-Acting Doors: Beveled edge

    a. Beveled Edge: 1/8 inch in 2 inches.

4. Top and Bottom Edges: Closed with flush (at top), inverted (at bottom), 0.042-inch- thick end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior and Interior Doors: Face sheets fabricated from A-60 galvannealed 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 2 (Seamless), 16 gage (.053 inch).
2. Exterior doors shall be hurricane resistant and tested for compliance with ANSI A250.13.
3. Exterior doors shall be rated to resist the following minimum, allowable, wind load design pressures. Note that these pressures have been calculated by multiplying the ultimate wind pressures by a factor of .6.

    a. Single Doors: +30.8 psf; -40.5 psf
    b. Double Doors: +30.8 psf; -40.5 psf

4. Exterior doors shall bear the label of the National Fenestration Rating Council (NFRC) and shall comply with Chapters 3 and 4 of the Florida Building Code, Fifth Edition (2014), Energy Conservation.

    a. Exterior doors shall have a maximum U-Value of U-0.61 per FBC Table C402.2 for Swinging, Opaque Doors.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Louvers: Provide louvers for interior and exterior doors where indicated on drawings which comply with SDI 111c.

1. Cold-rolled steel sheet shall be A60 galvanized steel.

2. Louvers shall have inverted – Y blade design.

3. Exterior doors with louvers shall comply with large missile impact criteria of the Florida Building Code and have a State of Florida Product Approval Number.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior and Interior Frames: Fabricated from A-60 galvannealed steel sheet.

1. Fabricate frames with mitered or coped and continuously welded face corners.
2. Frames for Level 3 Steel Doors: 16 gage (.053 inch) thick steel sheet.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
2. Postinstalled Expansion Type for In-Place Concrete Masonry: minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

F. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

G. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. Provide three anchors per jamb.
    b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.

1. All locations shall be based upon Steelcraft standards.
2. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware according to ANSI A250.8.

2.6 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Galvannealed Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    c. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
3. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08111

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.

B. Related Sections:

1. Division 9 Section “Painting” for field painting of metal louvers and metal frames for light openings.
2. Division 8 Section “Glazing” for glass in view panels in flush wood doors.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, and other pertinent data.

1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

D. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

E. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, 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.

1.4 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:

1. AWI Quality Standard: Architectural Woodwork Quality Standards of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
2. WDMA I.S.1-A, “Architectural Wood Flush Doors.”

B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:

1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 WARRANTY

A. General Warranty: Door manufacturer's 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. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers

exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
   a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:

1. Solid Core Doors:

   a. Algoma Hardwoods, Inc.
   b. Eggers Industries
   c. Graham Wood Doors
   d. Marshfield Door Systems
   e. Mohawk Flush Doors, Inc.
   f. VT Industries, Inc.

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for Transparent Finish: Comply with the following requirements:

1. Faces: Running, book-matched, rotary-cut, white birch.
2. A.W.I. Grade: Premium.
3. Construction: PC 5 (Particleboard core, 5 ply, with core bonded to faces).
4. Core: Particleboard core, ANSI A208.1, Grade LD-2.
5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Solid Core Doors: Comply with the following requirements:

1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
3. Blocking: Provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:
   a. 5-inch top rail blocking.
   b. 5-inch bottom rail blocking.
   c. 5-by-18-inch lock blocks.

d. 5-inch midrail blocking.

2.3 LOUVERS AND LIGHT FRAMES

A. Metal Louvers: Field install in factory cut opening.

1. Blade Type: Vision-proof, inverted V.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, hot-dip zinc coated and factory primed for paint finish.
3. Fire Door Louvers: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire rating of one and one-half hours and less.

B. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; factory primed and approved for use in doors including fire rated doors where indicated.

2.4 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:

1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:

a. Comply with clearance requirements of referenced quality standard for fitting.
b. Comply with requirements of NFPA 80 for fire-resistance-rated doors.

2. 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.

a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

B. Openings: Factory 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. Glazing: Factory install glazing in doors. Comply with applicable requirements in Section 08800 "Glazing."
3. Louvers: Field install louvers in factory prepared openings.

2.5 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium
2. Finish: WDMA System TR-8 UV cured catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section "Door Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
2. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stiles for pairs of doors, and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.
3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08211

SECTION 08361 - SECTIONAL OVERHEAD 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 sectional overhead doors, as follows:

1. Steel panel doors.

B. Related Sections include the following:

1. Division 9, Section “Painting” for field-applied paint finish on exterior sides of doors.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract.

B. Product data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include manufacturer's operating instructions and maintenance data.

C. Shop drawings for special components and installations which are not fully dimensioned or detailed in manufacturer's data including wind bracing for door panels.

1. Drawings must include details for anchorage of door tracks to building to meet wind and impact load requirements. Indicate fastener or weld type, size, and spacing for attachment to masonry walls. Note actual, field-measured rough door opening dimensions.
2. Shop drawings shall be signed and sealed by a Florida registered professional engineer.
3. Shop Drawings shall include State of Florida Product Approval.

a. Approval must be applicable to actual door size specified herein.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide each sectional overhead door as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, and installation accessories.

B. Installer: Installation of sectional doors shall be performed by an authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide doors, tracks, and accessories from one manufacturer. Provide secondary components from source acceptable to manufacturer of primary components.

D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

E. Wind Loads: Provide sectional overhead door system including anchorage to building capable of withstanding wind load design pressures as indicated:

1. Positive pressure = 50 p.s.f.
2. Negative pressure = -50 p.s.f.

F. Missile Impact Loads: Provide sectional overhead door system including anchorage to building capable of withstanding large and small missile impact loads in accordance with the Florida Building Code, Sections 1609 and 1626.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements provide one of the following:

1. Overhead Door Corporation – Series 424 Commercial Steel Door.
2. Raynor Garage Doors – Series S24 SteelForm Standard Steel Door.
3. Clopay Building Products – Series 524 Commercial Sectional Door.
4. Substitutions: Equivalent products by other manufacturers will be considered upon receipt of a properly submitted substitution request not less than 10 days prior to bid opening. Such requests must be accompanied by a copy of a shop drawing reflecting State of Florida Product Approval and compliance with wind load pressures as noted above for the specified door size.

2.2 STEEL SECTIONS

A. Sectional Door Assembly: Steel door assembly with rabbeted meeting rails to form weathertight joints and provide full-width interlocking structural rigidity. Units shall have the following characteristics:

1. Panel Thickness: 2”.
2. Exterior Surface: Smooth Rib.
3. Steel: Minimum 24 gauge, galvanized.
4. Center and End Stiles: 16 gauge.
5. Finish and Color: Factory-applied baked-on white polyester or epoxy coating.
6. Height: 14’-1” (required for 14’-0” actual, clear masonry opening).
7. Width: 14’-2” (required for 14’-0” actual, clear masonry opening). Door must be

wide enough to allow tracks' continuous angles to be secured to reinforced concrete columns as indicated on drawings.

B. Reinforce sections with continuous horizontal reinforcing, as required by door width and design wind loading. Provide galvanized steel angles, bars, struts, channels, or U-bars, formed to depth, and bolted in place.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Provide manufacturer's standard, 3" galvanized-steel track system designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing for rigid support of ball-bearing roller guides for required door type and size. Slope tracks at proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

1. Provide lift clearance track.

B. Track Reinforcement and Supports: Provide galvanized-steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

C. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve, mid-point, and end of tracks.

D. Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weatherstrip gasket at tops and compressible astragal on bottoms of each overhead door. Provide jamb seals.

2.4 HARDWARE

A. General: Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.

B. Hinges: Provide heavy steel hinges at each end stile and at each intermediate stile, per manufacturer's recommendations for size of door. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible.

C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide roller tires to suit size of track (3-inch diameter for 3-inch track) and as follows:

1. Case-hardened steel tires for normal installations.

2.5 COUNTERBALANCING MECHANISM

A. Torsion Spring: Operation by torsion-spring counterbalance mechanism, consisting of heavy duty adjustable-tension, tempered-steel torsion springs mounted on a cross header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables. Provide springs calibrated for 100,000 cycles minimum.

B. Provide cast-aluminum or grey-iron casting cable drums, grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts over 16 feet long, unless closer spacing recommended by door manufacturer.

C. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Furnish electric door-operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

B. Disconnect Device: Hand-operated disconnect device or mechanism for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount emergency chain operator so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Provide 6 digit, non-resettable counter mounted to each operator.

E. Door Operator Type: Provide the following:

1. Jackshaft (side mount) gear-head hoist type, with enclosed worm-gear, running-in-oil, primary drive; chain-and-sprocket secondary drive; auxiliary chain hoist; and floor-level quick release for manual operation.

    a. Product: Provide Liftmaster Model GH 75 operator (no substitutions).

F. Electric Motors: Provide high-starting torque, reversible, constant-duty, Class A-insulated electric motors with overload protection, sized to move door in either direction, from any position, at not less than 2/3 foot per second or more than 1 foot per second.

1. Coordinate wiring requirements and current characteristics of motors with building electrical system.
2. Provide open-drip-proof type motor, and controller with NEMA ICS 6, Type 1 enclosure.
3. Motor to be minimum ¾ H.P.

G. Remote Control Station: Provide momentary-contact, three-button control station with push button controls labeled “Open”, “Close”, and “Stop”.

1. Provide interior units, full-guarded, surface-mounted, heavy-duty, with general purpose NEMA Type 1 enclosure, two per door as indicated on drawings (two gangs of six stations each).

H. Radio control system: Provide universal radio control system. Provide one UHF radio receiver for each door operator. Provide four six-channel portable transmitters. Program transmitters in accordance with Owner’s directions at time of installation.

1. Provide one coaxial antenna per door installed below soffit and centered on door opening with stainless steel brackets, as indicated on drawings.

I. Automatic Reversing Control: Provide each door with automatic safety sensor edge, located within neoprene or rubber astragal mounted to bottom door bar. Contact with bar shall immediately reverse downward door travel. Provide manufacturer’s standard take-up reel or self-coiling cable.

1. Provide electrically or pneumatically actuated automatic bottom bar.

J. Photoelectric Sensor: Provide each door with the following:

1. In addition to automatic bottom bar, provide watertight NEMA 4 design photoelectric system designed to detect an obstruction in door opening without contact between door and obstruction. Photoelectric system components shall be positioned to create a diagonal beam across each door opening. Verify mounting height with Architect prior to installation.

K. Door Open Indicator Lights: Coordinate installation of electric door operators with installation of wall-mounted “fully open” indicator lights as shown on drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install doors, tracks, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer's instructions, and as specified.

B. Fasten vertical track assembly to structure in accordance with shop drawings. Hang horizontal track from structural overhead framing with angle or channel hangers, bolt-

fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door-operating equipment.

C. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

D. Touch-up damaged coatings, finishes, and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

3.3 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.
3. Review data in the maintenance manuals.
4. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 08361

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior entrance systems (hurricane-resistant).
2. Exterior storefront systems (hurricane-resistant).

B. Related sections include the following:

1. Division 7 Section “Joint Sealants” for sealing between framing and masonry.
2. Division 8 Section “Door Hardware” for lock cylinders.
3. Division 8 Section “Glazing” for glass requirements.

1.3 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:

1. Air infiltration and water penetration exceeding specified limits.
2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to the requirements of the Florida Building Code and ASCE 7-10.

1. Entrance doors and storefronts shall be rated to resist the following minimum, allowable, wind load design pressures. Note that these pressures have been calculated by multiplying the ultimate wind pressures by a factor of .6.

a. Positive pressure = +30.8 psf
b. Negative pressure = -33.6 psf

2. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.

3. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

    a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
    b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

D. Hurricane-Resistance Test Performance: Provide entrance and storefront systems that pass large and small missile-impact tests, as required by systems' location above grade, and cyclic-pressure tests according to The Florida Building Code, Section 1626.

E. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.

F. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

G. Engineering Responsibility: Storefront subcontractor shall engage a Florida registered structural engineer to design connections, member reinforcements, and fastening to building structure, and prepare design calculations and engineering data.

H. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

    a. Maximum air leakage of 0.06 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa)

2. Entrance Doors:

    a. Pairs of Doors: Maximum air leakage of 1.0 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa)
    b. Single Doors: Maximum air leakage of 0.5 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa)

I. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

J. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.

1. Temperature Change (Range): 100 deg F ambient; 150 deg F material surfaces.

K. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

L. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work. Show elevations at 2 A scale and details at 3" scale.

1. Shop drawings shall include large-scale anchorage details indicating attachment to slabs, walls, and overhead structure.
2. Submit calculations, structural properties, connection information and product information to verify that the system performance and anchorage can successfully resist wind loads. All calculations shall be signed and sealed by a Florida registered professional structural engineer.
3. For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.
4. Shop drawings shall include State of Florida Product Approval applicable to actual sizes of doors indicated.

C. Manufacturer’s certification that the overall entrance door assembly complies with the Florida Building Code – Energy Conservation, 5th Edition (2014), as follows, when fitted with the glass specified in Section 08800 - Glazing.

1. U-factor, Entrance Doors = .83 max.
2. SHGC = .25 max.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated.

1. Do not modify intended aesthetic effect, 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. All exterior storefronts and storefront entrance doors shall bear the label of the National Fenestration Rating Council (NFRC) and shall comply with Chapters 3 and 4 of the Florida Building Code, Fifth Edition (2014), Energy Conservation. This project is located in International Climate Zone 2A.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions 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. Kawneer Company, Inc.
2. Vistawall Architectural Products.
3. YKK AP America

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211.

B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

C. Glazing shall be provided by aluminum entrance manufacturer as follows:

1. Refer to Division 8 Section - Glazing.

D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

1. Provide silicone sealant in lieu of glazing gasket if required by entrance manufacturer for hurricane-resistant construction.

E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

2.3 COMPONENTS

A. Doors: Provide manufacturer's standard 1-3/4-inch- thick glazed doors with minimum 0.125-inch- thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
2. Stile Design: Medium stile; 3-1/2-inch nominal width.

B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.
2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match

framing members or hardware being fastened, unless otherwise indicated.

D. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated.

B. Ball-Bearing Butts: ANSI/BHMA A156.1, Grade 1, 5 knuckle, 4 1/2-by4-inch ball-bearing butts. Provide nonremovable pins at hinges exposed to door outside and provide nonferrous hinges for applications exposed to weather. Provide 3 hinges at each leaf for doors up to 36 inches wide and 80 inches tall; provide 4 hinges at each leaf for taller doors.

C. Closers, General: Comply with manufacturer's recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.

1. Closing Cycle: Comply with Florida Accessibility code for Building construction or the Americans with Disabilities Act (ADA), whichever is more stringent.
2. Opening Force: Comply with the following maximum opening-force requirements for locations indicated:

a. Exterior Doors: 8.5 lbf.

3. Hold Open: Adjustable.

D. Surface-Mounted Overhead Closers: ANSI/BHMA A156.4, Grade 1.

E. Door Stops: ANSI/BHMA A156.16, Grade 1, floor- or wall-mounted door stop, as appropriate for door location indicated, with integral rubber bumper.

F. Mortise Cylinders: Cylinders are specified in Section 08710 - Door Hardware.

G. Deadlatch Locks: Manufacturer’s standard mortise deadlatch with minimum 2 inch long latch bolt and auxiliary bolt located below latch bolt and complying with ANSI/BHMA A156.5, Grade 1 requirements.

H. Radius Face Strikes: Manufacturer's standard stainless-steel, radiused face strike with steel mounting plate and black-plastic dustbox.

I. Vertical-Rod Exit Devices: At all doors, provide concealed, vertical-rod exit device complying with UL 305 requirements, with 2-point top and bottom latching that is released by a full-width crash bar or when locked down (dogged) by lock cylinder or retracting screws beneath housing.

1. Device shall comply with hurricane-resistant entrance system requirements.

J. Pull Handles: As selected by Architect from manufacturer's full range of pull handles and plates.

K. Thresholds: At exterior doors, provide manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 2-inch- high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:

1. Material: Aluminum, mill finish.

L. Weather Sweeps: Manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1. Fabricate components for screw-spline frame construction.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

F. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

G. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete, hurricane-resistant system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

1. Frame dimensions to be 2-1/2" x 5" maximum.

H. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to

greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.

1. Provide compression weatherstripping at fixed stops.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finiah: 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 System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and flouropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.7 STEEL PRIMING FOR STEEL REINFORCEMENT

H. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

I. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

J. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 STOREFRONT INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated.

E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer’s written instructions using concealed fasteners to greatest extent possible.

G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

H. Install perimeter sealant, using compatible backer rod where indicated on drawings.

I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 08520 - ALUMINUM WINDOWS

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 Heavy-Commercial Grade aluminum windows of the performance class indicated. Window types required include the following:

1. Horizontal sliding windows.

B. Related Sections include the following: Division 8 Section “Glazing” for glazing requirements for aluminum windows, including those specified to be factory glazed.

1.3 DEFINITIONS

A. Performance class number, included as part of the window designation system, is the actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.

1. Structural test pressure, wind load test, is equivalent to 150 percent of the design pressure.
2. Water-leakage-resistance test pressure is equivalent to 15 percent of the design pressure with 2.86 lbf/sq. ft. (137 Pa) as a minimum for Residential, Commercial, and Heavy-Commercial Grade windows.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

B. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:

1. Refer to structural drawings for table of positive and negative design wind pressures for doors and windows.

2. Test Procedures: Test window units according to ASTM E 283 for air infiltration,

both ASTM E 331 and ASTM E 547 for water penetration, and ASTM E 330 for structural performance.

C. Performance Requirements: Testing shall demonstrate compliance with requirements indicated in AAMA 101 for air infiltration, water penetration, and structural performance for type, grade, and performance class of window units required. Where required design pressure exceeds the minimum for the specified window grade, comply with requirements of AAMA 101, Section 3, "Optional Performance Classes," for higher than minimum performance class.

1. Air-Infiltration Rate for Operating Units: Not more than 0.20 cfm per square foot for an inward test pressure of 1.57 lbf/sq. ft.
2. Water Penetration: No water penetration as defined in the test method at an inward test pressure of 15 percent of the design pressure.
3. Structural Performance: No failure or permanent deflection in excess of 0.4 percent of any member's span after removing the imposed load, for positive (inward) and negative (outward) test pressures indicated on drawings.
4. Thermal Movements: Provide window units that allow thermal movement resulting from the following maximum change (range) in ambient temperature when engineering, fabricating, and installing aluminum windows to prevent buckling, opening of joints, and overstressing of components, connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.

    a. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

5. Thermal Transmittance: U-factor, Operable Fenestration = .65 max.
6. Solar Heat-Gain Coefficient (SHGC) = .25 max.

D. Wind Loads: Provide aluminum window system including anchorage to building capable of withstanding minimum allowable wind load design pressures as indicated. Note that these pressures have been calculated by multiplying the ultimate wind pressures by a factor of .6.

1. Positive pressure = +32.5 psf
2. Negative pressure = -43.5 psf

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of window required, including the following:

1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on hardware, accessories, and finishes.
4. Recommendations for maintaining and cleaning exterior surfaces.

C. Shop Drawings showing fabrication and installation of each type of window required including information not fully detailed in manufacturer's standard Product Data and the following:

1. Layout and installation details, including anchors.
2. Elevations at 1/4 inch = 1 foot scale and typical window unit elevations at 3/4 inch = 1 foot scale.
3. Full-size section details of typical composite members, including reinforcement and stiffeners.
4. Location of weep holes.
5. Panning details.
6. Hardware, including operators.
7. Glazing details.
8. Accessories.
9. Anchorage details at head, jamb, and sill.

D. Samples for initial color selection on 12-inch- long sections of window members. Where finishes involve normal color variations, include Sample sets showing the full range of variations expected.

E. Test reports from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated based on comprehensive testing of current window units within the last 5 years. Test results based on use of down-sized test units will not be accepted.

F. Submit calculations, structural properties, connection information and product information to verify that system performance and anchorage complies with the loading criteria specified herein. All calculations shall be signed and sealed by a professional engineer registered in the State of Florida, whose discipline is structural engineering.

G. State of Florida Product Approval Number documentation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in material, design, and extent to those required for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain aluminum windows from one source and by a single manufacturer.

C. All exterior windows shall bear the label of the National Fenestration Rating Council (NFRC) and shall comply with Chapters 3 and 4 of the Florida Building Code, Fifth Edition (2014), Energy Conservation. This project is located in International Climate Zone 2A.

1.7 PROJECT CONDITIONS

A. Field Measurements: Check window openings by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Horizontal Sliding Windows:

a. EFCO Corporation, “Series 6500”.
b. Graham Architectural Products Corp., “Series 0600.”
c. Winco Window Company, “Series 3410”.

2.2 MATERIALS

A. Aluminum Extrusions: Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Sliding-Type Weatherstripping: Provide woven-pile weatherstripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.2.

E. Sealant: For sealants required within fabricated window units, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating. Comply with Division 7 Section "Joint Sealants" of these Specifications for selection and installation of sealants.

F. Glass-Fiber-Mesh Insect Screen: 18-by-16 or 18-by-14 mesh of plastic-coated glass-fiber threads, woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with requirements of ASTM D 3656.

2.3 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

B. Counterbalancing Mechanism: Comply with AAMA 902.2.

1. Sash-Balance Type: Concealed spiral type of size and capacity to hold sash stationary at any open position.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessories that comply with indicated standards.

B. Insect Screens: Provide insect screens for each operable exterior sash or ventilator. Locate screens on inside or outside of window sash or ventilator, depending on window type. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches.

1. Screen Frames: Fabricate frames of tubular-shaped, extruded- or formed-aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.

a. Provide removable PVC spline-anchor concealing edge of screen frame.

C. Head and Jamb Closures: Provide manufacturer’s standard extruded aluminum head and jamb closures compatible with frame profiles provided.

2.5 HORIZONTAL SLIDING WINDOWS

A. Minimum Window Class and Grade: Comply with requirements of AAMA Performance Class HC-Heavy Commercial. Provide AAMA Performance Grade as required by wind pressures indicated on drawings. Window units shall successfully pass operating force

test performance requirements specified in AAMA 101. Thermally broken construction is not required.

B. Hardware: Provide the following equipment and operating hardware:

1. Sash Rollers: Steel, lubricated ball-bearing rollers with nylon tires.
2. Sash Lock: Cam-action sweep sash lock and keeper at meeting rails.

2.7 FABRICATION

A. General: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable without dismantling sash or ventilator framing.
2. Prepare window sash or ventilators for glazing, except where preglazing at the factory is indicated.

B. Frames: Provide 3-5/8" minimum frame depth, with frame and sash extrusions of .062" minimum thickness, and with sill members of .094" minimum thickness. All horizontal rails shall be tubular.

C. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated.

D. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing system indicated. Finish to match window units.

E. Preglazed Fabrication: Preglaze window units at the factory where possible and practical for applications indicated. Comply with glass and glazing requirements of Division 8 Section "Glazing" of these Specifications and AAMA 101.

2.8 FINISHES

A. Comply with NAAMM "Metal Finishes Manual" 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. High-Performance Organic 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 System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and flouropolymer color

topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect openings before installation. Verify that rough or masonry opening is correct and sill plate is level.

1. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installing window units, hardware, operators, and other components of the Work.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified under "Dissimilar Materials" Paragraph in appendix to AAMA 101.
2. Set windows on .062" thick formed aluminum sill flashing provided by manufacturer, in finish to match windows.

C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets, as shown on Shop Drawings, to provide weathertight construction. Refer to Division 7 Section "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the Work.

3.3 ADJUSTING

A. Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

3.4 CLEANING

A. Clean aluminum surfaces promptly after installing windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

B. Clean glass of preglazed units promptly after installing windows. Comply with requirements of Division 8 Section "Glazing" for cleaning and maintenance.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to aluminum window manufacturer, that ensure window units are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520

SECTION 08710 - 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 items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are to be installed.

B. This Section includes the following:

1. Hinges.
2. Key control systems.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Push/pull units.
8. Closers.
9. Overhead holders.
10. Miscellaneous door control devices.
11. Protection plates.
12. Weatherstripping for exterior doors.
13. Astragals or meeting seals on pairs of doors.
14. Thresholds.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section “Laminated Plastic Casework”.
2. Division 8 Section “Standard Steel Doors and Frames”.
3. Division 8 Section “Flush Wood Doors”.
4. Division 8 Section “Aluminum Entrances and Storefronts”.

D. Windstorm product approval requirements:

1. Hardware, except keyed cylinders, listed for entrance doors in this section is to indicate quality level and function required at each opening. Specific items listed may be modified as required to maintain windstorm product approvals for exterior openings, but in no case shall materials of lesser quality or different function be acceptable.

1.3 SUBMITTALS

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

B. Product data including manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

    a. Type, style, function, size, and finish of each hardware item.
    b. Location, hand, size and material of each door and frame opening.
    c. Name and manufacturer of each item.
    d. Fastenings and other pertinent information.
    e. Location of each hardware set cross referenced to indications on Drawings, both on floor plans and in door and frame schedule.
    f. Explanation of all abbreviations, symbols, and codes contained in schedule.
    g. Mounting locations for hardware.
    h. Keying information.

2. Submittal Sequence: Submit final schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Submit samples of each type of exposed hardware unit as required in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. For each electrified opening, provide complete wiring diagrams prepared by an authorized factory employee. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to

detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval. Wiring diagrams may be submitted after approval of hardware schedule.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels. All fire seals required for fire rated wood doors shall be furnished by the door manufacturer or supplier.

D. Disabled Accessibility: Provide hardware that complies with all accessibility codes as they pertain to this project, including the Americans with Disabilities Act Accessibility Guidelines and the Florida Accessibility Code for Building Construction.

E. Exterior Openings: All doors, frames and hardware for exterior openings shall be tested and approved for use at the required wind loads for this project. Copies of current valid Florida State or Metro-Dade County product approvals shall be furnished as proof of compliance with this requirement.

1.5 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 MAINTENANCE

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Butts and Hinges:

   a. Hager Hinge Co.
   b. McKinney Products Co, an ASSA ABLOY Group Company.
   c. Stanley Hardware, Div. Stanley Works.

2. Pivots

   a. Rixson, an ASSA ABLOY Group company.

3. Key Control System

   a. Telkee Inc.
   b. Lund Equipment Company, Inc.
   c. MMF Industries

4. Cylinders and Locks:

   a. Schlage L9000 series, 03A trim, an Allegion Brand
   b. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company ML2000 Series, LSA trim

5. Bolts

   a. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company.
   b. Rockwood Manufacturing.
   c. Triangle Brass Manufacturing Company (TRIMCO).

6. Exit Devices

    a. Von Duprin. 98 series, 03 lever trim, an Allegion Brand
    b. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company 5000 Series, Lustra lever trim

7. Push/Pull Units:

    a. Rockwood Manufacturing, as ASSA ABLOY Group Company
    b. Triangle Brass Manufacturing Company (Trimco).
    c. Ives, IR security and Safety

8. Overhead Closers:

    a. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company. DC6000 series.
    b. LCN 4041 series, an Allegion Brand
    c. Norton Door Controls, an ASSA ABLOY Group Company. 7500 series.

9. Door Control Devices:

    a. Glynn-Johnson, an Allegion Brand
    b. Ives, an Allegion Brand
    c. Rixson Specialty Door Controls, an ASSA ABLOY Group Company.
    d. Rockwood Manufacturing ,an ASSA ABLOY Group Company
    e. Triangle Brass Manufacturing Company (Trimco).

10. Kick, Mop, and Armor Plates:

    a. Ives, an Allegion Brand
    b. Rockwood Manufacturing.
    c. Triangle Brass Manufacturing Company (Trimco).

11. Door Stripping and Seals:

    a. National Guard Products, Inc.
    b. Pemko Manufacturing Co., Inc.
    c. Reese Enterprises, Inc.
    d. Zero International, Inc.

12. Thresholds:

    a. National Guard Products, Inc.
    b. Pemko Manufacturing Co., Inc.
    c. Reese Enterprises Inc.
    d. Zero International, Inc.

13. Astragals:

    a. National Guard Products, Inc.
    b. Pemko Manufacturing Co. Inc.
    c. Reese Enterprises, Inc.
    d. Zero International, Inc.

2.2 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the “Hardware Schedule” at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer’s Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article “Manufacturers” in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.

    a. Butts and Hinges: ANSI/BHMA A156.1-06.
    b. Exit Devices: ANSI/BHMA A156.3-01.
    c. Door Controls - Closers: ANSI/BHMA A156.4-00.
    d. Architectural Door Trim: ANSI/BHMA A156.6-05.
    e. Template Hinge Dimensions: ANSI/BHMA A156.7-03.
    f. Door Controls - Overhead Stops and Holders: ANSI/BHMA A156.8-05.
    g. Mortise Locks and Latches Series 1000: ANSI/BHMA A156.13-05.
    h. Auxiliary Hardware: ANSI/BHMA A156.16-02.
    i. Thresholds: ANSI/BHMA A156.21-06.
    j. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22-05.
    k. Continuous Hinges: ANSI/BHMA A156.27-06.
    l. Electric Strikes and Frame Mounted actuators: ANSI/BHMA A156.31-07.

2.3 MATERIALS AND FABRICATION

A. Manufacturer’s Name Plate: Do not use manufacturers’ products that have manufacturer’s name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

1. Manufacturer’s identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer’s standard metal alloy, composition, temper, and hardness, but in

no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

F. Electrified Hardware: For each item of electrified hardware specified, provide standardized Molex™ plug connectors to accommodate up to twelve (12) wires or as required. Molex™ plug connectors shall plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies. Provide an Operation Narrative for each electrified hardware opening.

2.4 HINGES, BUTTS, AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units..

B. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Non-removable pins.
2. Out-Swing Corridor Doors with Locks: Non-removable pins.
3. Interior Doors: Non-rising pins.
4. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) is indicated.

C. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

2.5 LOCK CYLINDERS AND KEYING

A. Standard System: Except as otherwise indicated, provide new masterkey system for Project.

B. Equip locks with manufacturer's special 6-pin tumbler cylinder with construction masterkey feature that permits voiding of construction keys without cylinder removal.

C. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed. Furnish for all exit devices that would require dismantling of device in order to change keying of cylinder.

D. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

E. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".

F. Key Material: Provide keys of nickel silver only.

G. Key Quantity: Furnish 3 change keys for each lock, 6 master keys for each master system, and 6 grandmaster keys for each grandmaster system.

1. Furnish fifty extra key blanks.
2. Furnish ten construction Keys.
3. Furnish three control keys for construction cores to remove / insert construction cores.
4. Furnish two control keys for permanent cores to remove / insert permanent cores.
5. Deliver all permanent keys to Owner.

2.6 KEY CONTROL SYSTEM

A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.

1. Provide hinged-panel type cabinet for wall mounting; install where directed by Owner.

2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide curved lip strikes for locks with 3-piece, anti-friction latchbolts as recommended by manufacturer.
2. Provide extra long strike lips for locks used on frames with applied wood casing trim. Provide special strike lip for pairs of doors to allow astragal to be applied

without modification or conflict with strike.

3. Provide recess type top strikes for bolts locking into frame heads, unless otherwise indicated.
4. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.
5. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
6. Provide standard (open) strike plates for interior doors of residential units where wood door frames are used.

B. Lock Throw: Provide 3/4-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 1/2-inch minimum throw of latch for other bored and pre-assembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

D. Exit Device Dogging: Except on fire-rated doors where closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.

E. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

2.8 PUSH/PULL UNITS

A. Concealed Fasteners: Provide manufacturer’s special concealed fastener system for installation, thru-bolted for matched pairs but not for single units.

2.9 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, furnish units that are adjustable through a range of sizes (1 – 6).

1. Provide parallel arms for all overhead closers, except as otherwise indicated.

B. Provide heavy duty forged arms as listed. Where closers are indicated to be closer/stop, provide units with a rigid arm assembly and a heavy duty bracket with built-in lug to provide a means of positive stop. For closers where indicated to have spring stop, furnish a heavy duty bracket with spring to allow a cushion prior to door stopping. For closer/holders, provide units with an additional built-in holder designed to hold open against normal wind and traffic conditions. Holder shall be activated manually. For closers listed with Unitrol arms, provide the closer arms with a five degree cushion stop with stop located on the arm, not the bracket. As an alternate to Unitrol arms, the supplier may furnish solid heavy duty forged arms with appropriate bracket and a heavy duty overhead stop and holder.

C. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

D. Provide black resilient parts for exposed bumpers.

2.10 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate protection plates not more than 2 inches less than door width on hinge side and not more than 2 inch less than door width on pull side by height indicated.

1. Metal Plates: Stainless steel, 0.050 inch(U.S. 18 gage).
2. Metal Plates: Polished Aluminum with diamond pattern, 0.125 inch where indicated.

2.11 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping, door bottoms, and thresholds shall resist air infiltration in accordance with the requirements of Table C402.3 of the Florida Building Code – Energy Conservation, 5th Edition (2014). Testing shall be in accordance with the applicable reference test standard by an accredited, independent testing laboratory and labeled by the manufacturer. Submit certification by a qualified independent testing laboratory indicating compliance with infiltration resistance requirements at the time of hardware product submittal.

2.12 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

2.13 HARDWARE FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix A-NL@ is used with standard

finish designations to indicate “no lacquer”.

D. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, “Materials and Finishes”, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

E. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute.
2. WDMA Industry Standard I.S.1.7, “Hardware Locations for Wood Flush Doors”.

B. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section “Joint Sealers”.

F. Weatherstripping and Seals: Comply with manufacturer’s instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper

function and finish of hardware and doors. Adjust door control devices compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.3 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware", hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

Hardware Sets

SET 1.1

Doors: X101
Each to have:

2 sets	Pivots	147	626	RX
2	Int. Pivots	M19	626	RX
1	Rim Exit Device	XP98-E996L x 17	630	VO
1	Removable Mullion	KR4954	SP28	VO
1	I C Core Cylinder	AS Required	626	VO
1	Rim Exit Device	XP98L-996L x 17	630	VO
2	I C Cylinders	As Required	626	SC
2	Surface Closers	4041PA-EDA	AL	LN
1	Weather Seal	By Door Mfg.		
1	Threshold	By Door Mfg.		
1	Power Transfer	EPT	AL	VO
1	Power Supply	PS900 Series as required		VO

1	Card Reader	Furnished by Others			

NOTE: Hardware listed is basis of design. All exterior openings to comply with FBC windload requirements as per Para.1.2.D.1 and design pressure as required.
Provide required brackets for proper closer installation.
Provide door and frame wiring harness as required for installation of electrified hardware.
OPERATION: Valid card unlocks outside lever of one exit device for entry. Immediate egress from inside of both doors at all times.

SET 1.2

Doors: X128
Each to have:

3	Hinges	T4A2314-NRP	4 1/2 x 4 1/2	630	MC
1	Rim Exit Device	XP98L	996Lx17	630	VO
1	I C Cylinder	As Required		626	SC
1	Surface Closer	4041-EDA	PA As Required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Weather Seal	296CR	LAR	AL	PE
1	Threshold	2005AV	LAR	AL	PE
1	Door Sweep	321CN	LAR	AL	PE
1	Rain Guard	346C	LAR	AL	PE

NOTE: Hardware listed is basis of design. All exterior openings to comply with FBC windload requirements as per Para.1.2.D.1 and design pressure as required.

SET 1.3

Doors: X108
Each to have:

3	Hinges	T4A2314-NRP	4 1/2 x 4 1/2	630	MC
1	Ext Lockset	L9453R	17A	630	SC
1	Surface Closer	4041-EDA	PA As Required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Weather Seal	296CR	LAR	AL	PE
1	Threshold	2005AV	LAR	AL	PE
1	Door Sweep	321CN	LAR	AL	PE
1	Rain Guard	346C	LAR	AL	PE

NOTE: Hardware listed is basis of design. All exterior openings to comply with FBC windload requirements as per Para.1.2.D.1 and design pressure as required.

SET 1.4

Doors: X114
Each to have:

1	Elec. Hinge	QC-TA2314-NRP	4 1/2 x 4 1/2	630	MK
2	Hinges	T4A2314-NRP	4 1/2 x 4 1/2	630	MC
1	Elec. Lockset	EL9092R	17A	630	SC
1	Surface Closer	4041-EDA	PA As Required	AL	LN

1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Door Viewer	622		626	RO
1	Weather Seal	3296CR	LAR		AL
	PE				
1	Threshold	2005AV	LAR	AL	PE
1	Door Sweep	321CN	LAR	AL	PE
1	Rain Guard	346C	LAR	AL	PE
1	Power Supply	PS900 Series as required			SC
1	Card Reader	Furnished by others			

NOTE: Hardware listed is basis of design. All exterior openings to comply with FBC windload requirements as per Para. 1.2.D.1 and design pressure as required.
Provide door and frame wiring harness as required for installation of electrified hardware.
OPERATION: Valid key card unlocks outside trim of electric lock and allows entry. Immerdiate egress at all times.

SET 1.5

Doors: X113
Each to have:

6	Hinges	TA2314-NRP	4 1/2 x 4 1/2	630	MC
2	Surface Bolts	580	12"	630	RO
1	Storeroom Lock	L9480R	17A	630	SC
2	Overhead Holders	OH900 Series		630	RO
1	Weather Seal	296CR	LAR	AL	PE
1	Threshold	177AV	LAR	AL	PE
1	Door Sweep	321CN	LAR	AL	PE
1	Rain Guard	346C	LAR	AL	PE

NOTE: Hardware listed is basis of design. All exterior openings to comply with FBC windload requirements as per Para.1.2.D.1 and design pressure as required.

SET 2.1

Doors: 111A – 111C – 111D
Each to have:

3	Hinges	T4A3786	4 1/2 x 4 1/2	652	MC
1	Rim Exit Device	98L-F	996L	630	VO
1	I C Cylinder	As Required		626	SC
1	Surface Closer	4041	PA as required	AL	LN
1	Armor Plate	Furnished by Others			
1	Smoke Seal	296CR	LAR	AL	PE
1	Door Sweep	321CN	LAR	AL	PE
1	Threshold	2005AV	LAR	AL	PE

SET 3.1

Doors: 101
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Entry Lock	L9053R	17A	630	SC
1	Surface Closer	4041	PA as required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 3.2

Doors: 113 - 115
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Storeroom Lock	L9080R	17A	630	SC
1	Surface Closer/Stop	4041 CUSH		AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
3	Silencers				

SET 3.3

Doors: 112 - 114
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Classroom Lock	L9070R	17A	630	SC
1	H O Surface Closer	4041H	PA as required	AL	LN
1	Kick Plate	K1050	10 x 2 " LDW	630	RO
1	Threshold	2005AV	LAR	AL	PE
1	Door Bottom	321CN	LAR	AL	PE
3	Silencers				

SET 3.4

Doors: 102 – 133 - 134
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Privacy Lock w/ Indicator	L9496	17A	630	SC
1	Surface Closer	4041	PA as required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	620	RO
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 3.5

Doors: 140
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Passage	L9010	17A	630	SC
1	Surface Closer	4041	PA as required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 3.6

Doors: 120 – 121 – 122 - 123
Each to have:

3	Hinges	T4A3786	4 1/2 x 4 1/2	652	MK
1	Push Plate	70	12 x 18	630	RO
1	Pull Plate	70C x 110	4 x 16	630	RO
1	Surface Closer	4041	PA as required	AL	LN
1	Kick Plate	K1050	10 x 2" LDW	630	RO
1	Wall Stop	400 Series		630	RO
1 set	Smoke Seal	S88D			PE
3	Silencers				

SET 4.1

Doors: 103A - 106
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Office Lock	L9050R	17A	630	SC
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 4.2

Doors: 142 – 143 – 144 - 145
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Office Lock	L9050R	17A	630	SC
1	Overhead Stop	OH1000 Series		630	RO
3	Silencers				

SET 4.3

Doors: 105 – 136 – 137 – 138 - 146
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Storeroom Lock	L9080R	17A	630	SC
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 4.4

Doors: 107 – 108 – 109 - 110
Each to have:

3	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
1	Privacy Lock w/ Indicator	L9496	17A	630	SC
1	Wall Stop	400 Series		630	RO
3	Silencers				

SET 4.5

Doors: 148
Each to have:

6	Hinges	TA2714	4 1/2 x 4 1/2	652	MC
2	Flush Bolts	555	12”	626	RO
1	Exit Device	HC-9827L		630	VO
2	Wall Stops	400 Series		630	RO
2	Silencers				

SET 5.1

Doors: X121 – X122 – X123 – X124 – X125 – X126 – X127 – X130 – X131 – X132 – X133
X134 – X135 – X136

Each to have:

Complete hardware by door mfg.

Manufacturer List

Code	Name
AD	Adams Rite
MC	McKinney
LN	LCN Closers
PE	Pemko
SC	Schlage
RO	Rockwood
RX	Rixson
VO	Von Duprin

END OF SECTION 08710

SECTION 08800 - GLAZING

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 glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Window units.
2. Vision lites.
3. Storefront entrance doors and storefront systems.
4. Fixed glass, fire rated interior windows.

1.3 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.

G. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), and Quality q3 (glazing select).

2.2 HEAT-TREATED FLOAT GLASS

A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below, 1/4" thick:

1. Kind FT (fully tempered) in the following locations:

a. Interior door vision panels in doors in non fire-rated openings.
b. Interior windows in non fire-rated openings.

2. Manufacturers: Subject to compliance with requirements, provide heat-treated glass by one of the following companies.

a. AFG Industries, Inc.
b. Ford Glass Division
c. Guardian Industries Corp.
d. HGP & Affiliates, Inc.
e. Pilkington
f. PPG Industries, Inc.
g. Saint-Gobain
h. Viracon, Inc.

2.3 IMPACT-RESISTANT LAMINATED, INSULATED GLASS

A. Kind LT (fully tempered), ASTM C 1172, in the following locations. Laminated glass must be consistent with entrance and window product manufacturers' Florida Product Approval and/or NOA (Notice of Acceptance) documentation.

1. Exterior horizontal sliding windows and storefront entrances:

a. Glass shall be 1" nominal thickness consisting of:

1) 3/16" Outer lite of fully-tempered, Pilkington "Evergreen" glass
2) .090" PVB interlayer
3) 3/16" inner lite of fully-tempered clear glass with a Low-E coating on the number 4 surface
4) 5/16" argon gas-filled space
5) 3/16" inside lite of fully-tempered, clear glass

2.4 FIRE-PROTECTION-RATED CERAMIC GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9, including the hose stream test, and shall comply with NFPA 80.

1. Install at all interior fire rated doors and windows.

B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes

C. Laminated Ceramic glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch (8-mm) total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials, and certified as approved safety glazing.

1. Subject to compliance with requirements, provide one of the following:

a. AGC Glass Company North America, Inc.
b. SAFTI-FIRST Fire Rated Glazing Solutions
c. Schott North America, Inc.; Laminated Pyran Crystal
d. Technical Glass Products
e. Vetrotech Saint-Gobain; SGG Keralite FR-L.

2.5 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: Provide color of exposed joint sealants to comply with the following:

a. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants that comply with ASTM C 920 requirements.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

2.7 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer 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).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system where required.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within

openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and 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 just before each lite is installed.

F. 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.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers 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. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.7 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

SECTION 09220 - PORTLAND CEMENT PLASTER

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. Portland cement plaster.
1. Stucco finishes.
2. Plastic accessories.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each product specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.

B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.5 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.

B. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

C. Exterior Plaster Work: Do not apply plaster when ambient temperatures is below 40 deg F.

D. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plastic Accessories:

a. Alabama Metal Industries Corp. (AMICO).
b. Plastic Components, Inc.
c. Vinyl Corp.

2. Stucco:

a. California Stucco Products Corp.
b. Florida Stucco Corp.
c. Highland Stucco.
d. IPA Systems, Inc.
e. United States Gypsum Co.

2.2 ACCESSORIES

A. General: Comply with material provisions of ASTM C 1063 and the requirements indicated below; coordinate depth of accessories with thickness and number of plaster coats required.

1. Plastic Components: ASTM D 4216, high-impact polyvinyl chloride (PVC) for building products.

B. Cornerbeads: Small nose cornerbeads fabricated from the following metal, with expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.

1. PVC Plastic: Minimum 0.035 inch thick.

C. Casing Beads: Square-edged style, with expanded flanges of the following material:

1. PVC Plastic: Minimum 0.035 inch thick.

D. Control Joints: Prefabricated, of material and type indicated below:

1. PVC Plastic: Minimum 0.035 inch thick.
2. One-Piece Type: Folded pair of nonperforated screeds in M-shaped configuration, with expanded or perforated flanges.

E. Reveals, Drip Screeds, Control Screeds, and Channel Screeds: Shapes as indicated on drawings, of material indicated below.

1. PVC Plastic: Minimum 0.035 inch thick.

2.5 PLASTER MATERIALS

A. Base-Coat Cements: Type as indicated below:

1. Portland cement, ASTM C 150, Type I.

B. Stucco Finish Coat: Manufacturer's standard factory-packaged stucco, including portland cement, aggregate, and other proprietary ingredients.

C. Sand Aggregate for Base Coats: ASTM C 897.

2.6 MISCELLANEOUS MATERIALS

A. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, ½ inch long, free of contaminates, manufactured for use in portland cement plaster.

B. Water for Mixing and Finishing Plaster: Potable.

C. Bonding Agent: ASTM C 932.

D. Acid-Etching Solution: Muriatic acid (10 percent solution of commercial hydrochloric acid) mixed 1 part to not less than 6 nor more than 10 parts water.

2.7 PLASTER MIXES AND COMPOSITIONS

A. General: Comply with ASTM C 926 for base- and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated.

B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

C. Fiber Content: Add fiber to following mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's written instructions but do not exceed 1 lb/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

D. Two-Coat Work Over concrete unit masonry: 1/2” total thickness; base-coat proportions as indicated below:

1. Base Coat: 1 part Portland cement, 3/4 to 1-1/2 parts lime, 3 to 4 parts aggregate; 3/8" thickness.

E. Job-Mixed Finish Coats: Proportion materials for finish coats in parts by volume for cementitious materials and parts by volume per sum of cementitious materials to comply with the following requirements:

1. Proportions using sand aggregates as indicated below:

a. 1 part Portland cement, 3/4 to 1-1/2 parts lime, 3 parts sand; 1/8" thickness.

F. Stucco Finish Coat: (May be used in lieu of above described job mixed finish coat). Add water only; comply with stucco manufacturer’s written instructions; 1/8" thickness.

2.8 MIXING

A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 - EXECUTION

3.1 PREPARATIONS FOR PLASTERING

A. Clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.

B. Etch concrete surfaces indicated for direct plaster application. Scrub with acid-etching solution on previously wetted surface and rinse thoroughly with clean water. Repeat application, if necessary, to obtain adequate suction and mechanical bond of plaster.

C. Apply bonding agent on concrete and concrete unit masonry surfaces indicated for direct plaster application; comply with manufacturer’s written instructions for application.

D. Install temporary grounds and screeds to ensure accurate rodding of plaster to true surfaces; coordinate with scratch-coat work.

3.2 INSTALLATION OF PLASTERING ACCESSORIES

A. General: Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:

1. External Corners: Install corner reinforcement at external corners.
2. Terminations of Plaster: Install casing beads, unless otherwise indicated.
3. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Architect:

    a. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
    b. Distance between Control Joints: Not to exceed 18 feet in either direction or a length-to-width ratio of 2-1/2 to 1.
    c. Wall Areas: Not more than 144 sq. ft.
    d. Horizontal Surfaces: Not more than 100 sq. ft. in area.
    e. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.

3.3 PLASTER APPLICATION

A. Plaster Application Standard: Apply plaster materials, composition, and mixes to comply with ASTM C 926.

B. Do not use materials that are caked, lumpy, dirty, or contaminated by foreign materials.

C. Do not use excessive water in mixing and applying plaster materials.

D. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed at any location on surface.

E. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.

F. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where interior plaster is not terminated at metal frame by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

G. Corners: Make internal corners and angles square; finish external corners flush with cornerbeads on interior work, square and true with plaster faces on exterior work.

H. Finish Coats: Apply finish coats to comply with the following requirements:

1. Float Finish: Apply finish coat to a minimum thickness of 1/8 inch to completely cover base coat, uniformly floated to a true even plane with “sand float” finish.

2. Prepared Finish: Apply factory-prepared finish coats according to manufacturer's written instructions.

I. Moist-cure plaster base and finish coats to comply with ASTM C 926, including written instructions for time between coats and curing in "Annex A2 Design Considerations."

3.4 CUTTING AND PATCHING

A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.5 CLEANING AND PROTECTING

A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09220

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. Nonload-bearing steel framing members for gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section “Firestop Systems” for firestopping systems and fire-resistance-rated joint sealants.
2. Division 7 Section “Building Insulation” for sound attenuation insulation.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:

1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 “Fire Resistance Design Manual” or design designations in UL “Fire resistance Directory” or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 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. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

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, Inc.
b. Consolidated Systems, Inc.
c. Dale Industries, Inc.
d. Dietrich Industries, Inc.
e. Marino/Ware (formerly Marino Industries Corp.).
f. National Gypsum Co.; Gold Bond Building Products Division.
g. Unimast, Inc.

2. Grid Suspension Assemblies:

a. Armstrong World Industries, Inc.
b. Chicago Metallic Corp.
c. USG Interiors, Inc.

3. Gypsum Board and Related Products:

a. American Gypsum Co.
b. Georgia-Pacific Corp.
c. National Gypsum Co.; Gold Bond Building Products Division.
d. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for conditions indicated.

B. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Protective Coating: ASTM A 653, G 40 hot-dip galvanized coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0179 inch (25 gage) unless otherwise indicated.

2. Thickness: 0.0329 inch, (20 gauge) as follows:

   a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
   b. At partitions all around shower stalls.

3. Depth: 3 5/8” unless otherwise indicated on drawings.

C. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

1. Widths: Provide gypsum board in widths of 48 inches.

B. Gypsum Wallboard: ASTM C 1396 and as follows:

1. Type: Type X where required for fire-resistance-rated assemblies.
2. Edges: Tapered.
3. Thickness: 5/8 inch unless otherwise indicated on drawings.
4. Type: Sag-resistant for ceiling surfaces (“ceiling board”) ½ “ thick

C. Glass-Mat, Water-Resistant Gypsum Backing Board: ASTM C 1178, of type and thickness indicated below for installation at shower stalls:

1. Type and Thickness: Regular, 5/8 inch thick, unless otherwise indicated.
2. Products: Subject to compliance with requirements, provide “Dens-Shield Tile Backer” manufactured by G-P Gypsum Corp.

D. Paperless Drywall Panels: ASTM C 1396 and ASTM C 1177/C, for installation in Toilet Rooms only, except behind tile at shower stalls:

1. Type and thickness: Regular, 5/8” thick with moisture and mold resistant core and surfaces.
2. Facing: Coated, glass mat.
3. Product: Subject to compliance with requirements, provide “DensArmor Plus Paperless Interior Panel” panels manufactured by G-P Gypsum Corp.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal complying with the following requirement:

a. Steel sheet zinc coated by hot-dip process or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

a. Cornerbead on outside corners, unless otherwise indicated.
b. J-bead with both face and back flanges; face flange formed to receive joint compound. Use J-beads for edge trim, unless otherwise indicated.
c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

B. Accessory for Curved Edges: Cornerbead formed of metal with either notched or flexible flanges that are bendable to curvature radius.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

C. Joint Tape for Glass Mat, Water-Resistant Gypsum Backer Units and Paperless Drywall: 2" 10 x 10 glass mesh tape embedded in setting compound recommended by panel manufacturer.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.

a. All-purpose compound formulated for both taping and topping compounds.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Acoustical Sealant for Exposed and Concealed Joints:

a. PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
c. SHEETROCK Acoustical Sealant; United States Gypsum Co.

2.8 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

D. Ready-Mixed Texture Compound: Type required for spray application of orange peel texture to all gypsum board walls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with 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, door bumpers, furnishings, or similar construction. Comply with details

indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Suspend ceiling hangers from building 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 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-typing, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure flat, angle, and 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 as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.

1. Wire Hangers: 48 inches o.c.
2. Main Tees: 48 inches o.c.
3. Cross Channels 24 inches o.c.
4. Cross Tees: As required for installation of recessed fluorescent light fixtures.

C. Installation Tolerances: Install steel framing components for suspended ceilings so that grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

D. 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 FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at 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. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural 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 needed to make partitions continuous from floor to underside of solid structure.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated.

1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to 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. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate both edge or 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. Avoid joints other than control joints at corners of framed openings where possible.

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. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.

1. Except where 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. 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 wide joints to install sealant.

J. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide ¼- to ½-inch 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.

K. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

1. Sealing of penetrations in sound walls which are identified as also being fire-rated or smoke-resistant is the work of Section 07840. Fire and smoke requirements take precedence.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches o.c. for vertical applications.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

N. Sealing of perimeters of and penetrations through fire-rated or smoke-resistant assemblies is the work of Section 07840.

O. Identify rated walls above ceilings with the note "fire and smoke barrier-protect all openings", complying with requirements of local jurisdictions.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles of framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

B. Wall Tile Substrates: For substrates indicated to receive ceramic tile, comply with the following:

1. Install glass-mat, water resistant gypsum backing board panels to comply with manufacturer's installation instructions at showers. Install with ¼ -inch open space where panels abut other construction or penetrations. Fill gap with elastomeric sealant.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install aluminum trim and other accessories where indicated.

D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 1 for 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 2 where panels form substrates for tile and where indicated.
3. Level 4 for gypsum board surfaces, unless otherwise indicated.

E. Use one of the following joint compound combinations as applicable to the finish levels specified:

1. Embedding and First Coat: Ready-mixed drying-type, all purpose or taping compound. Fill (second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.

H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.10 APPLYING TEXTURE FINISHES TO WALLS

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If,

despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

3.11 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and soffits and report any deficiencies in the work observed. Do not proceed with installation of gypsum board to ceiling or soffit support framing until deficiencies have been corrected.

1. Notify architect one week in advance of the date and the time when the project, or part of the project, will be ready for an above-ceiling observation.
2. Prior to notifying architect, complete the following in areas to receive gypsum board ceilings:

    a. Installation of 80 percent of lighting fixtures, powered for operation.
    b. Installation, insulation, and leak and pressure testing of water piping systems.
    c. Installation of air duct systems.
    d. Installation of air devices.
    e. Installation of mechanical system control air tubing.
    f. Installation of ceiling support framing.

3.2 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

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. Porcelain paver tile.
2. Unglazed ceramic mosaic tile.
3. Glazed wall tile.
4. Marble thresholds and window sills.
5. Crack suppression membrane.
6. Grout sealer.

1.3 SUBMITTALS

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

B. Product data for each type of product specified.

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

D. Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated. Where products involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.
2. Full-size units of each type of trim and accessory for each color required.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

1.5 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.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Porcelain Paver Tile:

a. Daltile “Alta Vista ColorBody Porcelain”. No substitutions.

2. Unglazed Ceramic Mosaic Tile:

a. American Olean Tile Co., Inc.
b. Dal-Tile Corp.
c. United States Ceramic Tile Co.

3. Glazed Wall Tile:

    a. American Olean Tile Co., Inc.
    b. Dal-Tile Corp.
    c. United States Ceramic Tile Co.

4. Glazed Wall Tile with Stone Look and Random Shade Variation:

    a. American Olean Tile Co., Inc.
    b. Dal-Tile Corp.
    c. United States Ceramic Tile Co.

5. Latex-Emulsion-Based Latex-Portland Cement Mortars:

    a. American Olean Tile Co., Inc.
    b. Bonsal
    c. Bostik Construction Products Div.
    d. Custom Building Products
    e. Laticrete International Inc.
    f. Mapei Corp.

6. Commercial Portland Cement Grouts:

    a. American Olean Tile Co., Inc.
    b. Bonsal
    c. Bostik Construction Products Div.
    d. Custom Building Products

7. Acrylic Emulsions for Latex-Portland Cement Grouts:

    a. American Olean Tile Co., Inc.
    b. Bonsal
    c. Bostik Construction Products Div.
    d. Custom Building Products
    e. Laticrete International Inc.
    d. Mapei Corp.

8. Crack Suppression Membranes:

    a. Schluter Systems L.P.
    b. National Applied Construction Products, Inc.
    c. Mapei

9. Grout Sealer:

    d. Stone Tech Professional, Inc.
    e. Aquamix
    f. CeramaSeal
    g. Mapei

2.2 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

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 selections made by Architect from Manufacturer’s standard color ranges as follows:

a. Porcelain Paver Tile: Any color in price groups 1 or 2.
b. Glazed Wall Tile: Any color in price groups 1 or 2.
c. Unglazed Ceramic Mosaic Tile: Any color in price groups 1 or 2.

2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

2.3 TILE PRODUCTS

A. Porcelain Paver Tile: Provide flat tile complying with the following requirements:

1. Composition: Porcelain.
2. Nominal Facial Dimensions: 18 inches by 18 inches.
3. Nominal Thickness: ¼ inch.
4. Face: Plain with square edges
5. Finish: Unpolished.

B. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Natural clay.
2. Nominal Facial Dimensions: 2 inches by 2 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.

C. Glazed Wall Tile: Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 12 inches by 12 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with modified square edge or cushion edge.
4. Mounting: Factory back-mounted.

D. Glazed Wall Tile: Stone Look, Random Shading: Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 6 inches by 6 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with square edge.
4. Installation: Install on the diagonal above kitchen countertops.

E. Trim Units: Provide glazed wall tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Glazed Wall Tile at Showers: 3 inch x 12 inch surface bullnose cap.
3. Glazed Wall Tile Base at Toilet/Shower Rooms: 3 inch x 12 inch surface bullnose with field-mitered inside and outside corners.
4. Stone-Look Glazed Wall Tile: 3 inch x 12 inch surface bullnose above kitchen countertops.
5. Porcelain Paver Tile: 4 inch x 12 inch surface bullnose base with field-mitered inside and outside corners.

2.4 STONE THRESHOLDS

A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.

1. Provide white, honed marble complying with MIA Group "A" requirements for soundness.

C. Window Sills: White marble, minimum 1/2" thick.

2.5 SETTING MATERIALS

A. Thin Set Latex Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A118.4 and as specified below.

1. Mixture of Dry-Mortar Mix and Latex Additive: Factory-mixed formulation of mix and additive.

B. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1A.

C. Wall Base Adhesive: Construction adhesive for securing tile base to gypsum board (except at showers). Do not use thin set mortar for securing porcelain paver tile base to walls.

1. Product: Liquid Nails Ceramic Wall and Floor Tile Adhesive.

2.6 GROUTING MATERIALS

A. Dry-Set Sanded Grout: ANSI A118.6, color as indicated, for floor tile installation.

1. Latex additive (water emulsion) serving as replacement for part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:

a. Latex Type: Manufacturer's standard.
b. Dry Grout Mixture: Dry-set sanded grout specified or supplied by latex additive manufacturer. Use latex additive without retarder with dry-set grout.

B. Dry Set Non-Sanded Cementitious Grout, for Wall Tile Installation: ANSI A 118.6, color as selected by Architect, with latex additive.

2.7 CRACK SUPPRESSION MEMBRANE

i. Flexible “Peel-and-Stick” Sheet: Provide a highly flexible elastomeric, self-bonding, pressure-sensitive sheet membrane system for crack isolation that is compatible with latex-modified thinset mortars. Provide one of the following:

1. Mapelastic SM, Mapei
2. ECB Membrane, National Applied Construction Products, Inc.
3. Schluter – KERDI, Schluter Systems

2.8 GROUT SEALER

A. Grout Sealer: Water-based liquid sealer that resists water, oil, and acid-based contaminants. Provide one of the following:

1. All Purpose Grout Sealer, StoneTech Professional, Inc.
2. Grout & Tile Sealer, CeramaSeal
3. Keraseal Tile and Grout Sealer, Mapei
4. Grout Sealer, Aqua Mix

2.9 GROUT RELEASE

A. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile. Proved one of the following:

a. "Grout Release," Aqua Mix.
b. "SL-90 Summit Shield Grout Release," Summitville.
c. "Grout Easy," Aldon.
d. "Super Grout Release," Klein and Company, Inc.

2.10 WATERPROOFING FOR TILE SHOWER RECEPTORS

A. Polyethylene Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches wide by a nominal thickness of 0.040 inches, composed of an inner layer of chlorinated polyethylene sheet faced on both sides with laminated high-strength nonwoven polyester material, designed for embedding in latex-Portland cement mortar, and as the substrate for latex-Portland cement mortar setting bed.

B. PVC-Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches of PVC sheet heat-fused together and to facings of bondable nonwoven polyester, designed for embedding in latex-Portland cement mortar and as the substrate for latex-Portland cement mortar setting bed.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Polyethylene Sheet Waterproofing:

a. "Chloraloy"; Noble Co.

2. PVC Sheet Waterproofing:

a. "Composeal Blue"; Compotite Corp.

2.11 EXPANSION JOINTS

A. Expansion Joints: Pre-fabricated aluminum expansion joint with factory-installed, ¼ inch wide sealant. Height of joint to match tile thickness. Aluminum finish and sealant color to be selected by Architect.

1. Ceramic Tool Company "CTC Expansion Joint."

2.12 MISCELLANEOUS MATERIALS

A. Temporary Protective Coating for Porcelain Paver Tile: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products: and is easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

2.13 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas 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, and free from oil or waxy films and curing compounds.
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.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. 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 that plates, collars, or covers overlap tile.

1. Porcelain paver wall base shall be mitered at inside and outside corners. Ease cut edges at miters.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are 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 shown.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Expansion Joints: Locate expansion joints as noted on architectural and/or structural drawings and field verify.

1. Provide sealant-filled joints in tile directly above expansion joints in slabs. Use 1 or 2 part pourable polyurethane sealant for Use T in color selected by architect. Follow Tile Council of America Handbook for Ceramic Tile Installation details.
2. Tile expansion joints are not required at concrete slab control joints which are to receive crack suppression membrane.

G. Grout tile to comply with the requirements of the following 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.
2. Apply grout release when installing porcelain paver tile.

H. Seal all grout joints with grout sealer applied in accordance with manufacturer’s directions.

3.4 FLOOR INSTALLATION METHODS

A. Ceramic Mosaic Tile at Shower Receptors: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Bond Coat: Portland cement paste or dust coat on plastic bed, or the following thin-set mortar on cured bed, ANSI A108.5\, at Contractor's option:

a. Latex – Portland Cement Mortar.

2. Grout: Dry-set sanded grout with latex additive: Installation Specification – ANSI A108.10.
3. TCA Installation Method B420 for glass mat tile backer board.

B. Porcelain Paver Tile for Thin Set Installation Over Concrete Slabs: Install tile to comply with requirements indicated below for setting bed methods, TCA installation method and grout types:

1. Latex – Portland Cement Mortar: Installation Specification – ANSI A108.5.
2. Grout: Dry-set sanded grout with latex additive: Installation specification – ANSI A108.10.
3. TCA Installation Method F113.

3.5 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Thin-set latex-Portland Cement Mortar: Installation Specification-ANSI A108.5.
2. Grout: Dry-set, non-sanded, with latex additive: Installation Specification-ANSI A108.10.
3. TCA Installation Method B420 for glass mat tile backer board. Install sanitary cove base flush with floor tile – do not set base on top of floor tile.
4. Secure porcelain paver tile base to drywall partitions using construction adhesive applied in accordance with manufacturer's instructions using V-type trowel with notches 3/16" deep.

3.6 CLEANING AND PROTECTION

A. Cleaning: Upon 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 printed instructions, but no sooner than 14 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.

3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer.

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 that tile is without damage or deterioration at time of Substantial Completion.

1. 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.

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 Special Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product data for each type of product specified.

C. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.

D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. 6-inch square samples of each acoustical panel type, pattern, and color.
2. Set of 12-inch long samples of exposed suspension system members, including moldings, for each color and system type required.

E. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.

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.

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. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels required by manufacturer(s) to eliminate sagging or curling of ceiling panels.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

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 clearly describing contents.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

A. Standard for Acoustical Ceiling Units: Provide manufacturer’s standard units of configuration indicated that comply with ASTM E 12643 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NCR: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface) per ASTM RE 795.

B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.2 HIGH HUMIDITY RESISTANT ACOUSTICAL PANELS

A. Description: Provide Type III, Form 2, Pattern CD units per ASTM E 1264 with painted finish; and as follows:

1. Performance Criteria: LR 0.82; NRC 0.55-.65; CAC 35-39.
2. Edge Detail: Square. Install in wide-face suspension system.
3. Size: 24 inches by 24 inches by 5/8 inch, typical.
4. Color: White.
5. Panels are scheduled as “APC-1" on drawings.

B. Product: Subject to compliance with requirements, provide one of the following:

1. “School Zone Fine Fissured No. 1713"; Armstrong World Industries.
2. “Fine Fissured High NRC No. HHF-457”; CertainTeed.
3. “Radar ClimaPlus High CAC, High NRC No. 22421"; USG Interiors.

2.3 CERAMIC AND MINERAL FIBER COMPOSITE PANELS

A. Description: Provide high density, ceramic-base panels classified as noncombustible by the NFPA, flame spread- 0; smoke developed- 0.

1. Performance Criteria: LR 0.80; NRC 0.45-0.55; CAC 40-44.
2. Edge Detail: Square. Install in wide-face suspension system.
3. Size: 24 inches by 24 inches by 5/8 inch.
4. Color: White.
5. Panels are scheduled as “APC-2" on drawings.

B. Products: Subject to compliance with requirements, provide one of the following:

1. “Fine Fissured Ceramaguard – Perforated, No. 607”; Armstrong World Industries, or approved equal.
2. “Radar Ceramic ClimaPlus, No. 56644”; USG Interiors.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch diameter (12 gage) wire.

E. 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. Provide stepped, reveal edge molding (“Shadow Molding”), typical.

a. Product: Armstrong “Shadow Molding No. 7871” or equal by ROCKFON or Donn with ¾” x ¾” reveal.

2.5 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from hot dipped galvanized, cold-rolled steel sheet, with prefinished 15/16-inch wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Cap Material and Finish: Hot dipped galvanized steel sheet painted white.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Standard Grid (for APC-1 and APC-2).

a. “Prelude 15/16" Exposed Tee System”; Armstrong World Industries.
b. Series 200 – “H” Hot Dipped; Chicago Metallic.
c. “Donn DX”; Donn/USG Interiors, Inc., flat white #050.

C. Warranty: Manufacturer’s standard limited 10-year warranty against rusting of grid.

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. Do not proceed with installation until 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 the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

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 the supporting structure or of the 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 the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the 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 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.

C. 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 over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. 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 neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. Install panels with pattern running in one direction parallel to long axis of space.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09650 - RESILIENT 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. Rubber athletic flooring.

B. Related Sections include the following:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base.

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. Samples for Verification: Full-size tiles of each different color and pattern of resilient floor tile specified, showing the full range of variations expected in these characteristics.

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. 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.

C. 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. Do not install products until they are at the same temperature as the space where they are to be installed.

B. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

C. Install flooring and accessories after other finishing operations, including painting, have been completed.

D. 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. Deliver extra materials to Owner.

PART 2 - RELATED DOCUMENTS

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

2.2 SUMMARY

A. This Section includes the following:

1. Rubber athletic flooring.

B. Related Sections include the following:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base.

2.3 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. Samples for Verification: Full-size tiles of each different color and pattern of resilient floor tile specified, showing the full range of variations expected in these characteristics.

D. Maintenance Data: For resilient floor tile to include in the maintenance manuals specified in Division 1.

2.4 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. 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.

2.5 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.

C. 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.

2.6 PROJECT CONDITIONS

A. Do not install products until they are at the same temperature as the space where they are to be installed.

B. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

C. Install flooring and accessories after other finishing operations, including painting, have been completed.

D. 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.

2.7 EXTRA MATERIALS

B. Deliver extra materials to Owner.

PART 3 - PRODUCTS

3.1 RUBBER ATHLETIC FLOORING

A. Resilient rubber flooring made from recycled rubber and specifically designed for use as an athletic activity surfacing material.

1. Manufacturer: “Everlast Surfacing”, Dodge-Regupol.

2. Color and Pattern: “High Intensity”, Standard 20% Color, as selected by Architect.

3. Form: Roll goods; 48” wide.

4. Thickness: 3/8”.

5. Impact Insulation Class (ASTM E492): 45 minimum.

6. Recycled Content:

a. Flooring to be comprised of shredded and cleaned SBR tire rubber (100% post-consumer waste) and colored EPDM flecks (30% pre-consumer waste).

7. Product to be odorless.

3.2 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: Low VOC, Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 4 - 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. 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 RUBBER ATHLETIC FLOORING INSTALLATION

A. Comply with manufacturer’s written instructions for installing floor coverings.

B. Unroll floor coverings and allow them to stabilize before cutting and fitting.

C. Lay out floor coverings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

F. Maintain references markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. 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.

C. 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.

D. 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.

END OF SECTION 09650

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Resilient wall base.

B. Related Sections include the following:

1. Division 9 Section "Resilient Flooring."

PART 2 - RELATED DOCUMENTS

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

2.2 SUMMARY

A. This Section includes the following:

1. Resilient wall base.

B. Related Sections include the following:

1. Division 9 Section "Resilient Flooring."

2.3 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Initial Selection: Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

2.4 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 and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

2.5 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.

C. 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.

2.6 PROJECT CONDITIONS

A. Do not install products until they are at the same temperature as the space where they are to be installed.

B. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

2.7 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 10 linear feet for each 500 linear feet for fraction thereof, of each different type, color, pattern, and size of resilient product installed.
2. Deliver extra materials to Owner.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation.

3.2 RESILIENT WALL BASE

A. Rubber Wall Base: Products complying with FS SS-W-40, Type II and with requirements specified:

1. Color: As selected by Architect from manufacturer's full range of colors.

2. Style: Cove with top-set toe.

3. Minimum thickness: 1/8 inch.

4. Height: 4 inches.

5. Lengths: Coils in lengths standard with manufacturer.

6. Outside Corners: Formed on job.

7. Surface: Smooth.

8. Manufacturer: One of the following:

    a. Afco Rubber Corp.
    b. Armstrong World Industries
    c. Azrock Industries, Inc.
    d. Johnsonite
    e. Mercer Products Co., Inc.
    f. Flexco
    g. Roppe Corporation
    h. Tarkett, Inc.
    i. VPI Floor Products Division

3.3 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

4.2 PREPARATION

A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

4.3 INSTALLATION

A. General: Install resilient products 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. Form outside corners on job, from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
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 products so they are butted to adjacent materials and bond to substrates with adhesive.

4.4 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. Do not wash resilient products until after time period recommended by resilient product manufacturer.

B. Protect resilient products 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 resilient product manufacturer.

C. Clean resilient products 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.

END OF SECTION 09653

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 paint manufacturer's standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. 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.

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.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1.5 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.

1. The Architect will select one room 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. 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.

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. 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.

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.

C. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Unless otherwise specified, paint materials and systems specified herein are those of PPG Paints or PPG-Porter Paints. Subject to compliance with requirements, equivalent materials and systems by one of the following manufacturers are also acceptable:

1. Benjamin Moore and Co. (Moore).
2. Pratt and Lambert (P & L).
3. Glidden.
4. Sherwin Williams

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.

C. Colors: Provide color selections made by the Architect.

2.3 LEAD CONTENT

A. The paint shall comply with the latest requirements of the Federal Government for maximum allowable lead content. Such compliance shall be stated on the MSDS and container clearly identifying the product.

2.4 VOC COMPLIANCE

A. The paint shall comply with the latest requirements of Federal, Florida State, City or Local Government requirements for the maximum allowable VOC content at the time of purchase. Such compliance shall be stated on the MSDS and container clearly identifying the product.

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 and concrete masonry 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.

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. 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. 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.

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 schedule.
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, 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 interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. 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. All metal surfaces shall be sprayed except that piping, conduit, and ductwork may be brushed or rolled.

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. Electrical items to be painted include, but are not limited to, the following:

1. Exposed conduit and fittings.
2. Exterior switchgear.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. 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.

H. 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.

I. 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.

1. Provide satin finish for final coats.

J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

K. 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.
    b. Abrasion resistance.
    c. Apparent reflectivity.
    d. Flexibility.
    e. Washability.
    f. Absorption.
    g. Accelerated weathering.
    h. Dry opacity.
    i. Accelerated yellowness.
    j. Recoating.
    k. Skinning.
    l. Color retention.
    m. Alkali and mildew resistance.

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 PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

1. Exterior Stucco: Satin Acrylic Exterior Paint.

a. Prime Coat: Hot Stucco Primer.

1) PPG Paints: 4-603 Perma-Crete Interior/Exterior Alkali-Resistant Primer

b. First and Second Finish Coats: Satin Acrylic Exterior Paint

1) Porter: 739 Acri-Shield Satin Exterior Acrylic.

2. Exterior and Interior Hollow Metal Doors, Door Frames, and Window Frames: Semi-Gloss Acrylic Enamel Finish, spray applied.

a. Prime Coat: Spot Prime Scratched or Abraded Areas Only – Rust Inhibitive Alkyd Metal Primer.

1) PPG Paints: 90-912 Pitt-Tech Plus Interior/Exterior DTM Industrial Primer.

b. First and Second Finish Coats: Semi-Gloss Acrylic Enamel.

1) PPG Paints: 90-1210 Series Interior/Exterior Acrylic Semi-Gloss DTM Industrial Enamel

3. Sectional Overhead Doors (Exterior side only): Acrylic Gloss Exterior Paint.

a. Prime Coat: Spot prime scratched or abraded factory-finished areas only-rust inhibitive alkyd metal primer.

1) PPG Paints: 90-912 Pitt-Tech Plus Interior/Exterior DTM Industrial Primer.

b. Finish Coat: High-Sheen Gloss Acrylic Enamel.

1) PPG Paints: 90-1310 Series Interior/Exterior Acrylic High Gloss DTM Industrial Enamel. Apply by spraying one full bodied coat, plus any additional coats required for uniform color.

4. Exterior Galvanized Metal: Acrylic Gloss Exterior Paint.

   a. Preparation: Wipe down with naptha; apply Porter: 5 Galva-Prep; wash clean.

   b. Prime Coat: Rust Inhibitive, 100% Acrylic Metal Primer.

      1) PPG Paints: 90-912 Pitt-Tech Plus Interior/Exterior DTM Industrial Primer.

   c. First and Second Finish coats: High-Sheen Gloss Acrylic Enamel.

      1) Porter: 619 Acri-Shield Gloss Exterior Acrylic Paint.

5. Interior Concrete Block; Semi-Gloss Acrylic Epoxy.

   a. Prime Coat: Latex Block Filler.

      1) PPG Paints: 6-15 Speedhide Masonry Hi Fill Latex Block Filler.

   b. First and Second Finish Coats: Semi-Gloss Acrylic Epoxy.

      1) PPG Paints: 16-510 Pitt-Glaze WB1 Water-Borne, Pre-Catalyzed, Acrylic Epoxy.

6. Interior Gypsum Wallboard (Typical Finish); Eggshell Latex.

   a. Prime Coat: Latex Primer Sealer.

      1) PPG Paints: 6-2 Speedhide Interior Latex Quick-Drying Sealer.

   b. First and Second Coats: Eggshell Latex Enamel.

      1) PPG Paints: 6-4310 Series Speedhide Zero Interior Zero VOC Latex Eggshell Enamel.

7. Interior Gypsum Wallboard for the Following Rooms ONLY: Unisex Toilet 110; Women's Toilet 119; Men's Toilet 120; Satin-Gloss Acrylic Epoxy Paint.

   a. Prime Coat: Latex Primer Sealer.

      1) PPG Paints: 6-2 Speedhide Interior Latex Quick-Drying Sealer.

   b. First and Second Finish Coats: Semi-Gloss Acrylic Epoxy.

      1) PPG Paints: 16551 Pitt-Glaze WB Water-Borne Acrylic Epoxy.

8. Interior Gypsum Drywall Ceilings; Eggshell Acrylic Latex Paint.

   a. Prime Coat: Latex Primer Sealer.

      1) PPG Paints: 6-2 Speedhide Interior Latex Quick-Drying Sealer.

   b. First and Second Finish Coats: Eggshell Latex Enamel.

      1) PPG Paints: 6-4310 Series Speedhide Zero Interior Zero VOC Latex Eggshell Enamel.

9. Exterior Aluminum; Satin Acrylic Enamel Finish.

   a. Preparation: Acid Etch with Krud Kutter Metal Clean and Etch or equal.

   b. Prime Coat:

      1) PPG Paints: 90-912 Pitt-Tech Plus Interior/Exterior DTM Industrial Primer.

   c. First Finish Coat: Satin Acrylic Exterior Paint.

      1) Porter: 739 Acri-Shield Satin Exterior Acrylic paint.

10. Exterior Exposed Stainless Steel Flashing; Satin Acrylic Enamel Finish.

   a. Preparation: Hand sand to roughen surface; solvent clean.

   b. Prime Coat:

      1) PPG Paints: 90-912 Pitt-Tech Plus Interior/Exterior DTM Industrial Primer.

   c. First and Second Finish Coats: Satin Acrylic Exterior Paint.

      1) Porter 739 Acri-Shield Satin Exterior Acrylic Paint.

END OF SECTION 09900

SECTION 10155 – PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

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 toilet compartments and screens as follows:

1. Type: Plastic laminate.
2. Compartment Style: Overhead braced and floor anchored.
3. Screen Style: Wall hung.

B. Related Sections include the following:

1. Division 10 "Toilet and Bath Accessories" for grab bars and toilet paper holders.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

D. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation 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 units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corporation.
4. Ampco.
5. Bobrick Washroom Equipment, Inc.
6. Bradley Corporation; Mills Partitions.
7. Decolam.
8. Flush Metal Partition Corp.
9. General Partitions Mfg. Corp.
10. Global Partitions.
11. Knickerbocker Partitions Corp.
12. Marlite.
13. Metpar Corp.
14. Scranton Products.
15. Tex-Lam Manufacturing, Inc.
16. Weis-Robert Partitions, Inc.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Plastic Laminate: NEMA LD 3, HGS, 0.048-inch nominal thickness, color and pattern as follows:

1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.

C. Core Material for Plastic Laminate: ANSI 208.1, Type M-2 non-urea formaldehyde resin particle board with 45-lb density in thicknesses required to provide minimum nominal thicknesses for components as follows:

1. Doors, Panels, and Screens: 1 inch.
2. Pilasters: Finished to not less than 1-1/4 inches thick and with internal 0.1196-inch – thick steel-sheet reinforcement.

D. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch thick and 3 inches high, finished to match hardware.

E. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:

1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear-anodized aluminum.

F. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:

1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac), clear-anodized aluminum or stainless steel.

G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Plastic-Laminate Compartments and Screens: Pressure laminate facing sheets to core material without splices or joints in facings or cores. Apply laminate to edges before broad surfaces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture.

C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.

E. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Manufacturer's standard self-closing type.

a. Outswinging doors to return to fully closed position when unlatched; inswinging doors to stand open approximately 30 degrees when unlatched.

2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: For in-swinging doors, manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories; for outswinging doors, Bobrick surface-mounted robe hook #B-818 mounted at 48" above finished floor.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

1. Secure panels to walls and pilasters with not less than 3 stirrup brackets attached near top, middle and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Screens: Attach with not less than 3 stirrup brackets near top, middle and bottom of screen. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

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 intake and exhaust louvers at Apparatus Area 101.

B. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" for louvers in hollow-metal doors and frames.
2. Division 8 Section "Flush Wood Doors" for louvers in wood doors.
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. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

B. Wind Loads: Provide louvers including anchorage to building capable of withstanding minimum allowable wind load design pressures as indicated. Note that these pressures have been calculated by multiplying the ultimate wind pressures by a factor of .6.

1. Positive pressure = +32.5 psf
2. Negative pressure = -43.5 psf

2. Missile Impact Loads: Provide large and small hurricane missile protection in accordance with the Florida Building Code, Section 1626 – Impact Tests for Windborne Debris.

   a. Impact-resistant louvers are indicated on drawings. Refer to Sheet Number A4.1

3. Structural Design Criteria: Louvers shall pass Miami-Dade Protocols TAS-201 (Large Missile Impact), TAS-202 (Uniform Pressure), and TAS-203 (Cyclic Wind Pressure)

1.5 SUBMITTALS

A. Product Data: For each type of product indicated

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

   1. For installed louvers and vents indicated to comply with design loads, include structural analysis data including anchorage to structure (fastener size, type, and spacing) signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of metal finish required.

D. Qualification Data: For professional engineer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

   1. Provide State of Florida Product Approval number.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

   1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" 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.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements including masonry opening details indicated on drawings, provide products by one of the following:

1. Louvers:

a. Airolite Company, LLC.
b. Industrial Louvers, Inc.
c. Ruskin Company; Tomkins PLC.
d. United Enertech

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. 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 pan-head screws for exposed fasteners, unless otherwise indicated.

E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: 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.

B. Maintain equal louver blade spacing 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 material tolerances, and perimeter sealant joints.

1. Frame Type: Universal flange frame, unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.

F. Join frame members to each other 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.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Vertical, Wind-Driven Rain-Resistant, Missile-Resistant Louver:

1. Products (for installation in exterior building walls only):

a. Ruskin Company Model EME6325D.

b. United Enertech Model VV-10-D

2. Louver Depth: 6" overall assembly including missile protection system.

3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.062 inch for blades and 0.095 inch for frames.

4. Performance Requirements:

a. Percent Free Area: Not less than 42%, based upon actual louver size indicated on drawings.
b. Air Performance: Not more than 0.25 inch wg static pressure drop at 1,327 fpm free-area velocity.
c. Wind-Driven Rain Performance: Not less than 99.9 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 1006 fpm. Comply with Miami-Dade TAS-100A Wind-Driven Rain Test and AMCA 500L Wind-Driven Rain Test (Class A Water Penetration Class).

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. Horizontal, Florida Building Code Approved Drainable Louver

1. Products (for installation in A/C and Generator Enclosure screen wall only):

a. Airolite Company, LLC, Model K6746X
b. Industrial Louvers, Inc. Model 653XPDC
c. Ruskin Company Model ELF6375DFL
d. United Enertech Model DCFL-D-6

2. Louver Depth: 6”

a. Provide extended sill accessory; screen not required.

3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch for frames and blades.

4. Performance Requirements

a. Percent Free Area: Not less than 54%.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

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 from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. 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:

1. Insect Screening: Fiberglass, 16x18 mesh (51% free area), 0.0048-inch wire.

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. Finish louvers after assembly.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. 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 2605.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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.

3.3 INSTALLATION

A. Locate and place louvers and vents 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.

3.4 ADJUSTING AND CLEANING

A. 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. 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. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 10200

SECTION 10350 – FLAGPOLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Ground-set, fixed, cone tapered aluminum flagpoles with illuminated finial ball.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies capable of withstanding the effects of wind loads as determined according to the building code in effect for this Project or NAAMM FP 1001, “Guide Specifications for Design of Metal Flagpoles”, whichever is more stringent.

1. Flagged wind speed = 170 mph; 5’ x 8’ flag size.

B. Base flagpole design on maximum standard-size flag suitable for use with pole or flag size indicated, whichever is more stringent.

1.4 SUBMITTALS

A. Product Data: For each type of flagpole required. Include installation instructions.

B. Shop Drawings: Show general layout, jointing, grounding method, and anchoring and supporting systems.

1. Include detail of foundation system for ground-set poles and electrical wiring diagram for lighted finial.

C. Structural Calculations: For flagpoles indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each flagpole as a complete unit from a single manufacturer, including fittings, accessories, bases, and anchorage devices. Illuminated finial and truck unit may be obtained from a separate manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy Kraft paper or other weather-tight wrapping and prepare for shipment in hard fiber tube or other protective container.

B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Specifications are based upon products by The Flag Company, Inc. as distributed by The Flagpole Warehouse, Model ILH 30 “Iluminator Series”. Subject to compliance with specifications, comparable products by the following manufacturers are acceptable:

1. American Flagpole; a Kearney-National Inc. Company.
2. Baartol Company Inc. (The)
3. Concord Industries, Inc.
4. Eder Flag Manufacturing Company, Inc.
5. Ewing International.
6. Lingo Inc.; Acme Flagpole Division.
7. Michigan Flagpole Inc.
8. Morgan-Francis Div.; Original Tractor Cab Co., Inc.
9. PLP Composite Technologies, Inc.
10. Pole-Tech Company Inc.

2.2 FLAGPOLES

A. Aluminum Flagpoles: Fabricate from seamless, extruded tubing complying with ASTM B 241, alloy 6063-T6, with a minimum wall thickness of 1/4 inch, tensile strength not less than 30,000 psi, and a yield point of 25,000 psi. Heat treat after fabrication.

1. Provide cone-tapered aluminum flagpoles.
2. Butt diameter: 6”; top diameter: 3-1/2”; exposed height: 30’-0”.

2.3 FLAGPOLE MOUNTING

A. Provide manufacturer’s standard base system for the type of flagpole installation required.

B. Foundation type: For ground-set flagpoles, provide 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

1. Provide manufacturer's standard flash collar, finished to match flagpole.

2.4 SHAFT FINISH

A. General: Comply with NAAMM "Metal Finished Manual" for recommendations relative to application and designations of finishes.

B. Aluminum: Finish designations prefixed by "AA" conform to the Aluminum Association system for designating aluminum finishes.

1. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.5 FITTINGS

A. Finial Ball: 8", gold anodized aluminum ball with two, 3 watt, LED bulbs.

1. Provide transformer: 14 amps, with 12 volt output, 120 volt input, 60 Hz.

B. Truck: Ball-bearing, nonfouling, revolving, single sheave assembly of cast aluminum finished to match pole shaft, integrated with illuminated finial ball.

C. Cleats: Two 9-inch case metal cleats with fasteners, finished to match pole shaft.

D. Halyards: Provide two continuous halyards for each flagpole, as follows:

1. Polypropylene, braided, white: 5/16" diameter.

E. Halyard Flag Snaps: Provide 2 swivel snap hooks per halyard, as follows:

1. Chromium-plated bronze, with soft plastic covers.

PART 3 – EXECUTION

3.1 PREPARATION FOR GROUND-SET POLES

A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil or thoroughly compacted fill. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish, and other foreign matter from excavation, and moisten earth before placing concrete. Back fill open excavation after concreting with original excavated material.

B. Concrete: Provide concrete composed of Portland cement, coarse and fine aggregate, and water mixed in proportions to attain 28-day compressive strength of not less than 3000 psi, complying with ASTM C 94.

C. Place concrete immediately after mixing. Consolidate concrete in place by using vibrators. Moist-cure exposed concrete for not less than 7 days or use a nonstaining curing compound.

D. Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.

3.2 FLAGPOLE INSTALLATION

A. General: Prepare and install flagpoles where shown and in compliance with shop drawings and manufacturer's instructions.

1. Provide positive lightning ground for each flagpole installation.
2. Paint below-grade portions of ground-set flagpole with heavy coat of bituminous paint.

B. Foundation-tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric sealant and cover with flashing collar.

C. Wiring for illuminated finial: Wire in accordance with manufacturer's directions. Low voltage wiring to be run concealed within pole. Locate transformer as indicated on electrical drawings.

END OF SECTION 10350

SECTION 10431 - SIGNS

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 types of signs:

1. Panel signs.

2. Dimensional letters and numbers.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and lettering layout.

2. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:

a. Cast Acrylic Sheet and Melamine Sheet: Manufacturer’s color charts consisting of actual sections of material including the full range of colors available for each material required.
b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.

2. Samples for verification of color, patterns, and texture selected and compliance with requirements indicated:

    a. Cast Acrylic Sheet and Melamine Sheet: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.
    b. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. All signs shall conform to all requirements of the Americans with Disabilities Act 2010, ADA Standards for Accessible Design, Section 216 - Signs.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    1. Manufacturers of Panel Signs:

        a. APCO Graphics, Inc.
        b. ASI Sign Systems
        c. Clarke Systems
        d. Best Sign Systems
        e. Mohawk Sign Systems

2. Manufacturers of Dimensional Letters:

    a. Allen Industries, Inc.
    b. APCO Graphics, Inc.
    c. A.R.K. Ramos Manufacturing Company, Inc.
    d. ASI Sign Systems, Inc.
    e. Gemini Incorporated
    f. Metal Arts
    g. The Southwell Company

2.2 PANEL SIGNS FOR ROOM IDENTIFICATION

A. Panel signs shall be minimum 1/8” thick (excluding thickness of raised sign letters) melamine or acrylic plastic with 1/32” thick raised characters with Grade 2 Braille.

    1. At sign manufacturer’s option, the minimum 1/8” thickness of the panel can be achieved by laminating a base layer of melamine or acrylic to the top layer containing the integral raised characters. Edges shall be ground smooth.

    2. The characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with the background – either light characters on a dark background or dark characters on a light background. Submit manufacturer’s standard palette of colors meeting these requirements to Architect for selection.

    3. Graphics and text are to be etched to achieve correctly spaced and accurately reproduced sharp, true characters and Braille. The text shall be an integral part of the sign and not applied to the plate with adhesive or chemicals. Text height is to be determined within the range of 5/8” up to 2”. Graphics are etched into the face prior to the application of the background color.

B. Room identification and number signs are to be provided at each interior door opening and at certain exterior door openings where indicated on drawings.

    1. Provide an identification number sign at swinging doors or pairs of doors leading to a room as indicated on drawings. Room numbers to be as indicated on drawings.

    2. Provide an identification name sign at swinging doors or pairs of doors leading to a room as indicated on drawings.

        a. In addition to room number and name signs, include a pictogram of the international symbol of accessibility at each toilet room.
        b. Example:
            Room Number Sign: 120
            Room Name Sign: Men’s Toilet
            Pictogram: Accessibility Symbol

3. General Description of Signs.

   a. Room number signs shall be combined with room identification signs.
      1. Room numbers shall be ¾" Helvetica Medium Letters centered on sign (capital letter for suffix).
      2. Grade 2 Braille centered below number on all signs.
      3. Number shall be combined with Identification Sign on a single panel.

   b. Room Identification Signs.
      1. Room identification letters shall be 5/8" upper and lower case Helvetica Medium letters centered on sign.
      2. Grade 2 Braille centered on sign.

4. Fabrication: Provide 9 inch by 9 inch overall size. Sign edges are to be straight and free from saw marks or any other imperfections. Corners shall be rounded, with ¼" to 3/8" radius.

2.3 CAST DIMENSIONAL LETTERS AND NUMBERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting aluminum. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

B. Finish: High gloss polyurethane enamel in custom matched colors (two, maximum) to be selected by Architect.

C. Typeface: Times New Roman, all upper case.

D. Sizes: as follows; in locations indicated on drawings.

   1. 6" high and ¾" thick for street number

   2. 12" high and 1" thick for "Hillsborough County Fire Rescue Station No. 32."

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

   1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Room Identification Signs: Mount on adjoining walls and locate signs adjacent to the latch side of the door. In case of conflicts with closely spaced doors, with vision panels or where there is no wall space to the latch side of the door, notify Architect. Verify all sign locations with Architect prior to installation.

C. Wall Mounted Signs: Attach signs to wall surfaces using a minimum of two stainless steel screws. For exterior signs, use four stainless steel screws. Use expansion shields for screws set in masonry; use “Molly” type hollow wall fasteners for screws set in gypsum board or plaster.

   1. Mounting shall be at a height of 60” to the centerline of the sign (to centerline of top sign when two signs are mounted one above the other).

D. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

   1. Projected Mounting: Mount cast letters at a 1” projection distance from the wall surface indicated using projecting studs and spacers.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer’s instruction. Protect units from damage until acceptance by the Owner.

END OF SECTION 10431

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.

3. Modern Metal Products by Muckle
4. Potter-Roemer, Inc.
5. Samson Metal Products, Inc.
6. Strike First

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 2A-10B:C, 5-lb nominal capacity, in enameled steel container.

1. Provide at all locations except Dining/Day Room.

C. Wet Chemical “K Class” Type: UL-rated 2A:1B:K, 6 liter nominal capacity, in enameled steel container.

1. Provide at Dining/Day Room.

D. Multipurpose Dry Chemical Type: UL-rated 4A-80B:C, 10 lb. nominal capacity, in enameled steel container.

1. Provide at Fueling Station.

2.3 CABINETS

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed. Provide wherever cabinet is to be installed in a fire-rated wall or partition.

C. Cabinet Type: Suitable for containing the following:

1. Fire extinguisher.

D. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth.

E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

a. Provide 2-1/2 inch rolled edge.

F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.

G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.

1. Application Process: Silk screen.
2. Lettering Style: Horizontal
3. Lettering Color: White.

H. Door Style: Manufacturer's standard design.

1. Full-Glass Panel: Tempered glass, 1/8 inch thick.

I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

J. Exterior Cabinet: Heavy duty outdoor cabinet constructed of 16 gauge galvanized steel with red acrylic enamel finish. Provide weather-resistant gasketing, safety break cylinder lock, and sloped roof. Door to be solid metal, no glass.

a. Provide at Fueling Station.

2.4 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.5 STEEL CABINET FINISHES

A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

B. Factory-Priming for Field-Painted Finish: Apply shop primer specified below immediately following surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard fast-curing, lead-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.

5. Color: White. Paint the following:

a. Exterior of cabinet.
b. Interior of cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations indicated. Each extinguisher requires a cabinet. Mount cabinet with bottom edge of trim located 32" above finished floor.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions. Recesses in masonry walls shall be neatly sawcut.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10522

SECTION 10800 - 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 toilet and bath accessory items as scheduled, including privacy curtains and curtain rods for bunk rooms.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

D. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Specifications are based upon products by Bobrick Washroom Equipment, Inc. unless noted otherwise. Subject to compliance with requirements, equivalent toilet accessories by one of the following manufacturers are also acceptable:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bradley Corporation.
4. McKinney/Parker.

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16 (ASTM B 16M); Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366 (ASTM A 366M), 0.04 inch minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527 G60 (ASTM A 527M Z180).

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Mirror Glass: Nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro- plated copper coating, and protective organic coating.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

Letters shown in parentheses indicate symbol shown on drawings:

2.3 PAPER TOWEL DISPENSERS (PTD)

A. Surface-Mounted Towel Dispensers: Fabricate of stainless steel with hinged front equipped with tumbler lockset. Provide pierced slots at sides as refill indictor.

1. Capacity: Not less than 400 C-fold or 525 multi-fold paper towels without need for special adapters.
2. Product: Bobrick “Model B-262.”

2.4 TOILET PAPER DISPENSERS (TPD)

A. Double-Roll Dispenser and utility shelf: Size to accommodate two separate rolls of core type tissue up to 5-1/2-inch diameter roll.

1. Fabrication: Chrome-plated plastic spindles with heavy duty internal springs, with type-304 satin-finished, stainless steel brackets designed for surface mounting. Unit includes 16” wide by 5” deep stainless steel shelf with ½” return edges, satin finish.
2. Product: Bobrick “B-2840.”

2.5 GRAB BARS (GB)

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 18 gage (.050 inch) and as follows:

1. Mounting: Concealed, manufacturer’s standard flanges and anchorages.
2. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Smooth satin finish.
4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.
5. Product: Bobrick’s “Series B-6806", for 36 inch (GB-36) and 42 inch(GB-42) lengths at toilet stall/room locations as shown. Bobrick’s “Series B-6806,” for 24 “ and 48" units at shower stall locations as shown.

2.6 SOAP DISPENSERS

A. Surface-Mounted Units: Fabricate body andback of stainless steel; concealed mounting. Provide stainless steel piston, springs, and internal parts designed to dispense soaps, lotions and detergents in liquid form; 40 fl. Oz. capacity. Unbreakable fill window. Large locked hinged stainless steel filler top. Vandal-resistant design.

1. Product: Bobrick “Model B-4112”

2.7 MIRROR UNITS (MIR)

A. Stainless Steel Framed Mirror Units: Fabricate frame with angle shapes of not less than 18 gage (.050 inch), with square corners mitered, welded, and ground smooth. Provide in No. 4 satin polished finish. Mirror to be 1/4" tempered glass guaranteed against silver spoilage for 15 years.

2. Product: Bobrick “Model B-2908-1836” (for toilet rooms).

2.8 STAINLESS STEEL SHELF (SSS)

A. Stainless Steel Shelf: 6” wide by 16” long, 18-gauge, type 304 stainless steel, satin finish, ¾” return edge; front edge hemmed. Two 16-gauge brackets.

1. Product: Bobrick “Model B-296”.

2.9 SHOWER CURTAIN RODS (SCR) AND BUNK CURTAIN RODS (BCR)

A. Stainless Steel, heavy duty type: 1" outside diameter; 18-8, type 304, 20 gage tubing with satin finish. Flanges shall be 20 gage stainless steel with satin finish.

1. Product; Bobrick “Model B-6107.”

2.10 ANTIBACTERIAL SHOWER CURTAIN (SC)

A. Antibacterial Shower Curtain: 72-inch wide by 72-inch-high, 10-ounce, nylon-reinforced, antibacterial vinyl fabric with hemmed edges. Fabric to be flameproof, stain-resistant and self-deodorizing, with stainless steel grommets at minimum 6 inches o.c. through top hem. Furnish in color as selected by Architect. Provide one per shower stall.

1. Product: A & J “Model 250A”.
2. Shower Hooks: Provide stainless steel hooks in quantity required by number of eyelets in curtains; A & J “Model UX169 Curtain Ring.”

2.11 BUNK CURTAIN AND HOOKS (BC)

A. Curtain fabric shall be Trevira or Avora polyester, flame-retardant, machine-washable curtain, 54” wide by 76” high, as manufactured by Knoll Textiles-Healthcare Cubicle Fabric. Pattern shall be “Water’s Edge,” or “Orchard,” in color to be selected by Architect. Hiles Curtain Specialties is an acceptable fabricator (813) 886-5464.

B. Curtain Hooks: Provide stainless steel hooks in quantity required; A&J “Model UX169 Curtain Ring.”

2.12 SOAP DISH (SDSH)

A. Soap dish is furnished as an accessory with the hand-held shower. Refer to Plumbing Fixture Schedule on drawings.

2.13 FOLDING SHOWER SEAT (FSS)

A. Heavy-duty hinged seat designed to fold up against wall when not in use. Provide support braces, hinges, frame, and fasteners of Type 304 stainless steel. Construct frame of all-welded tubular construction for maximum strength. Provide L-shaped seat, designed for easy wheelchair access. Seat material to be phenolic core slats with ivory color face sheets.

1. Product: Bobrick “Model B-5181".

2.14 ROBE HOOK (RH)

A. Surface-Mounted Hat and Coat Hook: Heavy-duty satin-finished stainless steel hook welded to rectangular flange and support arm with backplate for concealed mounting.

1. Product: Bobrick “Model B-6727".

2.15 STAINLESS STEEL HOOK STRIP (HS)

A. Wall mounted, three-hook unit with hooks secured to 18 gauge, 4 inch high by 24 inch long satin-finished stainless steel mounting strip.

1. Product: Bobrick “Model B-232 x 24” with three hooks at all bunk rooms and toilet rooms.
2. Product: Bobrick “Model B-232 x 36” with four hooks at Corridor 109 where indicated on drawings.

2.16 STAINLESS STEEL TOWEL BAR (TB)

A. Stainless steel, surface-mounted towel bar with 18 inch long, ¾” square tubing bar attached to rectangular flanges and support arms with concealed wall plates; satin-finish.

1. Product: Bobrick “Model B-6737 x 18”.

2.17 MOP AND BROOM HOLDER/UTILITY SHELF (MBH)

A. Combination unit with 0.05-inch (18 gage), Type 304, stainless steel shelf with ½-inch returns, 0.062-inch (16 gage) support brackets for wall mounting. Provide 0.062-inch (16 gage) stainless steel hooks for wiping rags on front of shelf, together with spring-loaded, rubber hat, cam-type mop/broom holders; 1/4 inch diameter stainless steel drying rod suspended beneath shelf. Provide unit 36 inches long and complete with three mop/broom holders and two hooks.

1. Product: Bobrick “Model B-224 x 36".

2.18 FABRICATION

A. General: Only a maximum 1-1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof 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.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 11451 - RESIDENTIAL APPLIANCES

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. Refrigerator/Freezer.
2. Dishwasher.
3. Ice Maker, Commercial
4. Gas Range
5. Microwave Oven

1.3 SUBMITTALS

A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the residential appliance manufacturer for both installation and maintenance of appliances required for this Project.

B. Source Limitations: Obtain residential appliances through one source.

1. To the greatest extent possible, provide appliances by a single manufacturer for entire Project, unless noted otherwise in Residential Appliance Schedule.

C. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

E. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.

F. AHAM Standards: Provide appliances that comply with the following AHAM standards:

1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.

G. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

1.5 DELIVERY

A. Deliver appliances only after utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

1.6 WARRANTIES

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.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the appliances indicated for each designation in the Residential Appliance Schedule at the end of Part 3.

2.2 FINISHES

A. Porcelain-Enamel Finish: Provide manufacturer's standard factory-applied porcelain-enamel finish over cleaned and pretreated steel sheet. If no color is indicated, provide stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before residential appliance installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to Divisions 15 and 16 for plumbing and electrical requirements.

3.3 ADJUSTING AND CLEANING

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.4 RESIDENTIAL APPLIANCE SCHEDULE

A. Refrigerator / Freezer: Whirlpool Model WRF560SMYM, 30” French Door Refrigerator, 19.7 cubic foot capacity, stainless steel finish, glass shelves, Energy Star Qualified, ice maker. Three required.

B. Dishwasher: Whirlpool Model WDF550SAAS, 5 cycles, Tall Tub, Energy Star Qualified, Stainless Steel Interior, High Temperature Wash Option. Stainless steel finish. Two required.

C. Ice Maker, Commercial: Scotsman Model C0530MR Cuber, Energy Star Qualified, B530S bin, ERC 111 Remote Condenser, RTE 75 Line Set.

D. Gas Range: Viking Model VGCC536-4G, 36” wide range, self-cleaning, with four burners, 12” wide griddle, automatic electric spark ignition and re-ignition, 8” high backguard, stainless steel finish, three year full warranty. Two required.

E. Microwave Oven: Whirlpool Model WMC30516AS, 1.6 cu. ft., 1,200 watts, recessed glass turntable. Stainless steel finish.

END OF SECTION 11451

SECTION 12491 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes aluminum mini blinds for installation at all exterior windows.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract.

B. Product Data: Include printed data on physical characteristics, including slat metal thickness.

C. Shop drawings showing location and extent of blinds. Show installation details at and relationship to adjoining work. Include elevations indicating blind units. Indicate location of blind controls.

D. Samples for initial selection in the form of manufacturer's color deck of actual slats showing the full range of colors available.

E. Maintenance data for horizontal louver blinds to include the following:

1. Methods for maintaining horizontal louver blinds and finishes.
2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide horizontal louver blinds identical to those tested for the following fire-test-response characteristics as determined by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Test Methods: NFPA 701.
2. Rating: Pass.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual horizontal louver blind dimensions by accurate field measurements before fabrication, and show recorded measurements on final shop

drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

B. Space Enclosure and Environmental Limitations: Do not install horizontal louver blinds until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Springs Window Fashions Division, Inc., “Bali S 3000”.
2. Hunter Douglas, Inc., “Lightlines” Blinds.
3. Levolor Corp., “Mark i 1” with Lightmaster feature.

2.2 HORIZONTAL LOUVER BLINDS

A. Louvers: Manufacturer’s 1" wide aluminum slats, unperforated:

1. Privacy slat design for enhanced light control with hidden cord holes.
2. Minimum Thickness: .008 inches
3. Profile: crowned.
4. Braided ladder spacing: 18.0mm

B. Tilt Operation: Manual with wand.

1. Length of Tilt Control: 3/4 length of blind.
2. Position of Tilt Control: Left side, unless otherwise indicated.
3. Tilt: Full.

C. Cord-Lock Operation: Cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

1. Position of Cord Lock: Right side, unless otherwise indicated.

D. Cord Equalizers: Self-aligning to maintain horizontal louver blind position.

E. Valance: Match color of louvers.

F. Headrail: 1" high x minimum 1-1/2" wide.

1. Provide light-blocking lip at lower rear of headrail.

G. Mounting: End at each single window. At windows 6 feet wide and larger, mounting shall be at ends and window opening head as required for installation of a pair of blinds at each window.

H. Colors and Patterns: Where manufacturer's standard products are indicated, provide horizontal louvers complying with the following requirements.

1. Provide Architect's selections from manufacturer's full range of colors.

2.3 FABRICATION

A. Product Standard and Description: Comply with AWCMA Document 1029 for each horizontal louver blind unit consisting of louvers, rails, cord locks, tilting mechanisms, tapes, and installation hardware.

B. Lifting and Tilting mechanism: Noncorrosive, self-lubricating materials.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 degrees F.

1. Blind Units Installed Between (Inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb to jamb dimension of opening in which each blind is installed. Provide 1/2 inch clearance between each pair of blinds. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head to sill dimension of opening in which each blind is installed.

D. Installation Fasteners: Not less than 2 fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; support blind units under conditions of normal use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of horizontal louver blinds. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install blinds level, plumb, and located so exterior louver edges in any position are not closer than 1 inch to interior face of glass lites.

1. Jamb Mounted: Install headrail flush with face of opening jamb and head.

3.3 ADJUSTING

A. Adjust components and accessories for proper operation.

3.4 CLEANING

A. Clean blind surfaces, according to manufacturer's instructions, after installation.

B. Remove surplus materials, packaging, rubbish and debris resulting from installation. Leave installation areas neat, clean, and ready for use.

3.5 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensure that horizontal louver blinds are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 12491

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic mechanical requirements specifically applicable to Division 15 Sections, in addition to Division 1—General Requirements, General Conditions and Supplementary General Conditions.

B. This Division of the specifications includes mechanical;

1. Heating, Ventilating, Air Conditioning (HVAC).

2. Plumbing, and that mechanical which applies to heating, ventilating, air conditioning, and plumbing.

1.02 INTENT

A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use."

B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

C. The term “Basis of Design” used throughout this document shall be understood to mean a particular manufacturer’s equipment (as scheduled specifically on the drawings or specifications) has been used as the basis by the Design Engineer to establish physical dimensions, quality, and performance required, in addition to providing a basis for interaction with other ancillary components and/or other trades. Therefore, it shall be understood that use of a piece of equipment other than that identified as the Basis of Design may impact performance of an overall engineered system or may require revisions to ancillary interfacing equipment, and thus any manufacturer’s equipment other than that listed as Basis of Design shall require written approval via Addendum prior to bid except where the manufacturer’s name is specifically listed in these specifications as a pre-approved substitute or an accepted manufacturer. All substitutes, pre-approved substitutes, accepted manufacturers, and/or Basis of Design are subject to all requirements of quality, physical characteristics (i.e., dimension, sound, etc), and performance, etc., as set forth in these specifications and contract documents.

1.03 SURVEYS AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work. All material take-offs for the site shall be field measured prior to bids.

1.04 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Architect.

B. If directed by the Architect or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. At the time of each shop drawing submission, the Contractor shall call the Engineer's attention (in writing) to, and plainly mark on shop drawings, any deviations from the Contract Documents. (See Paragraph 1.06, B.)

D. Samples, drawings, specifications, and catalogs submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, location, section and article number of specifications governing, Contractor's name, and name of job. All equipment shall be labeled to match labeling on contract documents.

E. Control Systems: Submit description of operation and schematic drawings of the entire control system. Include bulletins describing each item of control equipment or component.

F. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.

G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

H. All shop drawings shall be submitted to the A/E by Contractor no later than 30 days from the day of contract award.

I. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

J. Submit all Division 15 submittals at one time in one integral group. Piece-by-piece submission of individual items will not be acceptable. Engineer may check contents of each submittal set upon initial delivery; if not complete as set forth herein, submittal sets may be returned to Contractor without review and approval and will not be accepted until made complete.

K. Routing and methods of support of piping shall be shown on shop drawings and shall have the review of the Engineer prior to fabrication and installation. Spacing of supports shall be as specified in Section 15140, or if not specified, shall not exceed the suggested maximum spacing recommended in ANSI B31.1 for each type of line. Supports shall be fabricated as detailed on reviewed shop drawings. Provide supports so located that temporary supports are not required during removal of valves or equipment. Insofar as possible, support lines directly from Building structure.

L. At the close of the job, prior to final review, five (5) bound copies of the following shall be submitted by transmittal letter to the Engineer for review and acceptance:

1. Equipment warranties;

2. Contractor's warranty;

3. Parts list and manuals for all equipment;

4. Balance and test readings;

5. Operating instructions (in writing);

6. Written instructions on maintenance and care of the system.

1.05 SUBMITTALS

A. Submit Manufacturer's published technical data, catalog cuts, wiring diagrams, shop drawings, samples and testing and balancing logs for all elements of the HVAC work. Submit under provisions of General Conditions and Supplementary General Conditions.

B. No equipment, piping, ductwork or components shall be fabricated, delivered, erected, or connected other than from shop drawings reviewed and approved by the Engineer.

C. It shall be understood that review of shop drawings by the Engineer does not supersede the requirement to provide a complete and functioning system in compliance with the Contract Documents.

D. Equipment Supports: Submit detailed shop drawings indicating equipment weight and dimensions, support material, connections, anchoring, and vibration isolation.

E. Submittals shall include, but not be limited to the following:

1. All equipment; cooling, heating, plumbing, electrical motors, starters, controls, etc.

2. Voltage, phase, and amps of each electrical item, such as motors, etc.

3. All auxiliary equipment.

4. Pipe, ductwork, valves, insulation, etc.

1.06 SUBSTITUTIONS

A. Materials and equipment are specified herein by a single or by multiple Manufacturers to indicate quality and performance required. The drawings are based upon equipment scheduled on drawings and specified. If another Manufacturer is considered for substitution during the bidding process, the Mechanical Contractor shall be responsible for coordinating all electrical, mechanical, structural, or architectural changes. Comparable equipment Manufacturers which are listed below equipment indicated as "Basis of Design" shall be considered as substitutes. Manufacturers other than the Basis of Design shall submit catalog information and 1/4" scale plan and section drawings showing proper fit and all clearances for maintenance items.

B. Substitutions of other Manufacturer's will be considered for use if, in the Engineers opinion, the item requested for substitution is equal to that specified. The Contractor shall provide to the Engineer a typed comparative list of the basis of design and the proposed substitute. The comparative shall list capacities, pressure drops, horse power, electrical requirements, etc., (refer to Paragraphs 1.04.C and 1.06.C).

Request for approval of substitutions shall be made in writing no less than ten (10) days (unless otherwise directed in Division 1) prior to bid. Substitutions shall not be considered approved unless the approval appears in an Addendum or unless so named in the specifications as a pre-approved substitute. The approval of any substitutions or equals prior to bid shall not be construed as a shop drawing approval. The substitute or equal must be submitted as described in the specifications and meet all the requirements of the specifications and drawings.

C. All requests for substitutions shall be submitted as described in paragraph 1.06, B., and specifically indicate any and all differences or omissions between the product specified as basis of design and the product proposed for substitution. Differences shall include, but shall not be limited to, data as follows for both the specified and substituted products.

- Principle of operation;
- Materials of construction or finishes;
- Thickness or gauge of materials;
- Weight of item;

- Deleted features or items;
- Added features or items;
- Changes in other Contractor's work caused by the substitution;
- Physical dimensions;
- Electrical requirements.

D. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or electrical, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted to the Architect/Engineer for approval.

E. Where such approved deviation requires quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.07 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the General Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. When work installed under this Division will be in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer/Architect, prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'0", clearly showing how work is to be installed in relation to the work of other trades. If the work is installed before coordinating with other trades, or so as to cause any interference with work of other trades, make all the necessary changes in work to correct the condition without extra charge.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.08 PROTECTION

A. Protect all work and material provided under this Division from damage. All damaged equipment work or material provided under this Division shall be replaced with new. Re-builts are not acceptable.

B. Protect all work and equipment until inspected, tested, and accepted. Protect work against theft, injury, or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

1.09 SCAFFOLDING, RIGGING, AND HOISTING

A. Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.10 REMOVAL OF RUBBISH

A. This Contractor shall at all times keep premises free from accumulations of waste materials or rubbish caused by his employees or work. At completion of work he shall remove all his tools, scaffolding, materials, and rubbish from the building and site. He shall leave the premises and his work in a clean, orderly, and acceptable condition.

B. All plaster, concrete, cement, etc. shall be removed from all pipe, hangers, and equipment prior to painting and/or concealment.

1.11 SAFETY

A. This Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.333), Title 29—Labor, Chapter XIII, Bureau of Standards, Department of Labor, Part 1518—Safety and Health Regulations for Construction; and that his housekeeping and equipment be maintained in such a manner that they comply with the Florida Industrial Commission Safety Code and Regulations of the Federal Williams—Steiger Occupational Safety and Health Act of 1970 (OSHA), wherein it states that the Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

1.12 SUPERVISION

A. This Contractor shall provide a competent, experienced, full time superintendent who is acceptable to the Architect/Engineer and Owner, and who is authorized to make decisions on behalf of the Contractor.

1.13 LUBRICATION

A. Where necessary, provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a lubrication tube with suitable fitting to an accessible location and suitably identify it.

B. After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated until final acceptance by the Owner.

1.14 VALVE CHARTS, TAGS, AND NAMEPLATES

A. Provide at a location designated by the Engineer and the Owner, a valve chart enclosed in an aluminum frame with clear plastic shield. Chart shall show the designated number of each valve, its location and service. Valve numbers shall be same as those shown on the "As-Built" drawings.

B. Each valve shown on the chart shall have a 1-1/2" diameter, 18 gauge brass tag with clearly visible stamped numbers, securely fastened to the valve stem or handle with a heavy brass hook or chain.

C. Each panel mounted switch, thermometer, gauge, or controller for fans, pumps, or other electrically operated equipment shall be clearly designated by a black plastic nameplate of size approved by the Engineer securely fastened with metal pins or screws to the panel directly under the item designated.

D. Refer to Section 15190 for additional information.

1.15 WIRING DIAGRAMS

A. Furnish for use under Division 16 all wiring diagrams as may be required for the installation of the wiring to insure proper operation and control of the equipment provided under this Division. Provide the diagrams in time to avoid delays.

1.16 MATERIAL AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished. Refer to substitutions in this Section.

B. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Architect and Engineer in accordance with the recommendations of the Manufacturer. This includes the performance of such tests as the Manufacturer recommends.

HILLSBOROUGH COUNTY

FLORIDA

REQUEST FOR PROPOSALS
FOR

EAST LAKE FIRE STATION NO. 32 REPLACEMENT
(CIP NO. C91179000*)*

CONSTRUCTION MANAGER (CM) AT-RISK

Volume 3 of 3
Technical Specifications (Part 2 of 2)

RFP NO. : RFP-C-0198-0-2016/ST

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1.17 QUIET OPERATION AND VIBRATION

A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer and the Owner. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer and the Owner shall be corrected in an approved manner at no additional expense to the Owner. Vibration control shall be by means of approved vibration eliminators in a manner as specified in Section 15242.

1.18 ACCESSIBILITY

A. This Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with all other Contractors whose work is in the same space, and shall advise them of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

B. This Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to, valves, traps, clean-outs, motors, controllers, switchgear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.

C. This Contractor shall provide the access panels for concealed mechanical equipment, valves, controls, dampers, or other device requiring service. (Refer to Paragraph 1.20 of this section.)

1.19 FOUNDATIONS, SUPPORTS, PIERS, AND ATTACHMENTS

A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this Division, and shall submit drawings to the Architect and Engineer for approval before purchase, fabrication or construction of same.

B. For pumps, compressors, and other rotating machinery, and for all equipment where foundations are indicated, provide concrete pads as shown. All pads shall be extended six inches (6") beyond machine base in all directions with top edge chamfered. Inset six inch (6") steel dowel rods into floors to anchor pads. All pads shall have a minimum of 6 x 6 W2.9/W2.9 WWF unless otherwise noted. Shop drawings of all foundations and pads shall be submitted to the Architect and Engineer for approval before same are constructed.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be the same materials and same quality of finish as the adjacent and surrounding flooring material.

D. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect and the Engineer, not strong enough shall be replaced as directed.

1.20 ACCESS DOORS FOR WALLS AND CEILINGS

A. Provide flush panel access doors with a 16 gauge steel frame and a 14 gauge steel door panel.

B. Finish is to be primed painted steel.

C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.

D. Provide access doors with a locked flush mounted vandal proof spanner head operated steel cams.

E. Provide 1-1/2 hour "B" label door for rated chase walls.

F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.

G. Provide a minimum 2'-0" by 2'-0" access doors unless shown or noted otherwise on the drawings.

H. Access doors for chase walls shall be mounted 16" off the finish floor.

I. Access doors for mechanical equipment shall be a minimum of 12" larger than equipment all around.

1.21 VALVE BOXES

A. All exterior underground valves shall be provided with exterior valve boxes equipped with removable covers appropriately labeled.

B. Valve boxes shall be manufactured of reinforced fiberglass plastic or heavy duty PVC as approved by the Architect/Engineer, unless otherwise noted on the drawings.

1.22 WELDING

A. Welded pipe joints shall be made by the oxyacetylene or electric process in accordance with the Code of Pressure Piping ASA B31.1.

B. Welding shall be done with good quality modern welding equipment, by competent operators, and in thorough, first class manner, conforming to AWS Standards.

C. The Contractor shall be required to furnish proof of the competency of each welding operator for both field and shop welds and shall at the request of the Architect/Engineer have all or any of such welding operators pass a standard qualification test such as ASME, AWS, or Hartford Insurance Company procedure and tests.

D. Filler-metal for the welding process shall conform to ASTM A233 "Specification for Mild Steel Arc-Welding Electrodes". Classification of electrodes shall be one of the following: E6010, E6015, E7016, E7018.

E. When welding is to be performed, precautionary measures must be taken to prevent fire. Remove flammable materials and debris from the area. Provide an appropriate extinguisher nearby.

F. Pipes shall be cut short and cold sprung into place before welding or fabricating to compensate for expansion of lines when hot.

G. Welds shall be of the single vee butt type. Pipe end shall be shop beveled to 45 degrees to within 1/16 inch of the inside wall surface.

H. The abutting ends of the joints shall be separated before welding to permit complete fusion, tacked in two or more points to maintain alignment, and welded. Welding shall be continuous around the pipe.

I. Welds shall be of sound weld metal, thoroughly fused into the ends of the pipe and to the bottom of the vee, and shall be built up in excess of the pipe wall to give a reinforcement of one-quarter (1/4) the pipe wall thickness and in such a manner that one weld metal will present a gradual increase in thickness from the surface of the pipe to the center of the weld. The minimum width of the weld shall be 2-1/2 times the pipe wall thickness.

J. The fillet welds from the flanges of fittings shall be fused into the pipe and plate for minimum distance of 1-1/2 times the pipe wall thickness and shall be built up to present a minimum throat thickness of depth of weld of 1-1/4 times the pipe wall thickness.

K. Branch connections shall be fabricated by welding. Openings cut into pipe for welded connections shall be accurately made to give carefully matched intersections and welding fittings shall be carefully welded into the pipe system.

L. Welding ells shall be used at all turns in welded pipe lines; no mitered ells will be approved.

M. Where branch piping is three times smaller than the main, branch connections shall be made up with the appropriate manufactured weld-on fitting. Welded tees shall be used for all other branch connections, unless otherwise approved by the Architect/Engineer for a specific case.

1. Approved Manufacturers

a. Allied Piping Products.

b. Bonney Forge.

c. Branch Connections.

d. Branchlets.

e. Tube Turn.

f. Thread-O-Lets.

N. Welds in piping shall be annealed after welding to remove the welding strains. The temperature need not exceed that causing a dull red, and shall be uniform around the pipe. Welds made in place shall be annealed, but the pipe shall be free to expand and shall be properly supported so as to avoid stresses. Annealing shall always be followed by slow cooling.

1.23 REGULATORY REQUIREMENTS

A. Conform to applicable Codes and Standards as follows:

1. Standard

a. Certain standard materials and installation requirements are described by reference to standard specifications. These standards are as follows:

ASA ..... American Standards Association.

ASTM ..... American Society for Testing Materials.

ASME ..... American Society of Mechanical Engineers Code of Unfired Pressure Vessels.

NEMA ..... National Electrical Manufacturers Association.

UL ..... Underwriters Laboratories.

ANSI ..... American National Standards Institute.

ASHRAE ..... American Society of Heating, Refrigerating and Air Conditioning Engineers.

SMACNA ..... Sheet Metal and Air Conditioning Contractor's National Association.

AMCA ..... Air Moving and Conditioning Association.

ARI ..... Air Conditioning and Refrigeration Institute.

AMA ..... Acoustical Materials Association.

For additional standards and requirements see other sections of the specifications.

Whenever a reference is made to a standard, installation and materials shall comply with the latest published edition at the time project is bid unless otherwise specified herein.

2. Codes And Rules

a. All material furnished and all work installed shall comply with the following codes as they apply to this project:

- ❍ National Electric Code.
- ❍ Regulations of the Florida Industrial Commission Concerning Safety.
- ❍ Applicable County, State and Local Building Codes.
- ❍ Local and State Fire Marshal Rules and Regulations.
- ❍ Occupational Safety and Health Agency Standards (OSHA).
- ❍ Florida State Board of Health Rules and Regulations.
- ❍ Florida Building Code—Mechanical.
- ❍ Chapter 4A-47, Florida Administrative Code - Uniform Fire Safety Standards for Elevators.

Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

3. Permits, Fees And Inspections

a. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all necessary approvals of all governmental departments having jurisdiction.

b. Obtain all required certificates of inspection for his work and deliver to the Owner/Engineer the same certificates before request for acceptance and final payment for the work.

c. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.

d. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.24 SCOPE OF WORK

A. The scope of the work included under this Division of the Specifications shall include complete mechanical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.

B. Systems shall include all appurtenances as required to achieve the operating conditions as shown and specified and shall result in a superior installation.

C. Scope of work shall include, but not be limited to, the following:

1. New Work

a. Provide air handling systems and split system DX units, complete with coils, filters, heating coils, ductwork, controls, etc.

b. Provide a standalone programmable control module on the 100% outside air units.

c. Insulate all new refrigerant and domestic hot water piping. Insulate all new and existing equipment with exposed hot and cold surfaces.

d. Provide rough balancing of air systems.

e. Provide sanitary and roof drainage systems as shown on drawings.

f. Provide new water heaters where indicated on drawings.

g. Provide new plumbing fixtures where indicated on drawings.

h. Provide exhaust air systems complete with ductwork, supply and exhaust fans, controls, etc.

i. Provide final connections of ductwork and piping to equipment and plumbing fixtures.

D. All electrical work required to support mechanical equipment or is otherwise necessary to operate mechanical equipment, shall be the responsibility of the Mechanical Contractor (including, but not limited to) electrical motors for all motor-operated equipment required under this Division, motor controllers, all starters not provided by the Electrical Contractor (coordinate with Electrical Contractor), pilot lights and relays, line and low voltage control wiring, raceways, connections to switches, and other electrical devices furnished with temperature control systems except as otherwise provided for in other Divisions of this Specification.

E. All starters furnished by the Mechanical Contractor shall meet all requirements specified in Section 16480.

F. Any equipment submitted for prior approval shall be submitted with the following written information specifically for the submitted project application: specific model numbers, dimensional data, performance data and other data as requested by the Engineer. General or ambiguous submittals will not be considered for prior approval.

1.25 PROJECT/SITE CONDITION

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Owner/Engineer before proceeding.

1.26 TRENCHING AND BACKFILLING

A. For requirements for trenching and backfilling, refer to Division 2.

1.27 CLOSE-OUT DOCUMENTS

A. This Contractor shall furnish Operating and Maintenance (O&M) manuals and As-built drawings before final payment will be issued.

1. O&M manuals shall be submitted in accordance with Division 1, General Requirements, and shall consist of the following (at a minimum):

a. All Contractor and Manufacturer warranties.

b. List of Contractors and Parts and Equipment Suppliers—complete with contact person, proper company name, address, and telephone numbers.

c. Parts list for supplied equipment—including a checklist of recommended components to be stocked on-site.

d. Maintenance and replacement parts manuals.

e. Start-up and shutdown operating instructions.

f. Manufacturer's literature describing the equipment, which shall include wiring diagrams and operating specifications.

g. Control system sequence of operation, system diagram, and backup disks of the system configuration.

h. Copies of final test and balance reports.

2. The Contractor shall provide AutoCAD as-built drawings and copies of each AutoCAD file on CD before final payment will be issued.

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SECTION 15140

SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe, Duct, and Equipment Hangers, Supports, and Associated Anchors.

B. Equipment Bases and Supports.

C. Sleeves and Seals.

D. Flashing and Sealing Equipment and Pipe Stacks.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15260 ..... Piping Insulation.

C. Section 15410 ..... Plumbing Piping.

D. Section 15450 ..... Plumbing Equipment.

E. Section 15535 ..... Refrigerant Piping and Specialties.

F. Section 15671 ..... Air Cooled Condensing Units.

G. Section 15836 ..... Split System Air Handler.

H. Section 15856 ..... 100% Outside Air Dehumidification Unit.

I. Section 15870 ..... Power Ventilators.

J. Section 15875 ..... Power Roof Ventilators.

K. Section 15890 ..... Ductwork.

1.03 SPECIAL REQUIREMENTS

A. Contractor shall submit shop drawings on products and methods of pipe supports.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. B-Line Systems.

B. Grinnell.

C. F and S.

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 2 Inch: Carbon steel, adjustable swivel, split ring (copper plated for copper pipe, hot dipped galvanized coating on non-copper pipe).

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis (copper plated for copper pipe, hot dipped galvanized coating on non-copper pipe).

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger (hot dipped galvanized coating.)

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over. Refer to drawings for special support details.

G. Vertical Support: Steel riser clamp (at each floor).

H. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

L. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

M. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

N. Shields for Vertical Copper Pipe Risers: Sheet lead.

O. Offset Pipe Clamp: Carbon steel, hot dipped galvanized finish (copper plated for copper pipe) for supporting vertical pipe away from wall.

P. Refer to drawings for additional supports.

2.03 HANGER RODS

A. Hanger Rods: Threaded both ends, threaded one end, or continuous threaded. Hanger rods shall be zinc plated steel.

2.04 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 FLASHING

A. Metal Flashing: 22 gage galvanized steel.

B. Lead Flashing: 5 lb/sq.ft. sheet lead for waterproofing; one lb/sq.ft. sheet lead for soundproofing.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

2.06 SLEEVES

The following are the minimum acceptable requirements for this project. Refer to the plans for more stringent methods and requirements.

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel, unless otherwise directed on the drawings with a more stringent requirement.

B. Sleeves for Pipes through Non-fire Walls or Footings. Form with steel pipe or 18 gage galvanized steel, unless otherwise directed on the drawings with a more stringent requirement.

C. Sleeves through outside walls shall be made with 18 gauge galvanized steel and fitted with chrome escutcheon covers at all finished surfaces.

D. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL Listed. Contractor shall submit manufacturer's UL approved methods for firesafing all types required for the project as coordinated with the methods of floor and wall construction. Refer to the plans for further requirements.

E. Sleeves for Round Ductwork: Form with galvanized steel.

F. Sleeves for Rectangular Ductwork: Form with galvanized steel.

G. Caulk: Silicone sealant of top quality.

2.07 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.08 MATERIAL/FINISH

A. General Locations: Steel pipe hangers, miscellaneous steel supports, hardware, bolts, washers, nuts, screws, etc., not specified to be plated or coated shall be hot dipped galvanized with a minimum of 1.50 oz/ft. on all sides and all field cuts shall be zinc coated.

B. Located In or Around Cooling Tower Yards: Pipe hangers, equipment supports, miscellaneous structure components, hardware, bolts, washers, nuts, screws, etc., shall be non-metallic polyester resin, vinyl ester resin, fiberglass, glass reinforced polyurethane or 316 stainless steel.

PART 3 EXECUTION

3.01 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE (INCHES)	MAXIMUM HANGER SPACING	HANGER ROD DIAMETER
1/2 to 1-1/4	6'-6"	3/8"
1-1/2 to 2	9'-0"	3/8"
2-1/2 to 3	10'-0"	1/2"
4 to 6	10'-0"	3/4"
8 to 12	14'-0"	7/8"
14 to 18	20'-0"	1"
PVC (All Sizes)	4'-0"	3/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor and support from wall midway between ceiling and floor or at 12 feet maximum spacing, whichever is less. Support vertical cast iron pipe at each floor and at each hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. All auxiliary steel required for pipe supports shall be furnished and installed by this Contractor. Where building structure is not usable for pipe supports, provide steel members, channels, angles, or "UNISTRUT" components for piping support. All auxiliary steel exposed to weather shall be galvanized.

J. Provide all steel required for support of pipes other than steel shown on structural Engineer's drawings.

K. Interior Pipe Guides, Expansion Loops, and Anchors: Provide pipe guides, expansion loops, and anchors on hot water heating pipes installed above the ceiling. Expansion loops shall be installed every 50 feet and supported from building structure with pipe guides on 10 feet spacing. Piping shall be anchored to the structure as necessary for directional expansion control.

3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases and supports of concrete type under all mechanical equipment and as shown on drawings.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Refer to Section 15010, Paragraph 1.19, Foundations, Supports, Piers, Attachments, for additional requirements.

3.04 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.

C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with Manufacturer's instructions for sound control.

3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Install chrome plated steel escutcheons at finished surfaces.

E. Sleeves installed in exterior walls with exposed ends shall be non-corrosive type sleeves (i.e., stainless steel).

***** END OF SECTION *****

SECTION 15170

MOTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single Phase Electric Motors.

B. Three Phase Electric Motors.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15671 ..... Air Cooled Condensing Units.

C. Section 15836 ..... Split System Air Handler.

D. Section 15856 ..... 100% Outside Air Dehumidification Unit.

E. Section 15870 ..... Power Ventilators.

F. Section 15875 ..... Power Roof Ventilators.

G. Section 16480 ..... Motor Control.

1.03 REFERENCES

A. AFBMA 9—Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11—Load Ratings and Fatigue Life for Roller Bearings.

C. ANSI/IEEE 112—Test Procedure for Polyphase Induction Motors and Generators.

D. ANSI/NEMA MG 1—Motors and Generators.

E. ANSI/NFPA 70—National Electrical Code.

1.04 OPERATION AND MAINTENANCE DATA

A. Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide manufacturers standard as supplied with respective equipment.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 16480 for required electrical characteristics.

B. Motors: Design for continuous operation in 40 degrees C environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, Service Factor, and motor enclosure type.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, Service Factor, Power Factor, efficiency.

D. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

2.03 SINGLE PHASE POWER—SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prefabricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER—PERMANENT SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER—CAPACITOR STARTER MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve ball bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.06 THREE PHASE POWER—SQUIRREL CAGE MOTORS

A. Starting Torque: Between one and one and one-half times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to ANSI/NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with ANSI/IEEE 112, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data.

G. Motor Frames: NEMA standard T-frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

I. Sound Power Levels: To ANSI/NEMA MG 1.

J. Nominal Efficiency: Meet or exceed values in Schedules at full load and rated voltage when tested in accordance with ANSI/IEEE 112.

K. Motors for variable speed (PWM) application shall conform to NEMA Standard MGI-1993, Part 31.40.4.2 insulation integrity capable of withstanding 1600 maximum peak voltages with 0.1 microsecond rise from 10% to 90% of steady state voltage.

L. Nominal Power Factor: Meet or exceed values in Schedules at full load and rated voltage when tested in accordance with ANSI/IEEE 112.

M. Motors with frame sizes 184T (5 HP) and larger shall be energy efficient type.

N. All motors shall be energy efficient type according to the following schedule:

MOTOR HP	MINIMUM EFFICIENCY
1-2	84.0
3-5	86.5
7.5	89.5
10	90.2
15	91.0
20-25	92.0
30	92.4
40-50	93.0
60	93.6
75-100	94.1
125-150	94.5
200	95.0

2.07 AIR HANDLING UNITS

A. Provide phase loss to shut down AHU in event of loss of phase from power company. Phase out device shall be automatically reset.

PART 3 EXECUTION

3.01 APPLICATION

A. Motors drawing less than 250 Watts and intended for intermittent service may be germaine to equipment manufacturer and need not conform to these specifications.

B. Motors shall be open drip-proof type, except where specifically noted otherwise.

C. Single phase motors for shaft mounted fans shall be split phase type.

***** END OF SECTION *****

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SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Identification of Mechanical Products Installed Under Division 15.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15260 ..... Piping Insulation.

C. Section 15280 ..... Equipment Insulation.

D. Section 15290 ..... Ductwork Insulation.

E. Section 15410 ..... Plumbing Piping.

F. Section 15450 ..... Plumbing Equipment.

G. Section 15671 ..... Air Cooled Condensing Unit.

H. Section 15836 ..... Split System Air Handler.

I. Section 15856 ..... 100% Outside Air Dehumidification Unit.

J Section 15870 ..... Power Ventilators.

K. Section 15875 ..... Power Roof Ventilators.

1.03 REFERENCES

A. ANSI/ASME A13.1—Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 15010 and Division 1.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number. Refer to Section 15010, Paragraph 1.14.

D. Submit manufacturer's installation instructions under provisions of Section 15010 and Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Brady.

B. Seton.

C. MSI.

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Metal Tags: 18 gauge brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Colors shall comply with ANSI A13.1. Size markers and letters as follows:

OUTSIDE DIAMETER OF INSULATION OR PIPE	LENGTH OF COLOR FIELD	SIZE OF LETTERS
¾" - 2"	1" x 8"	¾"
2½" - 6"	2¼" x 13"	1¾"
8" - 10"	4" x 24"	2½"
Over 10"	4" x 32"	3½"
Ductwork and Equipment	All	3½"

D. Plastic Flagging Tape: 1-3/16” wide, bright orange.

E. Plastic Equipment Markers: 2" x 4", minimum 1/8" thick, corrosive and chemical resistant, black with white letters. Minimum size letter shall be 1/4". Air handler shall include quantity and sizes of filters required for a complete filter change. Fasten with stainless steel hardware.

F. Equipment Locator Tacks: 7/8" diameter color coded with push tack and writable surface.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Metal Tags: Install with heavy brass hook or chain.

B. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.

C. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic equipment markers. Small devices, such as in-line pumps, may be identified with metal tags.

D. Controls: Identify control panels and major control components outside panels with plastic equipment tags.

E. Valves: Identify valves in main and branch piping with tags.

F. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

G. Ductwork: Identify ductwork with plastic equipment markers. Identify as to air handling unit number and service (supply air, return air, exhaust, outside air, etc.). Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

H. Provide signage for gas vents to indicate the following: "WARNING: FLAMMABLE GAS VENT".

I. Equipment Located Above Ceiling (i.e., VAV boxes, fans, air handlers, fire dampers, smoke dampers, etc.): Provide equipment locator tack, located on the ceiling directly below the equipment, to be spot marked and so mark is easily visible from the floor. Use a permanent marker and label each tag with the name of the equipment. Color code equipment by type as follows:

EQUIPMENT ABOVE CEILING	COLOR
Air Handlers/Fan Coil Units	Light Blue
Exhaust Fans	Green
VAV Boxes	Yellow
Duct Heaters	Orange
Fire Dampers	Red
Smoke Dampers	Red

J. Ductwork Volume Dampers Above the Ceiling: Tie an orange tape flag, minimum 18" long, from each volume damper. Let tape hang down vertically.

3.03 VALVE CHART AND SCHEDULE

A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

***** END OF SECTION *****

SECTION 15242

VIBRATION ISOLATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Vibration Isolation.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15450 ..... Plumbing Equipment.

C. Section 15671 ..... Air Cooled Condensing Units.

D. Section 15836 ..... Split System Air Handler.

E. Section 15856 ..... 100% Outside Air Dehumidification Unit.

F. Section 15870 ..... Power Ventilators.

1.03 REFERENCES

A. ASHRAE—Guide to Average Noise Criteria Curves.

1.04 QUALITY ASSURANCE

A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Indicate vibration isolator locations, with static and dynamic load on each, on shop drawings and described on product data.

C. Submit manufacturer's installation instructions under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

1.06 CERTIFICATES

A. Submit manufacturer's certificate under provisions of General Conditions, and Supplementary General Conditions that isolators are properly installed and properly adjusted to meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Amber Booth.

B. Mason Industries.

C. Vibration Eliminator Co.

D. AVNEC Incorporated.

E. Kevflex.

2.02 VIBRATION ISOLATORS

A. Amber Booth—Model numbers listed are included for identification. Refer to Paragraph 2.01 for additional manufacturers.

B. Type BSR—A combination spring and rubber hanger consisting of a rectangular steel box, coil spring, spring retainers, and elastomeric mounting designed for approximately 1/2" deflection.

C. Flanged, Type 2800—A flanged spherical rubber expansion joint constructed of molded neoprene, nylon cord reinforced, with integral steel floating flanges, suitable for pressure up to 225# (4 to 1 safety factor) and temperatures up to 225°F. Connectors shall have minimum movement capability of 1/2" compression, 3/8" extension 1/2" lateral and 15° angular. Where allowable movements will be exceeded or where operating pressures exceed the following, control rods shall be installed at each connector to limit elongation to 3/8".

through 4" ..... 200 psi
5" to 10" ..... 150 psi
12" to 14" ..... 100 psi
16" to 24" ..... 50 psi

Control units shall be of the spring isolated design through 8" and neoprene isolated for 10" and larger to limit noise and vibration transmission through the control rods.

D. Type SP-NRE—A pad-type mounting consisting of two layers of 3/8" thick ribbed or waffled Neoprene pads bonded to a 16 gage galvanized steel separator plate. Pads shall be sized for approximately 20 to 40 psi load and a deflection of 0.12" to 0.16".

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vibration isolators and flexible connectors for the following motor driven equipment.

1. Split System Air Handling Unit and Power Ventilators—Type BSR.

B. Set steel bases for one inch clearance between housekeeping pad and base. Adjust equipment level.

C. Provide Spring Isolators on Piping Connected to Isolated Equipment as follows: Up to 4 inch diameter, first three points of support; 5 to 8 inch diameter, first four points of support; 10 inch diameter and over, first six points of support. Static deflection of first point shall be twice deflection of isolated equipment.

***** END OF SECTION *****

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SECTION 15260

PIPING INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping Insulation.

B. Jackets and Accessories.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15140 ..... Supports and Anchors.

C. Section 15190 ..... Mechanical Identification.

D. Section 15400 ..... Testing of Piping Systems.

E. Section 15410 ..... Plumbing Piping.

F. Section 15450 ..... Plumbing Equipment.

G. Section 15535 ..... Refrigerant Piping and Specialties.

H Section 15671 ..... Air Cooled Condensing Unit.

I. Section 15836 ..... Split System Air Handler.

J. Section 15856 ..... 100% Outside Air Dehumidification Unit.

1.03 REFERENCES

A. ASTM C552-79—Cellular Glass Block and Pipe Thermal Insulation.

B. ANSI/ASTM C195—Mineral Fiber Thermal Insulation Cement.

C. ANSI/ASTM C547—Mineral Fiber Preformed Pipe Insulation.

D. ASTM B209—Aluminum and Aluminum-alloy Sheet and Plate.

E. ASTM C449—Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

F. ASTM E84, NFPA 255 and UL 723—Surface Burning Characteristics of Building Materials.

G. ASTM C1136—Vapor Retarders for thermal insulation.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three (3) years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, UL 723, and NFPA 255.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 INSULATION

A. Type A:

1. Impermeable, noncombustible, closed cellular glass insulation, conforming to ASTM C 552-79, "Specification for Cellular Glass Block and Pipe Thermal Insulation."

2. Conductivity (k) equals approximately 0.29 (BTU-IN/HR, SF, degrees F) at 75 degrees F.

3. Joint sealants and coatings shall be as approved by the insulation manufacturer for the intended application and service temperature range.

4. Jacketing shall be approximately 125 mils thick, consisting of a bituminous resin reinforced with a woven, glass fabric, an integral aluminum foil layer, and a protective plastic film coating.

5. Approved Manufacturers and trade names:

a. Pittsburgh Corning Corp. "*Foamglass Super K*" with Pittseal, Pittcote, and Pittwrap.

b. Approved Equal.

B. Type B:

1. Closed cell, flexible foamed plastic conforming to ASTM C177 or ASTM C518, "Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form."

2. Conductivity (k) equals approximately 0.27 (BTU-IN/HR, SF, Degree F) at 75 degrees F.

3. Approved Manufacturers and trade names:

a. Armstrong "*AP Armaflex*"

b. Rubetex Corp. "*Rubetex*"

C. Type C:

1. Glass fiber, rigid molded sectional pipe covering conforming to ASTM C547, Class II, Mineral Fiber Preformed Pipe Insulation.

2. Conductivity (k) equals approximately 0.23 (BTU-IN/HR, SF, Degree F) at 75 degrees F.

3. Approved Manufacturers and Trade Names:

a. Manville Corp. "*Micro-Lok 650-AP-T*."

b. Owens-Corning Fiberglass Corp. "*One Piece 25 ASJ/SSL-II*"

c. Certain-Teed "*500 Degree Snap-On*."

d. Knauf Fiberglass "*Knauf Pipe Insulation, 850°F.*"

2.02 JACKET

A. Interior Applications:

1. Vapor Barrier (ASJ) Jackets: Kraft reinforced foil vapor barrier with double self-sealing adhesive joints.

2. Vapor Barrier (ASJ) Jackets: Metalized polyester film, reinforcing scrim, flame-retardant adhesive, and bleached paper with SSL. Butt strip tape coated with high performance, pressure sensitive, flame retardant adhesive.

B. Exterior Applications: (Exterior and other exposed areas such as equipment/ mechanical rooms)

1. Aluminum Jackets: ASTM B209; 0.016 inch thick; smooth finish with factory applied integral moisture barrier.

2. Aluminum Fitting Covers: Childers 2 or 4 piece ELL-JACS elbow covers, Gore ELL-JACS elbow covers and 2-piece TEE-JACS tee covers; ASTM B209; 0.024 inch thick; smooth finish.

2.03 ACCESSORIES

A. Insulation Bands: 3/8 inch wide; 0.020 inch thick aluminum.

B. Metal Jacket Bands: 1/2 inch wide; 0.020 inch thick aluminum.

C. Insulation Bonding Adhesive (to metal)

1. Benjamin Foster 85-15.

2. Childers Chil-Stix CP-85.

D. Insulating and Finishing Cement

1. Armco Corp.

2. Rockwool Corp.

3. Manville Corp.

E. Vapor Barrier Lap Adhesive

1. Benjamin Foster 82-07.

2. Childers Chil-Stix CP-85.

F. Vapor Barrier Mastic

1. Benjamin Foster 30-35.

2. Childers CP-30 Low Odor (for indoor use).

3. Childers Chil-Pruf CP-22/23/24 (for outdoor use).

G. Lagging Adhesive

1. Benjamin Foster 30-36.

2. Childers Chil-Rene CP-96.

H. Glass Cloth Jacket

1. Benjamin Foster.

2. Childers Chil-Glas #10.

I. PVC Fittings Covers

1. Certain-Teed "*Snap Form*."

2. Manville Corp. "*Zeston*."

3. Approved Equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Install materials after piping has been tested, cleaned, and approved, as required by Section 15400.

B. All surfaces to be insulated shall be dry and free of loose scale, rust, dirt, oil or water.

3.02 APPLICATION

A. Insulation shall be installed in a smooth, clean, workmanlike manner. Joints shall be tight and finished smooth without fishmouths.

B. Insulation shall fit tightly against the surface to which it is applied to prevent air circulation between the insulation and the pipe or equipment to which it is applied.

C. Insulation applied to cold piping or equipment shall be completely vapor sealed, free of pin holes or other openings.

D. Do not use wet insulation materials.

E. All longitudinal joints on vertical pipe runs shall be staggered.

F. Apply insulation so as to permit expansion or contraction of pipe lines without causing damage to insulation or surface finish.

G. Do not apply mastic or adhesive until all previous application of mastic and adhesives have thoroughly dried.

H. The adhesive used in connection with all covering work shall contain an approved vermin and rodent-proof ingredient.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

3.04 TYPE A INSULATION INSTALLATION

A. Interior

1. Butter joints of Foamglass insulation with Pittseal 444 or Childers CP-76. Apply insulation to pipe and fittings with all joints tightly fitted. Secure with stainless steel wire so that each length of insulation shall be secured with two wires. Insulation shall be applied with all joints fitted to eliminate voids. Voids shall be eliminated by refitting or replacing insulation. Do not fill voids with joint sealer.

2. Finish with metalized polyester/scrim/bleached white Kraft or approved foil/scrim/bleached white Kraft, all service jacket (ASJ). Finish elbows and fittings with Pittcote 404 or Childers CP-30 Low Odor reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch.

B. Exterior and Mechanical Equipment/Storage Rooms

1. Apply insulation as noted above (paragraph 3.04 A.1) and apply vapor barrier with Pittcote 404 or Childers CP-30 Low Odor reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch. Then apply a second coat of Pittcote 404 or Childers CP-30 Low Odor and finish with .016 inch thick aluminum jacket. Elbows and tees shall be finished with preformed 0.024 inch thick aluminum fitting covers.

3.05 TYPE B INSULATION INSTALLATION

A. Interior

1. Type B insulation shall be slipped on the pipe prior to connection, and the butt joints shall be sealed. Where the slip-on techniques is not possible, the insulation shall be carefully slit and applied to the pipe.

2. All joints shall be sealed with the Manufacturer's recommended adhesives.

3. Do not apply Type B insulation in multiple layers.

4. Type B insulation shall not be used in plenums nor fire wall penetrations.

5. This Contractor shall paint Type B insulation exterior to the building with two (2) coats of a vinyl lacquer paint recommended by the Insulation Manufacturer.

B. Exterior and Mechanical Equipment/Storage Rooms

1. Type B insulation shall be installed as described for interior except the pipe and fitting shall be covered with .016 inch thick aluminum jacket.

2. Elbows and tees shall be finished with preformed 0.024 inch thick aluminum fitting covers.

3.06 TYPE C INSULATION INSTALLATION

A. Interior

1. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with vapor barrier adhesive. Seal end joints with four inch (4") wide straps of vapor barrier tape. Seal off ends of insulation with vapor seal mastic at valves, fittings, and flanges. No further finish required.

B. Exterior and Mechanical Equipment/Storage Rooms

1. PVC fitting jackets shall be used when they are available for the particular application.

3.07 HANGERS

A. Continue insulation through pipe hangers. Provide either rigid insulation inserts or sheet metal inserts at all outside pipe hangers. Provide rigid insulation inserts for piping operating below 60 degrees F and sheet metal inserts for piping above 60 degrees F.

B. Rigid insulation or wood inserts between the pipe and pipe hanger shall be of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation insert shall not be less than the following lengths:

1/2" to 2-1/2" pipe size	10" Long
3" to 6" pipe size	12" Long
8" to 10 pipe size	16" Long
12" and Over	22" Long

C. Inserts for cold piping shall have a vapor barrier facing of the same material as the adjacent pipe insulation. Seal inserts into insulation with vapor seal mastic.

D. Where insulation is a load bearing material of sufficient strength to support the weight of the piping, pipe shields one-third the circumference of the insulation and of a length not less than three times the diameter of the insulation (maximum length 24") shall be provided. An all service jacket shall be applied between shields and insulation. Follow insulation manufacturer's recommendations for use of pipe insulation in conjunction with outside installed hangers.

E. Where insulation is not of sufficient strength to support the weight of the piping, a saddle, or section of calcium silicate insulation such as "Kaylo" shall be provided. Vapor barrier and finish shall be applied as required to match adjoining insulation. In addition, shields shall be furnished as specified above.

3.08 PIPE SLEEVES

A. Pipe insulation and vapor barrier shall be continuous through sleeves in walls and floors.

B. Type B insulation shall not be used in sleeves through fire walls or fire rated (2 hour) floor systems. Use Type A or Type C through the sleeve instead and vapor seal the joint between the two (2) insulations.

C. Provide 26 gauge galvanized steel or 0.020 inch aluminum jacket over insulation on pipe passing through sleeves where sealant is required.

D. Where penetrating interior walls, extend the metal jacket 2 inches out either side of the wall and secure each end with a metal band compressing the insulation slightly.

E. Where penetrating floors, extend the metal jacket 2 inches below the floor and 5 inches above the floor. Secure with metal bands.

3.09 INSULATION SCHEDULE (ABOVE GRADE PIPING)

A.

SERVICE	PIPE SIZE	INSULATION TYPE AND THICKNESS
Exterior Chilled Water (including unconditioned spaces and mechanical equipment rooms)	All	2-1/2" Type A
Interior Chilled Water (Including Domestic)	2" or Less	1-1/2" Type A
Interior Chilled Water	2-1/2" or More	2" Type A
Refrigerant Suction Pipes and Coil Condensate Lines (except in plenums or fire wall penetrations)	All	3/4" Type B
Refrigerant Suction Pipes and Coil Condensate Lines (in plenums or fire wall or floor penetrations)	1-1/4" or Less	1-1/2" Type A
Refrigerant Suction Pipes and Coil Condensate Lines (in plenums or fire wall or floor penetrations)	1-1/4" or More	1-1/2" Type A
Heating Hot Water	All	2" Type A
Domestic Hot Water, Tempered Water, Recirculated Hot Water, and Service Hot Water	2" or Less	1" Type C
Domestic Hot Water, Tempered Water, Recirculated Hot Water, and Service Hot Water	2-1/2" or More	1-1/2" Type C
Roof Drain Bodies	All	1-1/2" Type C
Horizontal Rain Water Conductors	All	1-1/2" Type C

***** END OF SECTION *****

SECTION 15280

EQUIPMENT INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Equipment Insulation.

B. Covering.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15190 ..... Mechanical Identification.

C. Section 15260 ..... Piping Insulation.

D. Section 15400 ..... Testing of Piping Systems.

E. Section 15440 ..... Plumbing Fixtures.

F. Section 15450 ..... Plumbing Equipment.

G. Section 15856 ..... 100% Outside Air Dehumidification Unit.

H. Section 15936 ..... Air Outlets and Inlets.

1.03 REFERENCES

A. ANSI/ASTM C552—Cellular Glass Block and Pipe Thermal Insulation.

B. Elastomeric Foam Insulation.

C. ASTM E84—Surface Burning Characteristics of Building Materials.

D. NFPA 255—Surface Burning Characteristics of Building Materials.

E. UL 723—Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in insulation application with three years minimum experience.

B. Insulation and Covering: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84. UL 723.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include product description, list of materials and thickness for equipment scheduled.

C. Submit manufacturer's installation instructions under provisions of these specifications.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Pittsburg Corning (Type A).

B. Rubatex (Type B).

C. Armstrong Armaflex (Type B).

2.02 INSULATION

A. Type A: Cellular glass; ANSI/ASTM C552; 'k' value of 0.29 at 75 degrees F; 8.5 lb/cu ft density. ASTM 84 flamespread.

B. Type B: Elastomeric foam insulation; 'k' value of 0.27 at 75 degrees F. ASTM 84 flamespread: less than 25; smoke developed: less than 50.

2.03 ACCESSORIES

A. Bedding Compounds: Non-shrinking, permanently flexible, compatible with insulation.

B. Vapor Barrier Coating: Non-flammable, fire resistant, polymeric resin, compatible with insulation.

C. Insulating Cement: ANSI/ASTM C195, hydraulic setting mineral wool.

D. Wire Mesh: Corrosive-resistant metal; hexagonal pattern.

PART 3 EXECUTION

3.01 INSTALLATION

A. Refer to Section 15260, Paragraph 3.04, for additional instructions.

B. Install materials in accordance with manufacturer's instructions.

C. Do not insulate factory insulated equipment.

D. Apply insulation as close as possible to equipment by grooving, scoring, and beveling insulation, if necessary. Secure insulation to equipment with stainless steel wires or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Cover insulation with metal mesh and finish with heavy coat of insulating cement.

G. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

H. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage. Refer to detail on drawings for pump insulation requirements.

I. Flat or irregular equipment insulation shall be cut to fit the shape and contour of the equipment. All voids between equipment surface and insulation shall be packed with light density fiberglass.

3.02 SCHEDULE

A. Chiller Cold Surfaces—Type 'B'—3/4" thick (add insulation to all surfaces which exhibit condensation).

B. Chilled Water Pump Surfaces—Type 'A'—2" thick.

C. Air Separators, Strainers, Valve Bodies etc.—Type 'A'—2" thick.

D. All Equipment Operating Below Ambient Dew Point—Type 'A'—2" thick.

E. Air Inlets and Outlets—Refer to Section 15290.

F. Handicap Accessible Lavatory and Sink Traps, Cold and Hot Water Supply Piping—Type 'B'—3/4" thick, unless otherwise noted on plumbing drawings.

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SECTION 15290

DUCTWORK INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Ductwork Insulation.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15190 ..... Mechanical Identification.

C. Section 15856 ..... 100% Outside Air Dehumidification Unit.

D. Section 15890 ..... Ductwork.

E. Section 15910 ..... Ductwork Accessories.

F. Section 15936 ..... Air Outlets and Inlets.

1.03 REFERENCES

A. ANSI/ASTM C553—Mineral Fiber Blanket and Felt Insulation.

B. ANSI/ASTM C612—Mineral Fiber Block and Board Thermal Insulation.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application with two years minimum experience.

B. Materials: UL listed; flame spread/smoke developed rating of 25/50 in accordance with NFPA 90A.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

D. Submit product description and manufacturer's instructions for all adhesives, mechanical fasteners, joint tape, etc., prior to starting work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Knauf Fiberglass.

B. Owens Corning Fiberglass.

C. Mansville.

2.02 MATERIALS

A. Type A: Flexible glass fiber; ANSI/ASTM C553; commercial grade; 6.0 installed 'R' value (minimum) at 75 degrees F, 0.002 foil scrim facing for air conditioning ducts (nominally 2" thick).

B. Type B: Glass fiber; UL Class 1; 'k' value of 0.24 at 75 degrees F 3 lb/cu ft minimum density; black pigmented, fire resistant coated air side for maximum 6,000 ft/min air velocity. Insulation shall be Owens-Corning Fiberglas Aeroflex Duct Liner.

C. Adhesives: Waterproof fire-retardant type and conform to adhesive and sealant council standards; ASC-A7001A-1971.

D. Lagging Adhesive: Fire resistive to ASTM E84, NFPA 255, UL 723.

E. Mechanical Fasteners: Galvanized steel, 12 gage, self- adhesive pad. Fasteners shall conform to mechanical fastener standard MF-1-1971 (available from SMACNA).

F. Joint Tape: Glass fiber cloth, open mesh.

G. Tie Wire: Annealed steel, 16 gage.

PART 3 EXECUTION

3.01 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Extend shafts for handles on equipment/devices which are insulated so that insulation is applied at the intended thickness (not compressed). Insulation shall be installed in a manner to eliminate sweating on handles and shafts. Handles shall remain accessible, visible, and operable.

3.02 INSTALLATION

A. Type A

1. Apply insulation tightly and smoothly to duct.

2. Secure insulation on the bottom of ducts and plenums and on the sides of plenums and other places where the insulation will sag.

3. Install all materials in accordance with Manufacturer's installation instructions.

4. Butt all insulation joints firmly.

5. Install duct wrap to obtain specified 'R' value using a maximum of 25% compression.

6. All penetrations and damage to the facing shall be repaired with tape and mastic prior to system start-up.

7. Provide 3" wide (minimum) pressure sensitive tape applied with moving pressure using an appropriate sealing tool at all seams and joints. Apply vapor seal mastic over all taped seams and joints.

8. Longitudinal seam of the vapor retarder shall be overlapped a minimum of 2 inches. A 2 inch tab shall be provided for the circumferential seam.

9. Closure systems shall have a 25/50 flame spread/smoke developed rating per UL 723.

10. For rectangular ducts over 18 inches wide, the duct wrap shall be secured to the bottom side of the duct with mechanical fasteners spaced on 18 inch centers to reduce sag. Fasteners shall be installed in a manner to avoid over compressing the insulation with the retaining washer.

11. Impale insulation on the bottom of ducts and plenums and on the sides of plenums and other places where the insulation will sag.

12. Cut off protruding pin after clips are secured and seal with aluminum backed pressure sensitive tape.

13. Apply insulation with joints tightly butted.

14. Seal all ductwork joints, punctures, and fittings with a mastic type sealant containing a vapor barrier.

15. Cover all breaks, joints, punctures, and voids with a vapor seal mastic and cover with a vapor barrier material identical to vapor barrier on the insulation.

16. Bevel insulation around nameplates, access plates, and doors.

17. Insulation shall be continuous through walls and floors except at fire dampers.

B. Type B

1. All portions of duct designated to receive duct liner shall be completely covered with Duct Liner. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. Board shall be cut to assure tight, overlapped corner joints. Top pieces shall be supported by the side pieces.

2. The black coated surface of Duct Liner shall face the air stream.

3. Duct Liner shall be adhered to the sheet metal duct with 100% coverage of adhesive, all exposed leading edges and transverse joints shall also be coated with adhesive. In addition to the above, mechanical fasteners shall be used to secure the Duct Liner to the duct. All edges of duct liner shall be coated with adhesive during the fabrication of ductwork and all exposed edges shall be coated with adhesive prior to field installation of sections.

4. For horizontal runs when the duct width exceeds 12" or the duct height exceeds 16", the Duct Liner Board shall be additionally secured with mechanical fasteners starting within 3" of upstream transverse edges of the Liner and spaced at a maximum of 15" o.c. and 15" from longitudinal joints. On vertical runs, the fasteners shall be used when either dimension exceeds 12".

C. Install all materials in accordance with Manufacturer's installation.

D. Continue insulation with vapor barrier through penetrations.

3.03 SCHEDULE

A. Supply and Return Ductwork—Type A (nominally 2" thick).

B. Flex Connections at Air Handling Units and Other Transitions—Type A (nominally 2" thick).

C. All Equipment and Ductwork Operating Below Ambient Dew Point—Type A (nominally 2" thick).

D. Supply and Return Ductwork—First forty (40) feet, unless noted otherwise on the drawings, before and after air handler—Type B (1" thick) sandwiched inside double wall duct. Refer to Section 15890, Ductwork, for more information.

E. Relief, Exhaust, and Air Transfer Ductwork—Type B (1" thick).

F. Tops of All Supply Diffusers—Type A (nominally 2" thick).

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SECTION 15310

FIRE PROTECTION PIPING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe, Fittings, Valves, and Connections for Fire Protection Systems.

1.02 RELATED WORK

A. Section 15140 ..... Supports and Anchors.

B. Section 15190 ..... Mechanical Identification.

1.03 REFERENCES

A. ANSI/ASME B16.1—Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

B. ANSI/ASME B16.5—Pipe Flanges and Flanged Fittings.

C. ANSI/ASME B16.25—Buttwelding Ends.

D. ANSI/ASME Section 9—Welding and Brazing Qualifications.

E. ANSI/ASTM A135—Electric-Resistance-Welded Steel Pipe.

F. ANSI/AWWA C110—Ductile Iron and Gray Iron Fittings.

G. ANSI/AWWA C151—Ductile Iron Pipe, Centrifugally Cast.

H. ASTM A120—Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses.

I. NFPA 13—Installation of Sprinkler Systems.

J. NFPA 14—Installation of Standpipe and Hose Systems.

K. Chapter 4A-47, Florida Administrative Code Uniform Fire Safety Standards for Elevators.

1.04 QUALITY ASSURANCE

A. Conform to NFPA 13 for sprinkler systems.

B. Welding Materials and Procedures: Conform to ASME Code.

C. NFPA 14—Installation of Standpipe and Hose Systems.

D. Employ certified welders in accordance with ANSI/ASME Section 9, AWS D10.9.

E. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.05 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.

C. Indicate valve data and ratings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place, under provisions of Division 1.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures. Maintain in place until installation.

PART 2 PRODUCTS

2.01 PIPE

A. Steel Pipe: (Above grade) ASTM A53; ASTM A120; ANSI/ASTM A135; black; weight; schedule 40.

B. Steel Pipe: (Above grade) ASTM A135; ASTM A795; ASTM A795M; black; weight; schedule 10; rolled grooves, dimensionally compatible with listed grooved fittings. Cut groove pipes are not accepted.

C. PVC Pipe: (Below grade) ANSI/AWWA C151, ductile iron. Cement lined and Bituminous seal coated.

D. Piping shall have a minimum Corrosion Resistance Ratio (CCR) of 1.0.

2.02 PIPE FITTINGS

A. Steel Fittings: (Above grade) 2" and larger, ANSI/ASME B16.25, butt weld ends. ASTM A234, wrought carbon steel and alloy steel. ANSI/ASME B16.5, steel flanges and fittings. ANSI/ASME B16.11, forged steel socket welded and threaded.

B. Cast Iron Fittings: (Above grade) 1-1/2" and smaller, ANSI/ASME B16.4, screwed fittings.

C. Ductile Iron Fittings: (Below grade) 4" and Larger, ANSI/AWWA C110.

D. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.

2.03 JOINT MATERIALS

A. Threaded Joint Compound.

2.04 UNIONS, FLANGES, AND COUPLINGS

A. Unions: 150 psi malleable iron for threaded ferrous piping.

B. Flanges: 150 psi forged steel slip-on, Weldneck flanges.

C. Couplings: Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.05 ACCEPTABLE MANUFACTURERS—GATE VALVES

A. Stockham.

B. Crane.

C. Jenkins.

2.06 GATE VALVES

A. 2-1/2" and larger, U.L. listed, flanged faced, O.S.&Y., cast iron body and bonnet, bronze fitted 175 WWP class ASTM a 126 with tamper switch, Stockham G634, Jenkins 825A, Crane 467.

B. 2" and smaller, U.L. listed, threaded bronze, rising stem 175 WWP class, ASTM B62 with tamper switch, Stockham B133 or equal by Crane, Jenkins, or Walworth.

2.07 CHECK VALVES

A. 2-1/2" and larger, U.L. listed, cast iron body, bronze disc and seat, ASTM A126 Class B, 175 WWP class, Stockham No. G939.

B. 2" and smaller, U.L. listed, threaded bronze, swing type, 175 WWP class, Jenkins No. 92A automatic ball drip where required.

2.08 NON-SLAM CHECK VALVES

A. 3" and larger, U.L. listed, shall be non-slam type for any position installation. Bodies shall be cast iron flanged with bronze trim including surface of both seat and disc and guide bushing. 250 pound service. ASTM A126 B. Combination pump valve 10D or equal by Clow.

B. 2" and smaller shall be non-slam type with pipe thread connections. Bronze body stainless steel trim. 300 pound service. Combination pump valve no. 36 or equal by Clow.

2.09 HOSE VALVES

A. U.L. Listed, FM approved 300 pound, straight pattern, female to male connection, 2-1/2" cast brass with cap and chain. Threads to match local fire department.

2.10 GLOBE VALVES

A. U.L. Listed, bronze body and disc, screwed bonnet, 200 psi, WOG, threaded ends. Stockham No. B16, Crane No. 1, Jenkins No. 746.

2.11 INDICATING BUTTERFLY VALVES

A. U.L. Listed, FM approved where applicable, 175 pound, cast iron body, duct iron nickel plated disc, EPDM seat, wafer or lug body, tamper switch, remote indicator.

2.12 HANGERS AND SUPPORTS

A. Piping shall be supported from the building structure in accordance with NFPA Pamphlet No. 13. Hangers shall allow for expansion and contraction of pipe lines. Hangers shall be in accordance with NFPA Pamphlet No. 13.

B. Support hangers from approved concrete inserts where poured concrete slabs are available. Power actuated fasteners and devices are not permitted. "Redhead" self-drilling concrete expansion anchors are acceptable.

C. Where piping is required to be hung from other than poured concrete slabs, such as pre-cast or metal decking, submit proposed method of support to the Engineer for approval prior to installation.

D. Piping may be hung from structural steel by means of beam attachments. All auxiliary steel required for support shall be provided by this trade.

E. Vertical Piping: Provide riser clamps at each level. Use short end riser where space is limited. Install riser clamp below the floor, suspend from two hanger rods and inserts where escutcheons plates are installed as required by these specifications.

2.13 ESCUTCHEONS

A. Provide escutcheons on all exposed piping passing through walls, floors, partitions, and ceilings, except provide close fitting metal escutcheons on both sides of piping (whether exposed or not) through required fire rated walls, floors, partitions, and ceilings.

B. Escutcheons shall be held in place by internal spring tension or set screws.

C. Application: finished spaces - anodized aluminum, chrome plated brass unfinished spaces (excluding mechanical equipment rooms) - Plain brass, cast iron or aluminum.

2.14 SLEEVES

A. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs.

TYPE DESIGNATION	SLEEVE MATERIAL
1	#18 Gauge, galvanized steel.
2	Standard weight galvanized steel pipe
3	Standard weight galvanized steel pipe with a continuously welded stop of 1/4 inch steel plate extending from outside of sleeve a minimum of 2 inches all around - similar to F&S Manufacturing Corp. Figure 204.
4	Cast iron pipe sleeve with center flange similar to James B. Clow and Sons No. F-1430 and F-1435.
5	Standard weight galvanized steel pipe with flashing clamp device welded to pipe sleeve or watertight sleeves. Similar to Josam 1870-A2, 1870, 1840-C with Oakum and lead caulking as required.
6	Metal deck and wall sleeves.

2.15 SLEEVE SIZES

A. Floors and required fire rated partitions - 1/2" maximum clearance between outside of pipe and inside of sleeve.

B. Partitions not fire rated - 1-1/2" maximum clearance between outside of pipe and inside of sleeve.

2.16 SLEEVE LENGTHS

LOCATION	SLEEVE LENGTH
Floors	Equal to depth of floor construction including finish. In waterproof floor construction, sleeves to extend minimum of 2" above finished floor level.
Roofs	Equal to depth of roof construction including insulation.
Walls and Partitions	Equal to depth of construction and terminated flush with finished surfaces.

2.17 SLEEVE CAULKING AND PACKING

TYPE DESIGNATION	CAULKING AND PACKING REQUIREMENTS
A	Space between pipe and sleeve packed with Oakum or Hemp and caulked watertight with lead.
B	Space between pipe or pipe covering and sleeve shall be caulked with an incombustible, permanently plastic, waterproof non-staining compound leaving a finished smooth appearance or pack with incombustible asbestos cotton or fibrous glass to within 1/2" or both wall faces and provide caulking compound as per above.
C	Exception - Caulking or packing may be omitted when sleeve is located within walled-in pipe shafts, unless required by local building code or other authority having jurisdiction.

2.18 SLEEVE APPLICATION

SLEEVE TYPE THRU REQUIRED FIRE RATED CONSTRUCTION	SLEEVE TYPE THRU NON-FIRE RATED CONSTRUCTION	LOCATION	SLEEVE CAULKING & PACKING TYPE DESIGNATION
2	2	Membrane Waterproof Floor, Roof, & Wall Construction	B
5	5	Non-Membrane Waterproof Floor, Roof, & Wall Construction	A or B
2	1, 2	Interior Walls, Partitions & Floors	B or C
-	3, 4	Exterior Walls,	A
2	6	Cellular Metal Deck Floors	B or C
-	1	Pre-Cast Concrete Floor with poured concrete topping. Note: Sleeves to have flat flanges and/or guides which rest on top of pre-cast slab.	B

2.19 FIRE DEPARTMENT CONNECTION

A. Flush wall type: 6" by 2-1/2" by 2-1/2" brass chrome plated with individual drop clamper valves, plugs, and chains. Marked "standpipe, AUTO-SPKR". Threads to match local fire department Potter-Roemer No. 5752 or equal by Elkhart.

B. Free standing type: 6" by 2-1/2" by 2-1/2" brass chrome plated with individual drop clamper valves, plugs, and chains. Marked "Standpipe, AUTO-SPKR". Threads to match local fire department Potter-Roemer No. 5763 or equal by Elkhart.

C. Free standing Storz type: 5" Storz by 6" NPT as manufactured by Potter-Roemer Model 5795-05 fire department inlet connection (FDC) mounted to 6" schedule 40 steel pipe extending 24" above grade and buried a minimum of 30" below grade. Transition to civil pipe at bottom of elbow. Provide connections with joint restraints. Paint all metal pipe fire engine red. Provide a polished brass round identification plate at the back of the Storz connection displaying the words “Fire Department Connection” on the face. Coordinate exact location of FDC with Civil Drawings.

2.20 TAMPER SWITCHES

A. Standpipe risers, sprinkler branch lines and all control valves shall be provided with Tamper indicators monitored at the central control station. Grinnell fire department protection systems model F640 or equivalent.

2.21 FLOW SWITCHES

A. Provide liquid flow switch at base of each standpipe riser and at each control valve station. Signal from switch shall be wired to fire alarm panel. Wiring and panel shall be provided by electrical contractor. Flow switch shall be of paddle type, single pole double throw with adjustment for sensitivity to flow. Wetted parts shall be of brass and monel. Switch mounting fittings shall be of the same size of pipe where it is installed. Switch shall have vapor proof construction and shall be rated for a maximum pressure of 175 psi and a maximum temperature of 225 F. Grinnell Model F620, Viking Model BH-1001, or approved equal.

2.22 SPRINKLER HEADS

A. All heads shall be of the proper temperature rating for the location in which they are installed.

B. Provide stock of extra sprinkler heads and sprinkler wrenches in cabinet in accordance with NFPA 13.

C. Provide approved sprinkler head wire guards for all sprinkler heads located 7'-0" or less above floor.

D. Finish of sprinkler heads shall be as selected and approved by the Architect. Submit samples.

E. Baffles shall be installed whenever sprinklers are less than 6' apart. As per NFPA 13.

F. Sprinklers shall be upright, pendent or sidewall as indicated and conform to NFPA 13.

G. Sprinkler heads installed in unfinished area shall be bronze (or, special type - specify).

H. Sprinkler heads installed in non-climate controlled environments shall be galvanized pipe and have weatherproof housings for electrical and electrical components.

I. Sprinkler heads installed in finished areas shall be chrome plated with a satin finish.

J. All types and variations shall have the following features:

1. Approved heat responsive automatic type listed by UL or other nationally recognized testing laboratory.

2. 160 degrees fusible element, style as specified for the particular type. Provide higher temperature for heads located in danger zone as defined in NFPA Number 13 and FM 2-8.

3. Nominal 1/2 inch orifice.

4. Pattern, body deflectors capable of flowing Q = K times square root of P, in which Q = U.S. gallons per minute water delivery through an open sprinkler head. K = 5.3-5.8, dimensional constant. P = pounds per square inch residual gauge pressure at point of attachment of head inlet to pipe nipple or pipe fitting. Standard brass body.

5. Capable of remaining closed and leak-proof at temperatures less than 160 degrees Fahrenheit against 100 psig pressure.

K. Type A, Standard Pendent

1. Features as specified in A. preceding, and:

a. Standard pattern downward spray against essentially flat deflector.

b. 1/2 inch male NPT inlet.

c. Chrome body and trim.

d. Lever and fusible solder plug style.

e. Central Model A Upright.

L. Type B, Sidewall

1. Features as specified in A. preceding, and:

a. Extended coverage horizontal sidewall sprinkler.

b. 3/4" male NPT.

c. Chrome plated head and escutcheons.

d. Central model "H-17/32".

M. Type C, Washdown

1. Features as specified in A. preceding, and:

a. Rapid response sidewall type.

b. Chrome plated body and escutcheons.

c. 1/2" male NPT.

d. Central model HEC-12.

N. Type D, Recessed

1. Features as specified in A. preceding, and:

a. Chrome plated recessed flush sprinkler head and escutcheons.

b. 1/2" male NPT.

c. Central Model A recessed.

O. Type E, Upright

1. Features as specified in A. preceding, and:

a. Standard pattern upward spray against deflector having edges cupped downward.

b. 1/2" male NPT.

c. Brass body and trim.

d. Central Model A.

P. Type F, Concealed

1. Features as specified in A. preceding, and:

a. Adjustable flush model concealed head and cover plate.

b. Finish for cover plate to be selected by Architect.

c. Central model 76A.

2.23 FIRE HOSE AND VALVE CABINETS

A. Cabinet shall be 20 gauge white batted enamel steel box, 20 gauge tubular steel door with 18 gauge frame with continuous steel hinge (brass pin). Steel corner seams shall be welded and ground smooth.

B. Cabinet shall be furnished with the following:

1. Door Style: Duo panel glass (double strength) with cam catch and identifying decal.

2. 1-1/2" polished brass 300 lb. UL angle valve.

3. 1-1/2" red enamel steel UL FM hose rack.

4. 1-1/2" satin brass hose rack nipple and pin lug coupling.

5. 1-1/2" FM lined PR-flex hose (100 ft).

6. 1-1/2" polished brass straight stream nozzle.

7. 1-1/2" Escutcheon.

8. UL 20 lb. ABC portable fire extinguisher with pressure gauge.

9. 2-1/2" FM cast brass, 300 lb., angle valve with red hand wheel. Female NPT inlet x male hose outlet.

10. 2-1/2" polished brass cap and chain and polished brass flange with set screw.

C. Fire hose cabinet and equipment shall be Potter-Roemer, Elkhart, or Allenco.

2.24 IDENTIFICATION

A. Valves - attach 3" square anodized aluminum or brass tag stamped with designated number 1 inch high filled with red enamel to each valve. Securely fasten tag to valve spindle or handle with a brass chain.

B. Schedules and charts - Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire are controlled.

C. Finish three framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system with major control valves and numbers.

D. Apply color coded polyvinyl chloride (PVC) pipe bands identifying pipe service and direction of flow.

E. On exposed piping apply bands on 40' centers of straight runs, at valve locations, at points where piping enters and leaves a partition wall, floor, or ceiling.

F. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.

G. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valve or other devices that are made accessible by means of access doors or panels. Provide access panels as required.

H. Apply bands at exit and entrance points to each piece of equipment.

I. Band widths shall be eight (8) inches for pipes up to ten (10) inches in diameter and sixteen (16) inches wide for larger diameter piping. Letter heights stating service shall be preprinted on bank, three-quarter (3/4) inches high for eight (8) inch bands and one and one-quarter (1-1/4) inches high for sixteen (16) inch bands.

J. Nameplate Data - The installer shall properly identify the hydraulically designed automatic sprinkler systems by a permanently attached sign indicating the location, number of sprinklers in the hydraulically designed section and the basis of design (discharge density over designed are of discharge, including gallons per minute and

residual pressure demand at base of riser). Such signs shall be placed at the controlling alarm valve for the system containing the hydraulically designed layout.

2.25 INSPECTOR'S TEST CONNECTION

A. Test connections shall be provided for each sprinkler system equipped with an alarm device and shall be located at the hydraulically most remote part of each system.

B. Test connection shall be piped to a location where the discharge will be readily visible and where water may be discharged without damage.

2.26 MAIN DRAINS

A. Drains shall be piped to discharge at safe points outside the building. Auxiliary drains shall be provided as required by NFPA 13.

Bell - 10" water or electric gong, U.L. listed, FM approved, surface mounted.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide a complete, approved fire sprinkler protection system as specified.

B. The design and installation of the sprinkler system, including head location, hydraulic calculations, pipe sizing, main location and branch location shall be performed by Contractor's currently experienced in this work and having five continuous years of experience herein. Shop drawings, hydraulic calculations, etc., shall be signed and sealed by a Florida registered engineer.

C. Submit 1/8 scale shop drawings of fire sprinkler system layout, hydraulic calculations, pipe sizing, main location and branch location shall be performed by Contractor's currently experienced in this work and having five (5) continuous years of experience therein.

D. Contractor shall coordinate with other drawings and sections of the specifications for additional information and coordinate his work with all other trades and notify Architect of any conflicts prior to installation.

E. Contractor shall furnish flow test.

3.02 SUBMITTALS

A. Furnish submittals on all equipment.

3.03 INSTALLATION

A. All materials and equipment utilized in the system shall be U.L. listed and bear the U.L. label.

B. All threaded connections shall be in accordance with local fire department requirements.

C. The sprinkler information included in this specification are given as a guide only. Therefore, they do not relieve this Contractor from providing all work and equipment necessary to complete the installation according to the requirements. The number and spacing of sprinkler heads, spacing, and size of pipe, location and number of valves, method of draining lines, alarm valves, and all other details and work shall be as required by the Owner's underwriters, NFPA, and the local authority having jurisdiction.

D. The sprinkler heads in all areas are to be installed on a true axis line in both directions with a maximum deviation from the axis line of 1/2 inch plus or minus. At the completion of the installation, if any heads are found to exceed the above mentioned tolerance, same shall be removed and reinstalled by this Contractor.

E. All screwed pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened, nor otherwise injured, either before or during installation.

F. Provide all sprinkler heads and work in strict accordance with approved shop drawings. The Architect reserves the right to reject any and all work not in accordance with the approved shop drawings.

G. Contractor shall be responsible for his own cutting and patching. No hole shall be cut in structural members without the written consent from the Architect.

3.04 TESTS

A. Upon completion and prior to acceptance of installation, the fire sprinkler systems, including underground supply connection, shall be flushed and tested in accordance with NFPA.

B. Concealed work shall remain uncovered until required tests have been completed in presence of the Architect/Engineer.

C. Install underground piping in accordance with NFPA 24. Provide thrust blocks, pipe clamps and tie rods, locked mechanical or push-on mechanical joints utilizing set screw retainer glands as required at all changes in direction, tees, plugs, caps, and bends.

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SECTION 15400

TESTING OF PIPING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hydronic Piping.

B. Domestic Water Piping.

C. Sanitary Piping.

D. Gas Piping.

E. Sprinkler Pipe.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15260 ..... Piping Insulation.

C. Section 15410 ..... Plumbing Piping.

D. Section 15535 ..... Refrigerant Piping and Specialties.

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

3.01 INSTALLATION

A. Furnish all labor, materials, and equipment required for testing procedures.

B. Insulation shall not be applied until pressure testing has been completed. Joints of any type shall not be painted or varnished prior to testing.

C. Lines containing check valves shall have the test pressure source located upstream of the valves, or the valve discs shall be removed until after the testing. Control valves shall be set in the open position, unless directed otherwise.

D. Pipe testing shall be performed after flushing, except for buried lines.

E. Any equipment that has a pressure rating not as high as the testing pressure shall be valved off during the test.

F. The tabulated results of all tests shall be submitted to the A/E.

G. Potable hot and cold water lines shall be hydrostatically tested at 125 psig for a period of twenty-four (24) hours.

H. Soil waste, vent, and roof drain water lines shall be filled with water to the top of the system. Testing period shall be for a period of twenty-four (24) hours. Pipes or joints which leak shall be taken apart, remade, and re-tested.

I. Piping Systems: Test all pipe lines installed with a water pressure test of 1-1/2 times it's operating pressure, but not less than 100 psi for a period of 4 hours, during which time the pressure shall remain constant without pumping. If leaks or defects develop, new tests shall be made and repeated until all defects are remedied. Pipes or joints which leak shall be taken apart and remade. Caulking will not be permitted. Pipes which will be concealed may be tested separately before the distribution system is installed in order that these lines may be covered and furred in and thus, not delay the work of other trades.

J. Gas piping and gas piping conduit shall be tested in accordance with the current requirements of the standard gas code and/or applicable or local codes for the pressures involved.

***** END OF SECTION *****

SECTION 15401

DUAL WALL CONTAINMENT PIPING

PART 1 GENERAL

1.01 WORK SECTION INCLUDES

A. Provide and install all equipment, piping, fitting, and accessories for a complete dual containment diesel fuel piping system as specified herein.

B. Types of fuel dispensing equipment required include, but are not limited to:

1. Double wall containment piping and fittings. (Piping path from storage tank to day tank. Piping path from storage tank to fueling station.)

1.02 RELATED WORK

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

B. Although such work is not specifically shown or specified all appurtenances and devices incidental to or necessary for a sound, secure, safe and complete installation shall be furnished and installed as a part of this work.

C. Coordinate dual containment fuel piping connection requirements with Division 16.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with the current provisions of all codes Federal, State, County and City related to work being accomplished and following codes, specifications and standards except where more stringent requirements are shown or specified.

1. Underwriters Laboratories (UL) codes.

2. National Fire Protection Agency (NFPA) codes.

3. National Electric (NEC) codes.

4. Environmental Protection Agency (EPA) codes.

5. Department of Environmental Regulation (DER) codes.

6. OSHA codes and guidelines.

7. Manufacturer's installation and operational guidelines.

B. Current National Fire Protection Agency, "Standard for the Installation of Oil Burning Equipment", NFPA 31 (ANSI Z95.1) and the "Flammable and Combustible Liquids Code, NFPA 30, FDER 17-761

C. Installer Qualifications: A Contractor with minimum of 6 years experience in performing installation and servicing of underground diesel fuel piping.

D. Requirements of Regulatory Agency: All work shall conform to the applicable requirement of the Federal, State, County and City codes and NFPA 30. The monitoring system shall conform to the requirements of Florida Statute 376-303, Chapter 17-761, Stationary Tanks. All components shall be UL listed. If in any part of the plans and specifications conflict with the above codes, it shall be the responsibility of the Contractor to notify the Architect-Engineer before contract has been negotiated, it shall be the responsibility of the Contractor to conform with the above codes at no additional expense to the Owner and shall advise the Architect-Engineer before making and changes.

1. The Contractor shall coordinate necessary testing with the Department of Environmental Regulations and submit to the Owner, Certificates indicating installation is in full compliance with DER regulations.

E. The Contractor shall provide a licensed Pollutant Storage Systems Contractor and shall direct and be responsible for the installation of the fueling station.

1.04 SUBMITTALS

A. General: All submittals shall follow guidelines as specified in Section 15010 Basic Mechanical Requirements and Section 16010 Basic Electrical Requirements.

B. Product Data: Prior to placing any work, submit manufacturer's product data, specifications, installation and maintenance instructions and schematic piping and wiring diagrams for each type of equipment required to the Architect-Engineer. Submittals shall be in accordance with Section 15010 and Section 16010 and shall include:

1. Piping

2. Fittings

3. Piping specialties

4. All items listed herein.

Restrict submitted material to pertinent data. For instance do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manuals: Provide complete parts, operating, and maintenance manual covering equipment at time of installation including, but not limited to:

1. Description of system and components.

2. Schematic diagrams of electrical, hydraulic, pneumatic and mechanical systems.

3. Manufacturer's printed operating instructions.

4. Printed listing of periodic preventative maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

5. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

6. Assemble and provide copies of manual 8 1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by photo copy method. Provide copies per provisions of Division I - General Requirements.

D. Shop Drawings: Provide and submit signed and sealed shop drawings and details for piping, venting, electrical wiring and equipment installation as required for this project. All sub contractors shall obtain written certificates from the Contractor and installer indicating that shop drawings comply with the regulations of all local, city, county, state and federal authorities who have jurisdiction over the proposed project.

E. Certificates: Dated certificates of inspection and system approval by all local, city, county, state and federal governing authorities shall be delivered in triplicate to the Architect-Engineer prior to final acceptance of the work. The Contractor shall obtain written certification from all manufacturers that installer is approved by manufacturer for installation of specific system.

F. The Contractor shall provide primary products including tools and accessories necessary to perform the special work and/or approved by a single manufacturer.

G. The manufacturer determines the distributors or supplies of this product and directly or indirectly has responsibility for selecting the method of transport and of storage, therefore, the manufacturer must be considered fully responsible for materials until such are delivered into the hands and control of the Contractor.

H. Templates: The Contractor shall provide and submit templates for anchor bolts, and other items set in concrete.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Division 1, General Requirements, and products/handling/delivery/storage shall conform to the minimum recommendations of the manufacturers of the products herein specified.

1.06 ERRORS AND OMISSIONS

A. If, due to an error or omission in the scope of work, a particular item is not specifically included but is necessary to provide the Owner with a fully functional fueling facility, then that item is considered to be included in the scope of work just as if it had been listed in detail herein.

1.07 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division I - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturer's listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment items by Mark Number shall be provided in accordance with Division I - General requirements.

PART 2 PRODUCTS

2.01 PIPING

A. General: Contractor to furnish and install all labor and equipment, product piping, vent piping and fittings including connections and appurtenances to install equipment for a complete and code approved operating fuel station.

1. Drawings reflect general piping layout and shall be followed as a guide in the preparation of shop drawings.

2. The Contractor is advised that the extent of piping shown on the drawings may not include all containment fittings and necessary items needed for a complete installation. It is the Contractor's responsibility to include all such items as well as piping diagram with the shop drawings.

3. The Contractor shall submit shop drawings of the piping layout indicating joints, flexible connectors, pipe sizes and burial depth, and all installation detailing.

4. The Contractor shall obtain written certification from manufacturer of piping that installer is approved by manufacturer for installation of specific system.

5. Provide a written certificate indicating that shop drawings comply with the regulations of all authorities having jurisdiction over the proposed project and submit to the Architect/Engineer.

6. The Contractor shall provide primary products including tools and accessories necessary to perform the special piping work and/or approved by a single manufacturer.

7. The manufacturer determines the distributors or supplies of this product and directly or indirectly has responsibility for selecting the method of transport and of storage, therefore, the manufacturer must be considered fully responsible for materials until such are delivered into the hands and control of the Contractor.

B. Contractor to furnish and install all above Ground Pipe and Fittings.

1. Steel pipe: Schedule 40, ASTM A120, galvanized.

2. Fittings: 150 lb., galvanized malleable iron.

3. Unions and Couplings: API 300 lbs., galvanized malleable iron.

4. Joint Compound: Gas Oila or approved equal.

C. Fiberglass Pipe and Fittings: Contractor to furnish and install all fiberglass pipe and fittings which shall be, UL listed, Dualoy 3000/L as manufactured by Ameron or approved equal. The complete fuel carrying pipe system shall be installed within the next larger size Dualoy 3000/L pipe to provide a Secondary Containment System.

1. Straight Pipe: Filament-wound fiberglass reinforced epoxy with integral epoxy liner and external coating suitable for use with petroleum products; both primary piping and secondary containment piping.

2. Fittings: Compression molded and filament - wound fiberglass reinforced epoxy.

3. Primary Piping Fittings: Molded fiberglass reinforced epoxy one piece units.

4. Secondary Containment Fittings: Custom fabricated molded fiberglass reinforced epoxy, 2 piece split units, with threaded fasteners for dry-assembly of fitting during installation.

5. Joints: Matching tapered bell and spigot, adhesive joints.

6. Adhesive: Two-part amine cured epoxy

a. Primary Piping: as recommended by pipe manufacturer.

b. Secondary Containment Piping: as recommended by pipe manufacturer.

7. Taper Kits: as recommended by pipe manufacturer.

8. Insulation Wrap: as recommended by pipe manufacturer.

9. Bonding Kits: as recommended by pipe manufacturer.

10. Nominal Size: A 2" diameter primary pipe and a 3" diameter secondary pipe shall be used to form a secondary containment system.

2.02 FLEXIBLE CONNECTORS WITH SECONDARY CONTAINMENT JACKET

A. Flexible Connectors: Contractor to furnish and install UL listed, convoluted "Teflon" innercore reinforced with "Teflon" impregnated fiberglass, braided stainless steel inner jacket, and braided nonmetallic outer jacket; NPT threaded fittings each end. Provide manufacturer's 20 year warranty. Connector shall be as manufacturer by Resisto-Flex or approved equal.

B. Secondary Containment Jacket: Contractor to furnish and supply, UL listed, flexible jacket to provide secondary containment of flexible connector. Secondary containment jacket shall be as manufactured by Containment Technology or approved equal.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION OF PIPING

A. Prior to installation of the piping, the Contractor shall carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that the piping system can be installed in strict accordance with all appropriate codes and regulations, the manufacturer's recommendations as approved by the Architect-Engineer and the original design.

B. The Contractor shall install all on a slope so that liquids flow toward the tanks. The following minimum slopes shall apply to all piping:

1. Vapor recovery piping - 1/8" per foot.

2. Product piping - 1/8" per foot.

3. Vent piping - 1/4" per foot.

C. Contractor shall follow current manufacturer's installation practices.

D. Contractor shall lay pipe and fittings true to line with true 90 degree and 45 degree offsets to prevent abnormal stress on pipe and fittings.

E. Contractor shall make all pipe connections neat, tight, and leakproof.

F. Contractor shall use fiberglass pipe and fittings specified herein for all horizontal underground piping.

G. Contractor shall use "Resisto-flex" flexible connectors between submersible pumps and product carrying fiberglass pipe. Provide secondary containment piping around flexible connectors using 45 degrees elbow fittings and straight pipe.

H. Contractor shall use new galvanized steel pipe and fittings specified herein for risers and vertical vent piping.

1. Wrap all underground galvanized steel pipe and fittings with one layer of 20 mil plastic tape or 2 layers of 10 mil plastic tape using primer specifically compounded for tape use. Spiral wrap each layer with 1/2" overlap.

I. Test Equipment Hook-up: A crossover from the fiberglass pipe to steel is required at both ends of the line. Ordinarily, this will be the crossover fittings that is to be used for the permanent tie-in. The gauge should be between the valve and the line so that it indicates the line pressure after the valve is closed.

J. Test Pressure: The recommended hydrostatic test pressure is one and a half times expected the operating pressure and should be maintained for at least 10 minutes. Do not exceed one and half times the rating of the system. Check pressure rating of all components of the system - not just the pipe - because tanks or hoses may be rated lower than the pipe.

K. Monitoring: It is recommended that 5 to 10 psi pressure be maintained in the primary pipe during construction of the rest of the facility to monitor the integrity of the pipeline. This way damaged caused by stakes, tools, etc. can be detected and corrected before paving is installed or product is pumped through the pipe.

L. Warning: Pneumatic testing is extremely dangerous and is not recommended. Hydrostatic testing is recommended.

***** END OF SECTION *****

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SECTION 15410

PLUMBING PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipe and Pipe Fittings.

B. Valves.

C. Sanitary Sewer Piping System.

D. Domestic Water Piping System.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15140 ..... Supports and Anchors.

C. Section 15190 ..... Mechanical Identification.

D. Section 15260 ..... Piping Insulation.

E. Section 15400 ..... Testing of Piping Systems.

F. Section 15430 ..... Plumbing Specialties.

G. Section 15440 ..... Plumbing Fixtures.

1.03 REFERENCES

A. ANSI/ASME B16.29—Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings—DWV.

B. ANSI/ASTM B32—Solder Metal.

C. ASTM A74—Cast Iron Soil Pipe and Fittings.

D. ASTM A-518—Acid Resistant Close Grained Cast Iron.

E. ASTM B88—Seamless Copper Water Tube.

F. ASTM C564—Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

G. AWWA C601—Standard Methods for the Examination of Water and Waste Water.

1.04 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.05 SUBMITTALS

A. Submit product data under provisions of General Conditions and Supplementary General Conditions.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect at products site under provisions of General Conditions and supplementary General Conditions.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 SANITARY SEWER AND RAINWATER PIPING, BURIED

A. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.02 SANITARY SEWER AND RAINWATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A888.

1. Fittings: Cast Iron.

2. Joints: No hub pipe and fittings with ASTM C1277, CISPI 310 heavy-duty, double banded couplings.

B. Copper Pipe: ASTM B306, DWV.

1. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper.

2. Joints: ANSI/ASTM B32, solder, Grade 50B.

2.03 COLD WATER PIPING, BELOW GRADE (OUTSIDE BUILDING)

A. Copper Tubing: ASTM B88, Type K, hard drawn. Fittings: ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B52, solder, Grade 95TA.

2.04 COLD WATER PIPING, BELOW FLOOR (INSIDE BUILDING)

A. Copper Tubing: ASTM B88, Type K, continuous tubing.

B. Fittings 5 feet outside of building shall be ANSI/ASME B16.29, wrought copper. Joints ANSI/ASTM B32 solder, Grade 95TA.

C. Fittings are not permitted below floor. Fittings at equipment shall be compression type.

2.05 COLD WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.06 INSULATION

A. Refer to Section 15260.

2.07 VALVES—GENERAL

A. Materials for all valves shall be bronze.

2.08 ACCEPTABLE MANUFACTURERS—VALVES

A. Crane.

B. Grinnell.

C. Nibco.

D. Milwaukee.

2.09 GATE VALVES

A. Up to 2 Inches: Bronze body, non-rising stem and handwheel, inside screw, single wedge or disc, solder or threaded ends. Valves 2-1/2" through 4" shall be iron body bronze mounted with ends to suit pipe and shall be of non-rising stem type. Valves larger than 4" shall be iron body bronze mounted flanged ends with outside screw and yoke with rising stem. Working pressure for bronze valves shall be 150 pounds and for iron valves shall be 125 pounds per square inch.

2.10 GLOBE VALVES

A. Up to 2 Inches: Bronze body, rising stem and handwheel, inside screw, renewable composition disc, solder ends, with backseating capacity. Valves 2-1/2" and larger shall be iron body bronze mounted with ends to suit pipe, yoke bonnet, and disc guide. Working pressure for bronze valves shall be 150 psi and iron valves 125 psi.

2.11 BALL VALVES

A. Up to 2 Inches: Bronze body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.

2.12 SWING CHECK VALVES

A. Up to 2 Inches: Bronze 45 degree swing disc, solder ends. Valves 2-1/2" and larger shall be iron body brass mounted and with ends to suit pipe. Working pressure for check valves shall be 125 pounds.

2.13 WATER PRESSURE REDUCING VALVES

A. Up to 2 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, and single union.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

H. Slope water piping and arrange to drain at low points.

I. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover, or as existing piping connections require.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 09900.

L. Copper piping installed below grade shall be wrapped with ¾" Armaflex pipe insulation. Seal all edges and seams to prevent moisture intrusion.

M. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

N. Excavate in accordance with sections on Excavation and Backfill.

O. Install bell and spigot pipe with bell end upstream.

P. Install valves with stems upright or horizontal, not inverted.

Q. Install silicon iron waste and vent pipe in accordance with manufacturer's recommendations.

R. Pipe cold water to both hand mixing valves of sinks and lavatories when only cold water is designated for connection unless otherwise noted on the drawings.

3.03 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali or acid.

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601.

***** END OF SECTION *****

SECTION 15420

KITCHEN CANOPY AND DUCT FIRE PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Wet Chemical Fire Protection System.

1.02 RELATED WORK

A. Section 15140 ..... Supports and Anchors.

B. Section 15190 ..... Mechanical Identification.

C. Section 15911 ..... Kitchen Exhaust Canopy.

1.03 REFERENCES

A. ANSI/ASME A13.1—Scheme for the Identification of Piping Systems.

B. NFPA 96 and 17.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010 and Division 1.

B. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—KITCHEN HOOD/FIRE PROTECTION

A. Furnish and install a complete and operable, pre-engineered, UL listed, wet chemical fire suppression system including, but not limited to, fire protection of cooking equipment, exhaust hood, grease removal device, and exhaust duct as per NFPA 96 and 17A.

B. All materials shall be UL listed, new and free of defects as per NFPA.

C. Each wet chemical storage tank shall be D.O.T. rated for stored pressure of 175 psi and shall be provided with a pressure gauge.

D. The system shall be capable of automatic or manual activation.

E. Piping and fittings shall be schedule 40 (standard weight) steel or stainless steel.

F. Wet chemical cylinders.

G. Remote manual pull station.

H. Bell/horns.

I. Fusible links.

J. Nozzles.

K. Automatic gas valve shut-off.

L. Cylinder control head.

M. System shall be ANSUL or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. All pipe and fittings shall be reamed and blown clear of chips and scale. Threading compound shall be used sparingly and only on male threads.

B. All piping shall be securely supported.

C. Each manual pull station shall be located in the path of egress from the kitchen. The manual pull station shall be mounted at 4'-6" above finished floor.

D. Alarm bell shall be located within the kitchen area so that it may be heard throughout the area.

E. UL electric solenoid gas valves or UL mechanical gas valves, where applicable, shall be furnished and installed by the Fire Protection Contractor. The Fire Protection Contractor shall be responsible for providing power, wiring, conduit, etc. to all device locations.

F. Electrical contactors shall be provided by the Fire Protection Contractor. The Fire Protection Contractor shall be responsible for installing the contactors and providing power, wiring, conduit, etc., to all locations.

G. The Fire Protection Contractor shall provide all accessory equipment such as micro switches and relays for automatic shutdown of kitchen equipment, supply fans, fuel and heat sources, etc. Each canopy exhaust fan shall continue to run.

H. The extinguishing system shall be installed and tested in accordance with NFPA-17A, NFPA-96, national electrical codes latest editions and the Manufacturer's recommendations.

3.02 SYSTEM GUARANTEE

A. All components, parts, and assemblies supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of one (1) year commencing upon start up and beneficial use. Warranty services shall be provided by a qualified factory trained representative of the Equipment Manufacturer during normal working hours, Monday through Friday, excluding holidays. The repressentative shall be based in a fully staffed branch office located within a reasonable distance from the job site with an adequate supply of repair parts. Manufacturer's statement of warranty shall be included in the submittals. This Contractor shall also demonstrate the system operation to the Owner/Engineer.

***** END OF SECTION *****

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SECTION 15430

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Floor Drains.

B. Cleanouts.

C. Backflow Preventers.

D. Dielectric Fittings.

E. Hose Bibbs/Wall Hydrants.

F. Thermometers.

G. Shock Absorbers.

H. Vent Flashing.

I. Trap Primers.

J. Mixing Valves.

K. Escutcheons.

L. Water Pressure Reducing Valves.

M. T&P Relief Valves.

N. Washing Machine Drain Fittings.

O. Area Drains.

P. Hub Drains.

Q. Roof Drains.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15140 ..... Supports and Anchors.

C. Section 15400 ..... Testing of Piping Systems.

D. Section 15410 ..... Plumbing Piping.

E. Section 15440 ..... Plumbing Fixtures.

1.03 REFERENCES

A. ANSI/ASSE 1011—Hose Connection Vacuum Breakers.

B. ANSI/ASSE 1019—Wall Hydrants.

C. ANSI A112.21.1—Floor Drains.

D. ANSI A112.26.1—Water Hammer Arresters.

E. PDI WH-201—Water Hammer Arresters.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout, or as noted.

1.05 SUBMITTALS

A. Submit shop drawings and product data under Section 15010 General Conditions and supplementary General Conditions.

B. Include component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 THERMOMETERS

A. Provide thermometers with needle type shut-off valves. They shall be installed so that they can be clearly read from the floor.

B. Industrial stem thermometers shall have a scale not less than 9" long and shall be red-reading mercury type with white background and black etched graduations and numerals.

C. Thermometers shall be suitable for the service intended and the range shall be selected to span from approximately 10 degrees below through 10 degrees above the operating range of the fluid.

D. Thermometers shall have a guaranteed accuracy of within 1% of the range scale and shall be provided with 1 degree graduations. Thermometers shall be provided with brass separable socket wells.

E. Provide thermometer wells and necessary fittings where specified or indicated. Wells installed in insulated piping shall be provided with lagging extensions of appropriate length to accommodate insulation. Where wells are provided without thermometers or thermostats, a plug and chain shall be provided. The insertion length of wells shall be compatible with the pipe diameter in which they are installed. Wells shall be provided with graphite mixture.

F. Thermometers shall be as manufactured by Weksler, Marsh Instruments, or Ametek.

2.02 ACCEPTABLE MANUFACTURERS—BACKFLOW PREVENTERS (BFPR)

A. Hersey Products, Inc.

B. Watts Regulator Co.

C. Zurn Industries, Inc.

2.03 BACKFLOW PREVENTERS (BFPR)

A. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.04 ESCUTCHEONS

A. Chrome plated or stainless steel with set screws for holding securely in place.

2.05 DIELECTRIC FITTINGS

A. Metal parts of union or flange shall be installed to prevent current flow between dissimilar metals. EPCO Dielectric pipe fittings or equivalent.

2.06 VENT FLASHING

A. 16 ounce copper or 4 pound lead flashing and counter flashing.

2.07 T&P RELIEF VALVES

A. Valve shall have bronze body, non-mechanical seat-to-disc alignment and shall have a stainless steel thermostat.

B. Valve shall contain an emergency back-up fusible plug.

C. The valves shall be sized on the AGA temperature steam rating.

2.08 PRESSURE REDUCING VALVES

A. Valves shall have bronze body, stainless steel integral strainer, renewable stainless steel seat, high temperature diaphragm and 160# gauge and tapping.

B. Valves shall be provided with built-in thermal expansion by-pass.

2.09 OTHER

A. Refer to the Plumbing Fixture Schedule on the drawings for further information.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate forming of roof and floor construction to receive drains to required invert elevations.

3.02 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install water hammer arresters complete with isolation valve. The water hammer arresters and isolation valve shall be installed in a location accessible through the ceiling. Provide access doors as necessary. Coordinate location of access doors with Architect/Engineer and other trades. Access door shall be sized to allow removal and replacement of concealed device or equipment.

E. Locate trap primer under lavatory on CW supply and/or flush valve as per manufacturer’s recommendations.

F. Use escutcheons on pipes passing through walls, floors, and ceilings of finished areas.

G. Seal all openings in sleeves for piping penetrations with UL listed caulk. Refer to detail on drawings.

***** END OF SECTION *****

SECTION 15440

PLUMBING FIXTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Floor Sinks.

B. Water Closets.

C. Lavatories.

D. Service Sink.

E. Sinks.

F. Fixture Trim.

G. Urinals.

H. Toilet Seats.

I. Shower Units.

1.02 RELATED WORK

A. Section 15140 ..... Supports and Anchors.

B. Section 15410 ..... Plumbing Piping.

C. Section 15430 ..... Plumbing Specialties.

1.03 REFERENCES

A. ANSI A112.18.1—Finished and Rough Brass Plumbing Fixture Fittings.

B. ANSI A112.19.2—Vitreous China Plumbing Fixtures.

C. ANSI A112.19.5—Trim for Water-Closet Bowls, Tanks, and Urinals.

1.04 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each product specified throughout, except as indicated otherwise.

B. Trim: By same manufacturer for each product specified throughout, or as stated.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include fixture trim exploded view and replacement parts lists.

1.07 WARRANTY

A. Provide one year manufacturer's warranty.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to Plumbing Fixture Schedule on drawings for further information.

PART 3 EXECUTION

3.01 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

A. Provide a cast brass trap at each fixture with removable cleanout for servicing and cleaning.

B. Provide chrome plated stops with rigid supplies to fixtures with loose key stops, reducers, and escutcheons. All stops shall have renewable seats and disks.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with Silicone sealant as to match fixture.

F. Install all handicapped fixtures per ANSI A117.1-1986.

G. Assemble all fixtures and equipment shipped loose which this Contractor is required to make final connections to, whether furnished by him or by others (i.e., science cabinet water faucets, trim, or tailpiece, etc.).

H. Provide a premanufactured drain insulating cover on all sinks and lavatories designated as a handicap fixture. Refer to plumbing drawings and the Architect's drawings for designation.

3.03 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean plumbing fixtures and equipment.

C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with table of minimum sizes for particular fixtures shown with fixture schedule. (Refer to drawings.)

***** END OF SECTION *****

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SECTION 15450

PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Electric Water Coolers.

B. Water Heaters.

C. Emergency Showers and Eyewash Stations.

D. Backflow Preventers (required on water heaters).

E. Emergency Eye and Face Wash.

F. Circulating Pumps.

1.02 RELATED WORK

A. Section 15140 ..... Supports and Anchors.

B. Section 15170 ..... Motors.

C. Section 15242 ..... Vibration Isolation.

D. Section 15260 ..... Piping Insulation.

E. Section 15400 ..... Testing of Piping Systems.

F. Section 15410 ..... Plumbing Piping.

1.03 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

B. ARI 1010—Drinking Fountains and Remote Chilling Package.

C. UL 174—Household Electric Storage Tank Water Heaters.

1.04 QUALITY ASSURANCE

A. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

B. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. National Sanitation Foundation (NSF).

2. American Society of Mechanical Engineers (ASME).

3. National Electrical Manufacturers' Association (NEMA).

4. Underwriters Laboratories (UL).

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70 and UL 174 requirements for water heaters.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and Division 1.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

C. Indicate pump type, capacity, power requirements, and affected adjacent construction.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15010 and Division 1.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

A. Provide five (5) year manufacturer's limited warranty under provisions of Division 1.

B. Warranty: Include coverage of domestic water heaters.

C. Warranty: Include coverage of electric water cooler compressor for five (5) years.

PART 2 PRODUCTS

2.01 SCHEDULE

A. Refer to Plumbing Fixture Schedule on drawings for further information.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heater and chiller in accordance with manufacturer's instructions and to NFPA and UL requirements.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

***** END OF SECTION *****

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SECTION 15535

REFRIGERANT PIPING AND SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Valves.

1.02 RELATED SECTIONS

A. Section 15260 ..... Piping Insulation.

1.03 REFERENCES

A. ANSI/ASHRAE 15—Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE 34—Number Designation of Refrigerants.

C. ANSI/ASME B16.22—Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ANSI/ASME B16.26—Cast Copper Alloy Fittings For Flared Copper Tubes.

E. ANSI/ASME B31.5—Refrigeration Piping.

F. ANSI/ASTM B32—Solder Metal.

G. ANSI/AWS A5.8—Brazing Filler Metal.

H. ASTM B280—Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

I. MIL-V-23450C—Valves, Expansion, Thermostatic, Refrigerant 12 and Refrigerant 22.

1.04 SUBMITTALS

A. Submit shop drawings under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Submit shop drawings indicating schematic layout of system, including equipment, critical dimensions, and sizes.

C. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

D. Submit product data indicating general assembly of specialties, including manufacturers catalogue information.

E. Submit manufacturer's installation instructions under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

F. Submit welders certification of compliance with ANSI/ASME Sec 9.

G. Submit design data as a submittal under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

H. Submit data indicating pipe sizing.

I. Submit test reports under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

J. Submit Test reports indicating results of leak test, acid test.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Accurately record exact locations of equipment and refrigeration accessories on record drawings.

1.06 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.9.

B. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9 and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME SEC 9.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Deliver and store piping and specialties in shipping containers with labeling in place.

C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.

1. Fittings: ANSI/ASME B16.22 wrought copper.

2. Joints: ANSI/AWS A5.8 BCup silver braze.

B. Copper Tubing to 7/8 inch OD: Type L, annealed.

1. Fittings: ANSI/ASME B16.26 cast copper suitable for connection with silver solder.

2. Joints shall be made with silver solder.

2.02 REFRIGERANT

A. Refrigerant: ANSI/ASHRAE 34; Monochlorodifluoromethane.

2.03 ACCEPTABLE MANUFACTURERS

A. Henry Valve Co.

B. Sporlan Valve Co.

C. Danfoss, Inc.

2.04 VALVES

A. Packed Ball Valves: Two piece forged brass Body with Teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

B. Refrigerant solenoid valves shall be Sporlan "M" Series or equal by Henry Valve Co. or Danfoss Inc.

C. Thermostatic expansion valves shall be externally equalized type, sized as determined by system tonnage.

D. Pressure Relief Valves—Straight through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB; for standard 300 psi setting; selected to ANSI/ASHRAE 15.

E. Service valves shall be brass construction designed for refrigerant service. They shall be diaphragm packless or backseating type. They shall be "Globe-Master" or "LineMaster" as manufactured by Mueller or equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections when joining dissimilar metals.

C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide clearance for installation of insulation and access to valves and fittings.

E. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 09900.

F. Refer to Section 15400 for pressure testing of piping system.

G. Moisture indicator sight glass shall be installed just before refrigerant valve. Indicator shall be line size sweat type for liquid lines 2-1/8 inches O.D. and smaller.

H. Refrigerant solenoid valves shall be provided for each evaporator circuit as required by the system. Valves with port size less than 1/4 inch may be direct operated. Valves 1/4 inch and larger shall be pilot operated. All shall have manual lift stems. Valves shall be selected in accordance with Manufacturer's published data. Systems using refrigerant 12 shall be limited to 2 psig drop through valve and 3 psig for those using 22 or 502. Valves shall have sweat connections for lines 1-1/8 inches O.D. and smaller. When lines larger than 1-1/8 inches O.D. are required they shall be flanged.

I. All piping shall be sized in accordance with the equipment (i.e., remote condenser/chiller or split system) manufacturer’s recommendations and limitations. These shall include pressure drop, length of run, lift, etc. Equipment manufacturer shall provide field coordination and shop drawings on all units exceeding 25 tons, 75 feet of equivalent length pipe (one way), or exceeding 20 feet lift.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Test refrigeration system in accordance with ANSI/ASME B31.5.

***** END OF SECTION *****

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SECTION 15671

AIR COOLED CONDENSING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Condensing Unit Package.

B. Charge of Refrigerant and Oil.

C. Controls and Control Connections.

D. Refrigerant Piping Connections.

E. Motor Starters.

F. Electrical Power Connections.

1.02 RELATED SECTIONS

A. Section 15170 ..... Motors.

B. Section 15242 ..... Vibration Isolation.

C. Section 15260 ..... Piping Insulation.

D. Section 15280 ..... Equipment Insulation.

E. Section 15535 ..... Refrigerant Piping and Specialties.

F. Section 15856 ..... 100% Outside Air Dehumidification Unit.

G. Section 16180 ..... Equipment Wiring Systems.

H. Section 16480 ..... Motor Control.

1.03 REFERENCES

A. ANSI/ASHRAE 15—Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE 90A—Energy Conservation in new Building Design.

C. ANSI/NEMA MG 1—Motors and Generators.

D. ANSI/UL 207—Refrigerant-Containing Components and Accessories, Non-Electrical.

E. ANSI/UL 303—Refrigeration and Air Conditioning Condensing, and Air-Source Heat Pump Equipment.

F. ANSI/UL 465—Central Cooling Air Conditioners.

G. ARI 210/240—Unitary Air Conditioning and Air-Source Heat Pump Equipment.

H. ARI 520—Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units.

I. ASHRAE 14—Methods of Testing for Rating Positive Displacement Condensing Units.

J. ARI 270—Sound Rating of Outdoor Unitary Equipment.

1.04 SUBMITTALS

A. Submit shop drawings under provisions of Sections 15010 and Division 1.

B. Submit shop drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

C. Submit product data under provisions of Sections 15010 and Division 1.

D. Submit product data indicating rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams.

E. Submit design data under provisions of Sections 15010 and Division 1.

F. Submit design data indicating pipe and equipment sizing.

G. Submit manufacturer's installation instructions.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.

1.06 DELIVERY, STORAGE, AND HANDLING

A. As part of the requirements, the Manufacturer of equipment herein specified shall deliver to the job site, ready for installation within twelve (12) weeks of receiving the purchase order.

B. Deliver, store, and protect products under provisions of Division 1.

C. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

D. Protect units on site from physical damage. Protect coils.

1.07 WARRANTY

A. Provide one (1) year warranty under provisions of Section 01700.

B. Warranty: Include a five (5) year warranty for parts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. BASIS OF DESIGN—Trane.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. McQuay.

2. Carrier.

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 MANUFACTURED UNIT

A. Unit: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, suction pressure capacity control, controls, liquid receiver, screens, etc.

B. Construction and Ratings: In accordance with ARI 210/240, and ANSI/UL 207 and ANSI/UL 303. Testing shall be in accordance with ASHRAE 14.

C. Performance Ratings: Energy Efficiency Rating (EER) not less than prescribed by ANSI/ASHRAE 90A.

2.03 CASING

A. House components in welded steel frame with zinc coated galvanized steel panels with phosphatized and coated with an epoxy resin primer and finished with an enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels.

2.04 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen. Aluminum tubes with aluminum fins equal to Trane's spine fin design are acceptable.

B. Coil Guard: PVC coat steel wire.

2.05 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in thermal overload protection and overcurrent protection.

C. Motors as indicated, in compliance with Section 15170.

2.06 COMPRESSORS

A. Construction: Serviceable hermetic or semi-hermetic reciprocating type with external spring insulators, heat treated forged steel or cast iron shafts, aluminum alloy connecting rods, automotive type pistons, rings to prevent gas leakage, suction and discharge valves, and sealing surface immersed in oil.

B. Mounting: Statically and dynamically balance rotating parts and mount on rubber-in-shear vibration isolators.

C. Motor: Constant speed 3600 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Refer to Section 15170. Furnish with starter and motor overcurrent protection and thermal overloads.

D. Crankcase Heater: Evaporates refrigerant returning to crankcase during shut down. Energize heater thermostatically.

2.07 REFRIGERANT CIRCUIT

A. Provide each unit with single independent refrigerant circuits, factory supplied and piped. Refer to Section 15535.

B. Provide the following for each refrigerant circuit:

1. Filter dryer replaceable core type.

2. Liquid line sight glass and moisture indicator.

3. Thermal expansion valve for maximum operating pressure.

4. Insulated suction line.

5. Suction and liquid line service valves, and gage ports.

6. Liquid line solenoid valve.

7. Charging valve.

8. Discharge line check valve.

9. Compressor discharge service valve.

10. Condenser pressure relief valve.

11. Refer to Piping Detail on Drawings.

12. Refrigerant specialties can be field supplied and piped, as required. Installing Contractor shall coordinate piping requirements with Manufacturer.

2.08 CONTROLS

A. Controls: Heat pump unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Control wiring shall be 24-volt control circuit which includes fusing and control transformer. Units shall provide external location for mounting a fused disconnect device. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-recycle timers are available as optional accessories.

B. Defrost Controls: Electronic timed initiated, temperature terminated defrost system with choice of 50, 70, or 90 minute cycle. Timed override limits defrost cycle to 10 minutes.

C. Low Ambient Operation: Standard units shall start and operate to approximately 35°F when matched with Trane air handlers and coils. Optional head pressure control accessory permits operation to 0ºF.

D. Anti-Short Cycle Timer: Shall prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for 5-7 minutes upon shutdown. Shall consist of a solid state timing device, 24-volt, 60 cycle with either 5 or 7 minute fixed-off timing period.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units on vibration isolation. Refer to Section 15242.

D. Install units on metal frame base as indicated on drawings.

E. Provide connection to refrigeration piping system and evaporators. Refer to Section 15535. Comply with ANSI/ASHRAE 15.

3.02 MANUFACTURER'S FIELD SERVICES

A. Prepare start systems under provisions of Division 1.

B. Provide initial and cooling season start-up, and winter season shut down during first year of operation, including routine servicing and check out.

C. Provide initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

D. Inspect and test for refrigerant leaks every 3 months during first year of operation, and repair leaks.

***** END OF SECTION *****

SECTION 15790

ELECTRIC DUCT HEATERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Electric Duct Heaters.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15890 ..... Ductwork.

C. Section 15910 ..... Ductwork Accessories.

D. Division 16 ..... Electrical.

1.03 REFERENCES

A. ANSI/ARI 410—Forced-Circulation Air-Cooling and Air- Heating Coils.

B. ANSI/NFPA 70—National Electrical Code.

C. ANSI/UL 1096—Electric Central Air Heating Equipment.

D. SMACNA—Metal Duct Standards.

E. Ducted Electric Heat Guide for Air Handling Systems, SMACNA, Inc.

1.04 QUALITY ASSURANCE

A. Fabrication: Conform to applicable standards.

B. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and Division 1.

B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

C. Product data shall indicate dimensions, weights, capacities, ratings, and gages and finishes of materials.

D. Submit manufacturer's installation instructions under provisions of Division 1.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Division 1.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean and controls have been tested.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Indeeco.

B. Markel.

C. Warren.

2.02 GENERAL

A. The Contractor shall furnish and install the duct mounted electric heaters as shown and scheduled on the plans. The electric duct heaters shall be installed in strict accordance with the specifications. Unit shall be complete with controls, wiring, fuses, safety devices, control panels, thermostats, etc., as required for a complete and operating system.

2.03 ELECTRIC DUCT HEATERS

A. Heaters and panelboards shall meet the requirements of the National Electrical Code and shall be listed by Underwriter's Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment.

B. Heating elements shall be open coil, 80% nickel, 20% chromium, type A resistance wire. Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the airstream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into aluminized steel supporting brackets.

C. Heater frames and terminal boxes shall be aluminized steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be provided with a hinged, latching cover and multiple concentric knockouts for field wiring.

D. All heaters shall be furnished with a disc type, automatic reset thermal cutout for primary overtemperature protection. All heaters shall also be furnished with disc type, load carrying manual reset thermal cutouts, factory wired in series with heaters for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable.

E. Heaters shall be rated for the voltage, phase indicated in the schedule. All three phase heaters shall have SCR control. All internal wiring shall be stranded copper with 105°C insulation and shall be terminated in crimped connectors or box lugs.

F. Terminal blocks shall be provided for all field wiring and shall be sized for installation of 75°C copper wire rated in accordance with NEC requirements.

G. Provide thermal cutouts, airflow switch, contactors, fuses, control circuit transformer and built-in, snap-acting, door interlock disconnect switch.

H. Provide thermal cutouts, airflow switch, SOLITECH SCRs, fuses, control circuit transformer and built-in, snap-acting, door interlocked disconnect switch.

I. Provide heaters with insulated dust tight terminal box.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and in conformance with ARI and the SMACNA Ducted Electric Heat Guide for Air Handling Systems.

B. Provide for connection to electrical service.

C. Provide all clearances for maintenance and service as required by NEC and the manufacturer's installation instructions.

D. Contractor shall remote mount the control panel as required by the field conditions. Coordination of control panel locations shall be completed prior to shop drawing/ submittal phase with all other trades to account for panel type prior to ordering equipment.

E. Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Provide frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Provide airtight seal between coil and duct or casing.

F. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

G. Wire electric duct coils in accordance with ANSI/NFPA 70.

***** END OF SECTION *****

SECTION 15836

SPLIT SYSTEM AIR HANDLER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Handling Units.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 16180 ..... Equipment Wiring Systems.

1.03 RELATED SECTIONS

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15140 ..... Supports and Anchors.

C. Section 15170 ..... Motors.

D. Section 15190 ..... Mechanical Identification.

E. Section 15242 ..... Vibration Isolation.

F. Section 15260 ..... Piping Insulation.

G. Section 15280 ..... Equipment Insulation.

H. Section 15290 ..... Ductwork Insulation.

I. Section 15535 ..... Refrigerant Piping and Specialties.

J. Section 15671 ..... Air Cooled Condensing Units.

K. Section 15890 ..... Ductwork.

L. Section 15910 ..... Ductwork Accessories.

M. Section 16180 ..... Equipment Wiring Systems.

N. Section 16480 ..... Motor Control.

1.04 REFERENCE

A. ANSI/NFPA 70—National Electrical Code.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. BASIS OF DESIGN—Trane.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. Carrier.

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 BLOWER COIL UNITS

A. Performance Data

1. Unit capacities shall be certified with Air Conditioning and Refrigeration Institute Standard 210.

2. Units shall be listed with Underwriters Laboratory, UL Standard for indoor blower coil units.

B. General

1. Air handler units shall be completely factory assembled including coil, condensate drain pan, fan motor(s), filters, and controls in an insulated casing that can be applied in either vertical or horizontal configuration. Units shall be rated and tested in accordance with ARI Standards 210, 240, 360. Units shall be UL listed and labeled in accordance with UL 465/1995 for indoor blower coil units. All units shall be CSA certified for Canadian application.

C. Cabinet

1. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surface shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Casing shall be completely insulated with cleanable, foil faced, fire-retardant, permanent, odorless glass fiber material. All insulation edges shall be either captured or sealed. Knockouts shall be provided for unit electrical power and refrigerant piping connections. Captive screws shall be standard on all access panels.

D. Coils

1. Configured aluminum fin surface shall be mechanically bonded to 3/8" internally enhanced copper tubing and factory pressure and leak tested at 375 psig. Coil is arranged for draw-through airflow and shall provide a double sloped condensate drain pan constructed of stainless steel. The drain pan shall be removable for cleaning. The condensate drain pan can be installed in any of four positions allowing for vertical or horizontal application and providing external connections on either side of the unit.

E. Filters

1. Refer to schedule for type.

2. Provide two (2) spare sets with unit (total of 3 sets).

F. Fans

1. Double inlet, double width, forward curved, centrifugal-type fan(s) with adjustable belt drive shall be standard. Thermal overload protection shall be standard on motor. Fan and motor bearings shall be permanently lubricated. Oversized motors shall be available as an option for high static application.

G. Motors

1. All motors shall be resilient mounted, three speed, with UL listed thermal overload protection. Motor bearings shall be of the sleeve type or ball bearing type with oversized oil reservoirs. Motors shall be permanent split capacitor. Shaded pole motor will not be acceptable. Electrical junction boxes shall be provided for single point power connection.

H. Controls

1. Magnetic evaporator fan contactor, low voltage terminal strip, check valve(s), and single point power entry shall be included. All necessary controls shall be factory installed and wired. Evaporator defrost control shall be included to prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

I. Electric Heaters

1. UL and CSA approved electric heat modules shall be available for installation directly on fan discharge. Electric heaters shall be available in a wide range of capacities with one or two stage control, single-point electric power connection and terminal strip connections. Electric heater elements shall be constructed of heavy-duty nickel chromium elements internally wye connected on 480/600 volt, three phase, and delta connected on 208/240 volt, three phase. Each 208/240 volt heater shall have pilot duty with secondary backup fuse links for automatic reset of high limit controls. Each 480/600 volt heater shall have automatic line break high limit controls.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install unit as indicated on plans.

B. Protect units with protective covers during balance of construction.

C. Refer to drawings for piping of the coils.

3.03 CLEANING

A. Clean work under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

3.04 AIR HANDLER SCHEDULE

A. See Drawings.

***** END OF SECTION *****

SECTION 15856

100% OUTSIDE AIR DEHUMIDIFICATION UNIT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Packaged 100% Outside Air Dehumidification Unit.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15170 ..... Motors.

C. Section 15242 ..... Vibration Isolation.

D. Section 15290 ..... Ductwork Insulation.

E. Section 15400 ..... Testing of Piping Systems.

F. Section 15890 ..... Ductwork.

G. Section 15910 ..... Ductwork Accessories.

H. Section 16180 ..... Equipment Wiring Systems.

1.03 REFERENCES

A. AMCA 99—Standards Handbook.

B. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300—Test Code for Sound Rating Air Moving Devices.

D. AMCA 301—Method of Publishing Sound Ratings for Air Moving Devices.

E. ANSI/AFBMA 9—Load Ratings and Fatigue Life for Ball Bearings.

F. ANSI/AFBMA 11—Load Ratings and Fatigue Life for Roller Bearings.

G. ANSI/UL 900—Test Performance of Air Filter Units.

H. ARI 410—Forced-Circulation Air-Cooling and Air-Heating Coils.

I. ARI 430—Standard for Central-Station Air-Handling Units.

J. ARI 435—Standard for Application of Central-Station Air-Handling Units.

K. NFPA 90A—Installation of Air Conditioning and Ventilation Systems.

L. SMACNA—Metal Duct Standards.

1.04 QUALITY ASSURANCE

A. The manufacturer must have a quality management system in place, equal to the quality assurance standard ISO 9001-2000, for the design, manufacture, and service of heat exchangers and packaged ventilation/air conditioning equipment. Less than the 2000 Standard of ISO shall not be acceptable due to the reduced focus on overall company management. Standard catalog units requiring modification to meet these specifications or units that are field assembled from pre-fabricated panels shall not be considered or accepted. The complete packaged unit must be manufactured in the United States of America.

B. Wiring internal to the unit shall be wired to a numbered terminal strip for simplified identification and ease of trouble shooting. Units shall be ETL listed and labeled (where applicable), classified in accordance with UL 1995/CAN/CSA/ No. 236-M90.

C. Fan Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

D. Sound Ratings: AMCA 301; tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.

E. Fabrication: Conform to AMCA 99 and ARI 430.

F. Filter Media: ANSI/UL 900 listed, Class I, approved by local authorities.

G. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

H. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

1.05 SUBMITTALS

A. Submittals shall include, at a minimum, the following information: Unit Performance, Scaled Drawings, Airflow Diagram showing internal air temp changes, Component Selection Details, Fan Curves, Controls Diagram, Wiring Diagram, Listing of Specification Features, Sequence of Operation.

B. Submit shop drawings and product data under provisions of Section 15010 and Division 1.

C. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

D. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gages and finishes of materials.

E. Provide fan curves with specified operating point clearly plotted. Fan performance curve shall not be submitted in table form.

F. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

G. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

H. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

I. Submit manufacturer's installation instructions under provisions of Division 1.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Division 1.

C. All indoor double wall air handlers should be stored inside. When outdoor storage is necessary, it is recommended that these guidelines be followed:

- Select a well drained area, preferably a concrete pad or blacktop surface.
- Place the units on a dry surface or raised off the ground to assure adequate air circulation beneath unit and to assure that no portion of the unit contacts standing water at any time.
- Allow proper clearance around the unit to perform periodic inspection and maintenance of the equipment while in storage.
- Keep the equipment in the original shipping container for protection and care of handling.
- Cover the unit securely with a canvas tarp.

  NOTE: Use canvas only! Do not use clear or colored plastic or plastic tarps to cover the modular climate changer. Plastic will cause condensation to form in and on the equipment. This moisture can result in corrosion damage or wet storage stains.

- Ensure that the canvas tarp is secure.

- Do not stack units.
- Do not pile other material on the units.
- Loosen belt tension on dry belts.
- Every two weeks, rotate the fan and motor shaft thirty revolutions by hand. Check for free rotation
- Every six months, check fan shaft bearings and grease lines. Add grease using a manual grease gun following lubrication recommendations in the periodic maintenance section.
- Check the motor lubrications; remove and clean grease plugs, and check for the presence of moisture in the grease. If moisture is present, remove the motor and send it to an authorized repair shop for bearing inspection/replacement. If no moisture is present, refer to the motor manufacturer's lubrication recommendation for proper lubrication.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

B. Do not allow chilled water to flow through the unit when the unit is not operating.

1.09 EXTRA STOCK

A. Provide a minimum of two (2) extra sets of each type of filter specified in Paragraph 2.04, Filters. The first complete set (prefilter and final filter) shall be used throughout the duration of construction from the time of initial start-up until Final Completion. At the time of Substantial Completion, the second set of filters shall be installed. At the time of the Final Completion Walk-through, provide a clean set of filters so that the project is turned over with clean filters.

1.10 WARRANTY

A. The Contractor shall provide a written warranty, signed by the manufacturer, agreeing to replace/repair, within warranty period, components with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation. Warranty Period shall be 12 months in service or 18 months from delivery, which ever occurs first.

1.11 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Products must be inspected on the delivery truck for damage, missing parts, and cleanliness prior to signing the bill of lading. Even after inspection, a note of 'less concealed damage' should be included just above the signature.

B. Handling of the units is to be in accordance with the rigging instructions in the IOM accompanying the unit. If improper rigging is utilized, damage to casings, doors, seals, and internal components can occur. Once in place, units must be inspected for casing marks, scrapes, and scratches. Touch up must be done in accordance with coating manufacturer's recommendations to preserve warranty.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—100% OUTSIDE AIR DEHUMIDIFICATION UNIT

A. BASIS OF DESIGN—Trane (DesChamps).

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. Carrier—(Carrier shall verify that unit size will fit each room application and submit any discrepancies prior to bid.)

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010 and as noted below. Accepted substitutes will be notified via Addendum.

D. The manufacturer must also have a net worth greater than five times the value of the equipment being bid and must have been a manufacturer of packaged energy recovery equipment for at least ten years prior to bid time.

E. Provide Energy Recovery Unit(s) IAW with this specification, drawing details and the corresponding Schedule of Performance and Schedule Notes.

F. The Energy Recovery system shall be shop manufactured and assembled by Des Champs Technologies, Inc. Arrangement of all units shall be as shown on the Drawings. Performance shall be rated in accordance with ARI standards where applicable. All units shall be factory assembled, internally wired, and run tested to check electrical operation, fan and blower rotation and control sequence (if applicable) before leaving the factory.

G. Energy Recovery Unit(s) shall be provided in accordance with the following direction:

H. Des Champs Technologies shall be included in the Base Bid

I. Other Approved Manufactures: Other Manufacturers shall be listed as an add or deduct to the Base Bid to include the costs associated with project redesigns such as project electrical upgrades, structural upgrades, increase in project utility usage. Alternate manufactures not approved in writing shall not be considered equal and the pricing of these units shall not be included in the bid.

J. Pre-Approval: To gain approval, alternate manufacturers shall provide to the Architect the following information at least three (3) weeks prior to the bid date:

K. Certified factory drawings detailing that overall dimensions and weights of proposed equipment does not exceed those shown on plans.

L. Certified Performance Submittals of the unit and a line-by-line comparison of proposed equipment specification versus this specification with highlights of how the proposed equipment meets or exceeds this specification.

M. If applicable: Provide DDC control sequence of proposed equipment, provide temperature sensor location, and wiring diagram.

2.02 GENERAL

A. The Contractor shall furnish and install the unit(s) as shown and scheduled on the plans. The units shall be installed in strict accordance with the specifications. Unit shall be complete with fan section, heating and cooling coil section, access section, filter with pre-filter section/mixing box, and all accessories specified (refer to drawings).

2.03 CASING

A. Base Frame—The base of the package shall be an all-welded "C" channel steel frame with required cross-members as required to maintain floor rigidity. The base shall be painted with one coat of a lead-free, rust-inhibiting, alkyd metal primer, followed by two coats corrosion and weather resistant paint. The frame shall have sufficient cross members to support the system without bending or deforming the casing to maintain waterproof integrity and proper equipment alignment. The base shall also be constructed to minimize oil canning and deflection due to component loading. Four or more lifting lugs designed to work with clevises shall be an integral part of the structural frame and shall be welded using three-pass welds.

B. Underfloor Insulation—The underfloor shall be insulated with a sprayed polyurethane insulation that is a minimum 1" thick. Manufacture shall guarantee the underfloor will not sweat. Due to potential for underfloor sweating, pinned and glued fiberglass insulation shall not be allowed unless it is also accompanied by a fully seam and perimeter welded underfloor made of 18 gauge galvanized steel.

Curb mounted units shall include self-flashing rails that allow the perimeter channel to over-lap the curb and form a natural weather seal. Equipment that requires separate flashing between the curb and the based of the unit shall be unacceptable.

C. Unit Casing—Unit casing shall be of the monocoque stressed skin design with 2-inch double-wall, watertight construction. Walls and roof shall have an 18-gauge precoated steel outer skin with a 22-gauge galvanized steel inner liner. 2-inch minimum, 1.5 # density fiberglass insulation shall be secured between the inner and outer skins, and shall not be exposed to any air streams. All roof and sidewall seams shall be positively sealed to prevent water and air leakage. Air leakage shall not exceed 1% at 1-1/2 times maximum unit operating pressure up to 8 in. w.c.. All fastening hardware between wall panels shall be encapsulated within the wall for a clean exterior appearance and to minimize exterior wall panel penetration. Unit shall be constructed to limit frame and panel deflection to 1/200th of its span in any direction. Tubular frame or aluminum post type construction shall not be accepted due to excessive thermal bridging at panel joints, and poor weather seal characteristics.

The casing shall house the fans, motors, coils, heat exchangers, and all factory-supplied optional equipment (where applicable). For outdoor units, intake and exhaust hoods shall be provided. with an aluminum bird screen. The hood shall have a maximum 500 feet per minute face velocity through the free area. Hood material shall match that of the outer casing, and may be shipped loose for field installation and/or assembly by the Contractor. The hood to sheet metal joint shall be caulked with silicone by the Contractor to prevent water leakage.

D. Floors—Floors shall be constructed of seam welded 16ga Aluminized Steel. Floors constructed of galvanized Steel shall be coated with a corrosion resistant coating such as Heresite to achieve the same moisture resistant characteristics as Aluminized Steel. No screws or sealants may be used to construct the floor. No penetrations may be made thru the floors for fastening of in internal componenets such as fan supports, and coils supports

Floors shall have an upturned flange around the entire perimeter and around all interior chases to contain moisture within the unit. The entire floor and upturn flanges must be factory water tested and certified leak proof for a period of five years from the date of shipment.

Multiple floor drains shall be provided to route moisture to either side or bottom of the unit, and shall be accessible from the exterior of the unit. The purpose of the drains shall be to remove any condensate that is created within the casing as a natural part of the recovery or dehumidification process. Drains shall be flush with the unit floor so as not to create a trip hazard. Each floor hole interface with the drain tube shall be circumferentially fillet welded to prevent water leakage under the unit floor. The use of sealants for this purpose shall not be acceptable.

E. Access Doors—Provide self-supporting hinged access doors shall be provided for inspection and maintenance of fan assemblies and filters. Access doors shall be gasketed around the perimeter with weather-resistant closed-cell neoprene gasket. Doors shall have an internal stop the full length of the door to ensure the gasket does not become over-compressed or lose it’s seal. The door shall be insulated with the same materials as the unit casing, and double-wall constructed with full-length stainless steel piano-type hinges for rigidity and airtight enclosure.

A minimum of two adjustable glass reinforced nylon handle-type door latches shall be furnished for each hinged door over 24 inches in height. Each door handle shall be provided with large nylon roller cam for ease of operation and superior gasket depression. Each hinged door shall include locking mechanism that requires the use of a tool to open for safety and security purposes prior to unit startup.

Door frames shall be a minimum 16 gauge aluminized or stainless steel, welded at the corners. Doors shall have adhesive-backed stickers applied to their exterior surfaces which indicate the unit contents that lie behind that door. All exterior doors shall be equipped with rain gutters. Doors shall be installed in such a way as to allow removal of interior components without disassembly of the wall panels.

F. Casing Paint—Entire exterior of unit shall use pre-coated 18 gauge galvanized steel panel that have a paint that passess ASTM B117 2000-hour salt fog resistance test.

2.04 HEAT PIPE TYPE HEAT EXCHANGER

A. The heat exchanger shall be a regular product of the dehumidifier manufacturer who must have at least 10 years of heat exchanger manufacturing experience prior to bid time. Heat pipes shall be individually processed, weld-sealed, charged, and factory tested. Each pipe is constructed with an individual charging valve, which provides the opportunity to take advantage of future refrigerant developments. Heat transfer fluid shall be Class I in the American National Safety Code for mechanical refrigeration. Heat exchanger performance shall be rated in accordance with ASHRAE Standard 84-1991 and ARI Standard 1060. Heat Pipes that require charging in the field are not acceptable.

B. Heat exchanger shall be constructed of one-piece extruded aluminum tubes installed within a 16-gauge galvanized steel casing providing both structural integrity as well as an airtight seal. The heat pipes shall be individually charged, 1-inch I.D. with 0.063-inch wall thickness. Fins shall be of 0.015 mean thickness, tapered root to fin tip. Fin surface from root to fin tip shall have aluminum of 0.437 inch mean fin height. Fin density shall be 11 fins per inch. Heat pipes shall be a maximum of 2-1/8 inch on center in the face, and shall be 1-7/8 inch on center row-to-row.

C. Two component heat pipes such as expanded tube-to-fin shall not be acceptable in order to prevent efficiency degradation resulting from the eventual weakening of the fin-to-tube bond with age. Individual heat pipes shall be furnished within the casing and will accommodate expansion unique to each tube without damage to the integrity of the entire heat exchanger. Plate fin coil-type heat exchangers shall not be acceptable because of the shortened life caused by non-floating heat exchanger tubes.

D. Manufactures who use heat pipes with internal diameters of less and 1” shall also provide a tilt mechanism to ensure maximum energy transfer in summer and winter opteration. Tilt Mechanism shall consists of a maintenance free pivot point, electromechancal actuator and a mold resistant canvas attached upstream and downstream of all four sides of the heat pipe. Canvas connection points shall be fastened to internal frame to ensure zero air leakage or bypass.

2.05 SUPPLY FAN

A. The supply (and exhaust) air fan(s) shall be AMCA certified, Class I or II, heavy duty, centrifugal plenum (AF-SWSI) type with non-overloading wheel. Flexible duct connections shall be provided to isolate the fan from the cabinet housing as required. Bearing supports shall be constructed of structural steel members to prevent vibration and to rigidly support the fan shaft and bearings. Bearings shall be heavy duty, grease lubricated, anti-friction ball (adapter mount) or roller, self-aligning, pillow block type and selected for an average life of 200,000 hours per AFBMA standards and shall be rigidly mounted on welded structural steel members to prevent vibration.

B. Provide 2" Spring Isolation under Fan/Motor Assembly

C. All bearings shall be equipped with greasable zerk fittings and, where necessary, extended lube lines for easy access for lubrication. Turned, precision ground and polished steel shafts shall be sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class. All wheels shall be statically and dynamically balanced on precision electronic balancers to a Balance Quality Grade G6.3 per ANSI/AMCA 204 or better.

D. Fan performance shall be based on tests and procedures performed in accordance with AMCA Publication 210 and Publication 310 and comply with the requirements of the AMCA Certified Ratings Program. Fans shall bear the AMCA seal.

E. All fans prior to shipment shall be completely assembled and test run as a unit at the specified operating speed or maximum RPM allowed for the particular construction type. Maximum vibration shall be within the limits of ANSI/AMCA 204 Fan Application Category BV-3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

2.06 MOTORS AND DRIVES

A. Motor electrical connections are to be factory prewired to the unit control panel. Motor shall be mounted on an adjustable base. Motors shall be Open Drip Proof (ODP) *(Total Enclosed Fan Cooled, TEFC)* type fan motors shall be furnished with efficiencies equal to or greater than those specified in the Energy Policy Act of 1992 (EPACT).

2.07 DAMPERS

A. All dampers shall be of the low leakage airfoil blade type with blade edge and side seals. Dampers shall be constructed of extruded aluminum frames (6063T5) of not less than 2.03 mm thickness. Blades shall be of extruded aluminum profiles with blade gaskets of extruded EPDM. Frame seals shall be of extruded TPE. Gaskets shall be secured in an integral slot within aluminum extrusions.

B. Bearings to be comprised of a celcon inner bearing fixed to a 11.11 mm aluminum hexagon blade pin rotating within a polycarbonate outer bearing inserted in frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant zinc & nickel-plated steel, complete with cup-point trunnion screws for slip-proof grip.

C. Air leakage through a 48" x 48" damper shall not exceed 10.3 CFM/sq. ft against 4" W.G. differential static pressure with standard air. Standard air leakage data to be certified under the AMCA certified ratings program. Pressure drop through a fully open 48" x 48" damper shall not exceed 0.02" W.G. at 1000 FPM.

D. The following dampers shall be provided:

1. Outdoor air damper with electric 2-position actuator

2.08 DIRECT EXPANSION COIL

A. Direct expansion-cooling coil shall be sized to provide cooling/moisture removal of the capacity indicated on the equipment schedule. Coil shall be furnished with interlaced refrigerant circuits so that the entire coil face area is active when the unit is in operation.

B. Coil shall be copper tubes mechanically bonded to configured aluminum plate fins with a steel casing. Coil face velocity shall not exceed 500 feet per minute. The coils shall be rated according to ARI 410 .

C. Coils shall have an integral all seam welded stainless steel drain pan with a minimum depth of two inches. Drain pan shall be part of the all welded floor, recessed, and sloped toward basins. Basins shall be provided minimum every 60" and allow for capture and cleaning of larger debris. Minimum basin size is 6" x 3" x 1.75" deep. Underneath of the entire drain pan, and basins, shall be insulated with spray urethane insulation positively preventing any underneath condensate from forming. Entire coil assembly, including safe-offs shall be inside of the recessed drain pan. Drain pans that sit on top of unit floor shall not be acceptable due to water management issues. An access door shall be provided on each side of the coil, where feasible, to allow coil removal.

D. All coils over 42 inches in length shall incorporate a 16 gauge galvanized tube support at the center of the fin length; coils over 96 inches in fin length shall incorporate additional tube supports. Coils shall be sealed around the perimeter (between the coil flanges and the unit casing channels) with silicone or polyurethane sealant to eliminate air bypass and prevent moisture carryover.

2.09 AIR-COOLED CONDENSING SECTION

A. Provide an integral or remote, factory piped, charged and wired mechanical refrigeration system designed and built by the same manufacturer as the Energy Recovery Unit. Third party refrigeration systems or system provided by manufacturers with less than 10 years of refrigeration manufacturing experience shall not be accepted.

B. The Air Cooled Condensing unit shall be manufactured by Trane and approved by Des Champs for use with their air handling unit without exception. The condensing unit shall include the following:

C. Multiple Tandem Compressor sets that are direct drive, hermetic, scroll type with centrifugal gear type oil pump providing positive lubrication to moving parts.

D. Each tandem compressor set shall be individual circuited to the DX coil. Compressor motors shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent unit nameplate voltage. Temperature and current sensitive motor overloads shall be included for maximum protection. Compressors shall have vibration isolation to minimize vibration transmission and noise. Provide minimum run time and minimum off times as well as interstage timers.

E. All power and control wiring shall be run in UV resistant Nylon Conduit.

F. Each refrigerant circuit shall be made of Type L copper; nitrogen purged during all brazing processes, Include Filter Drier and Sight glass. Provide Thermal Expansion Valves with External Equalized Balancing Port to ensure stable operation over entire stroke range. Provide Superheat of 10-12°F. Refrigerant System shall be able to safety operate down to 35°F SST.

G. Provide each circuit with a High and Low Pressure cut out switches independently wired to the control panel. Use of the compressor's internal High Side to Low Side relief valve is not an adequate substitution for the required external low side pressure cut out.

H. Each compressor shall be provided with crankcase heaters and automatic pumpdown cycle. Provide the following items for proper pumpdown cycle: Refrigerant Check Valves, NC Electric Solenoid Valves.

I. Provide Hot Gas Bypass on lead compressor.

J. Condenser coil shall be of internally finned copper tubes mechanically bonded to configured aluminum plate fins. Coils shall be leak tested at the factory to insure pressure integrity. Condenser coils shall be arranged in a V-Bank configuration and set back inside the ACCU section to protect it from hail and weather damage. Provide Security Screen to prevent tampering with Compressors, refrigerant system and Condenser Coils.

K. Condenser fans shall be direct drive, constructed of Glass Reinforced Polypropolene, statically and dynamically balanced, draw through in the vertical discharge position. To insure low noise levels, maximum fan RPM shall be 1140 RPM, Protective steel fan guards shall be furnished. The fan motors shall be permanently lubricated TEAO and have built-in thermal overload protection.

2.10 FILTERS

A. Pre-filters located in mixing box shall be disposable type and shall have 2-inch thick media contained in a rigid frame. Filters shall have a rigid supporting maze across both the entering and leaving faces of the media. Filters shall be American Air Filter Model AM-AIR 301 or Eco-Air C35, 25%-30% efficient based on the ASHRAE 52-76 test method with tolerances conforming to Section 7.4 of ARI Standard 850-78. The filter shall be rated at no more than .20 inches W.G. initial resistance at 300 fpm face velocity. Recommended final resistance of prefilters is 1.2 inches W.G.

B. Final air filters shall be American Air Filter—Varicel II or Eco-Air Ecocell, medium efficiency, extended surface, self-supporting, 4" mini-pleat type. Each filter shall consist of a rigid ultra-fine glass fiber media pack, securely bonded to a double wall enclosing frame.

Filter media shall be ultra-fine fiberglass formed into a thin paper-like mat with a water repellent binder. Construction shall consist of coarser fibers on the air entering side and finer fibers on the air leaving side. The rigid media pack shall consist of media pleats, structurally bonded one to the other. The finished filter shall not exceed 3-3/4" depth in direction of airflow.

The filter shall have an average atmospheric dust spot efficiency of 60-65% as determined by the ASHRAE 52-76 test method. The filter shall be rated at no more than 0.40 inches W.G. initial resistance at 500 fpm face velocity. Recommended final resistance of final filters is 1.5 inches W.G.

The filter shall be classified by Underwriters' Laboratories Class 2 when tested according to UL Standard 900.

Maximum face velocity shall be 500 feet per minute. Filters must be provided standard on all air entering sides of air-to-air heat exchangers.

2.11 ELECTRIC HEAT

A. An electric heating coil shall be furnished. It shall be mounted in the reheat position. Coil shall have 80/20 nichrome open wire elements, designed for low-watt density, mounted in an aluminized steel frame. Over current, thermal overload and loss of airflow protection shall be included as required. Coil shall be SCR controlled to modulate the air temperature to set point.

2.12 ELECTRICAL CONTROLS

A. An integral electrical control panel shall be provided that has hinged access doors and an approved locking device. All power wiring shall be brought to a common terminal strip and only a single point electrical connection shall be required. All required safety and automatic operating controls, including compressor internal motor temperature protection, motor thermal overloads, cutouts for high and low refrigerant pressure (for units with integral condensing units), and operating thermostats shall be included.

B. A fused control power transformer shall be furnished. All components shall be fully wired and tested prior to shipment and all major electrical components shall be UL listed or recognized. Electrical system shall be ETL listed and labeled, in accordance with UL 1995. All wiring shall be connected to a numbered terminal strip for easy troubleshooting.

2.13 TEMPERATURE AND HUMIDITY CONTROLS

A. An electronic programmable dedicated digital controller (DDC) with key pad input shall be furnished to control the energy recovery system. Temperature and humidity set points and 365-day clock functions including daylight savings, holiday programming and user overrides, shall be easily input by the operator. All required outside air and supply air temperature sensors and humidity transducers shall be provided as specified. Space humidity transducer and temperature sensor shall be field mounted and wired by the controls contractor if required.

B. Refrigeration shall be staged by the DDC to attain maximum steps of control.

C. Unit shall be furnished with optional supply air temperature control system to permit customer control of discharge dry bulb temperature as well as dew point OPTION1: Unit controls shall be compatible with BAS through BACnet, LON, or N2 connection as required by the owner. Unit manufacturer shall provide complete controls sequence with points list in the submittal package. Field mounted unit controls are not recommended acceptable

2.14 PROOF OF PERFORMANCE TESTING

A. Manufacturer's that cannot demonstrate proof of their energy recovery equipment performance having been certified by a third party must provide a test, at their factory or at an independent testing laboratory, to be witnessed by the consulting engineer, owner's representative, and test engineer from Intertek (ETL) prior to approval of submittals and release of equipment for manufacture. Under no circumstances shall manufacturer proceed with manufacture of equipment without the satisfactory completion of the performance test and approval by the consulting engineer.

B. Heat exchangers shall be tested in accordance with ASHRAE standard 84-1991, ARI Standard 1060, and/or ANSI/ASHRAE Standard 143-2000 (Method of Test for Rating Indirect Evaporative Coolers). The following parameters shall be measured:

1. Supply air inlet temperatures (dry bulb and wet bulb)

2. Supply air outlet temperatures (dry bulb and wet bulb)

3. Exhaust air inlet temperatures (dry bulb and wet bulb)

4. Exhaust air outlet temperatures (dry bulb and wet bulb)

5. Supply air flow rate

6. Exhaust air flow rate
7. Supply air pressure drop
8. Exhaust air pressure drop
9. Heat Pipe Face Velocity dry side
10. Heat Pipe Face Velocity wet side
11. Number of heat pipe rows deep
12. Heat Pipe diameter
13. Heat Pipe Fins/inch
14. Refrigerant used in heat pipe tubes
15. Air temperature leaving condenser coil
16. Suction pressure for each refrigerant circuit
17. Head pressure for each refrigerant circuit
18. Compressor amps

C. Exchanger sensible effectiveness (winter heat recovery mode) shall be determined per ASHRAE standard 84-1991. Exchanger wet bulb depression effectiveness shall be determined per ANSI/ASHRAE Standard 143-2000 (Method of Test for Rating Indirect Evaporative Coolers). The duration of each test shall be of sufficient duration to reach equilibrium.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and in conformance with ARI 430.

B. Install unit on vibration isolators. Refer to Section 15242.

C. Because of phased construction and mechanical room constraints, the manufacturer shall make provisions for the air handlers to be field assembled, if required. The Mechanical Contractor shall coordinate installation of the air handlers with the General Contractor, prior to construction of mechanical room walls. The cost of assembly shall be included as a basic part of this project.

D. The Contractor shall make condensate drain connections at all drain pan pipe fittings furnished with the unit and manifold them to a single condensate trap, then slope/pipe to room floor drain. The condensate drain shall be configured and dimensioned to remove all condensate from the drain pan in accordance with the manufacturer's recommended dimensional formula. The dimensional data shown on the drawing details should be used as a guide only. The installed trap shall have a minimum 4 inch height differential between the unit drain connection and trap discharge.

E. Provide coil piping insulation flush and tight against side of unit. Provide a bead of caulk to insure the integrity of vapor seal.

F. Seal any penetration in unit caused by cutting casing or mounting devices to unit.

G. Start-up Checklist Items:

1. Check to insure condensate trap is effective. With the unit operating, check condensate flow then open the fan section access door. If the flow does not increase dramatically with the door open, the trap is correct. If the flow increases significantly, then the trap is incorrect and the unit must be properly trapped.

2. Do not run air unit at below 60 degree leaving air temperature until the building is closed up and controls are fully functional. Running equipment at low leaving air temperatures during building construction may result in permanent damage to unit, ductwork, and pipe insulation.

3. Set controls to provide 15 minute dry down cycle. Unit fan should run for 15 minutes after chilled valve is closed.

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SECTION 15870

POWER VENTILATORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. In-line Cabinet Fans (direct and belt driven).

B. Kitchen Hood Supply Fans (KHSF).

C. Sidewall Exhaust Fans.

D. In-line Square Design Fans.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15170 ..... Motors.

C. Section 15242 ..... Vibration Isolation.

D. Section 15890 ..... Ductwork.

E. Section 15910 ..... Ductwork Accessories.

F. Section 16180 ..... Equipment Wiring Systems.

G. Section 16480 ..... Motor Control.

1.03 REFERENCES

A. AMCA 99—Standards Handbook.

B. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300—Test Code for Sound Rating Air Moving Devices.

D. AMCA 301—Method of Publishing Sound Ratings for Air Moving Devices.

E. SMACNA—Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. Fabrication: Conform to AMCA 99.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and General Conditions.

B. Provide product data ceiling and cabinet fans.

C. Provide fan marked schedules with specified operating point clearly plotted.

D. Submit sound power levels for both fan inlet and outlet at rated capacity.

E. Submit manufacturer's installation instructions under provisions of General Conditions and Supplementary General Conditions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. BASIS OF DESIGN—Greenheck.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. Cook.

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 IN-LINE CABINET FANS (BELT DRIVEN MODEL BCF)

A. Centrifugal Fan Unit: Statically and dynamically balanced forward curve wheels, belt driven, with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted drip-proof motor, service access panel for removal of motor/fan, UL approved and with the AMCA label affixed.

B. Provide units with rectangular duct mounting collars, vibration isolation, disconnect switch, and gravity backdraft damper.

C. Provide with pulley sized for 150% of driven horsepower, keyed to shaft, adjustable for final balancing.

2.03 IN-LINE CABINET FANS (DIRECT DRIVEN MODEL SP)

A. Duct mounted fans shall be of the centrifugal, direct drive type. The fan housing shall be constructed of heavy gauge galvanized steel and shall include prepunched mounting brackets. The housing interior shall be lined with 1/2" acoustical insulation. The outlet duct collar shall include a spring loaded aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators. The fan wheel(s) shall be of the forward curved centrifugal type, constructed of galvanized steel and dynamically balanced. Fans shall be licensed to bear the AMCA Certified Ratings Seals for sound and air performance and shall be UL Listed and CSA approved.

2.04 SCHEDULES

A. Refer to drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route ductwork as shown on drawings.

C. Refer to details on the drawings.

***** END OF SECTION *****

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SECTION 15875

POWER ROOF VENTILATORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Centrifugal Roof Exhausters.

B. Upblast Centrifugal Roof Exhausters.

C. Gravity and Intake Vents.

D. Kitchen Hood Exhaust Fans (KHEF).

E. Roof Curbs.

F. Base Flashing Cap Sheet.

G. Base Flashing Base Ply.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15170 ..... Motors.

C. Section 15242 ..... Vibration Isolation.

D. Section 15890 ..... Ductwork.

E. Section 15910 ..... Ductwork Accessories.

F. Section 16180 ..... Equipment Wiring Systems.

G. Section 16480 ..... Motor Control.

1.03 REFERENCES

A. AMCA 99—Standards Handbook.

B. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300—Test Code for Sound Rating Air Moving Devices.

D. AMCA 301—Method of Publishing Sound Ratings for Air Moving Devices.

E. SMACNA—Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. Fabrication: Conform to AMCA 99.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and Division 1.

B. Provide product data on wall and roof exhausters, and ceiling and cabinet fans.

C. Provide fan curves with specified operating point clearly plotted.

D. Submit sound power levels for both fan inlet and outlet at rated capacity.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. BASIS OF DESIGN—Greenheck.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. Cook.

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 CENTRIFUGAL ROOF EXHAUSTERS (MODEL G)

A. Roof exhaust fans shall be centrifugal direct drive type.

B. The fan wheel shall be centrifugal backward inclined, constructed of aluminum, and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances.

C. Wheels shall be statically and dynamically balanced. The fan housing and shroud shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.

D. Motors shall be mounted out of the airstream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be factory installed and wired from the fan motor to a junction box within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

E. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

F. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.03 CENTRIFUGAL ROOF EXHAUSTERS(MODEL GB)

A. Centrifugal Fan Unit: Belt driven with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 16 gage aluminum bird screen; square base to suit roof curb with continuous curb gaskets; secured with stainless steel bolts and screws.

B. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

C. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

D. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment. A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.

E. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

F. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.04 UPBLAST CENTRIFUGAL ROOF EXHAUSTERS (MODEL CUBE)

A. Roof exhaust fans shall be upblast centrifugal belt driven type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

B. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. Windbands shall have a rolled bead for added strength and shall be joined to curbcaps with a welded seam.

C. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the air stream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.

D. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings.

E. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

F. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.

G. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.

H. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.05 KITCHEN MAKE-UP EXHAUST AIR UNITS (MODEL KME)

A. Supply

1. Filtered make-up air units shall have belt driven double width/double inlet, forward curved centrifugal type supply fans.

2. The entire fan and motor assembly shall be mounted on vibration isolators to prevent noise transmission. Motors shall be permanently lubricated, heavy duty, ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. The fan shaft shall be ground and polished steel mounted in heavy duty, sealed ball bearings. Bearings shall be selected for a minimum average (L50) life in excess of 200,000 hours at maximum cataloged operating speeds. Pulleys shall be of the fully machined, cast iron type, keyed and securely attached to the wheel and motor shafts. Motor sheaves shall be adjustable for final system balancing. Drives shall be sized for a minimum of 150% of driven horsepower.

3. Fan wheels shall be of the forward curved type, constructed of heavy gauge steel and statically and dynamically balanced to ensure smooth, vibration free operation.

4. Housing construction shall be heavy gauge galvanized steel with removable panels for access to fan and tempering unit components, filters, and controls.

5. Filters shall be one inch aluminum mesh and shall be UL classified.

6. The prewired control center shall include, but not be limited to, an integral master disconnect switch with fuse blocks for main power connection, magnetic motor starters with thermal overloads and manual reset, fused 115 volt control transformer, and distribution terminal control strip for control wiring connection. All electrical components shall be UL Listed, Approved or Classified where applicable and wired in compliance with the National Electrical Code. Wiring shall be complete, requiring only one-point field connection for power service and one-point field connection for low voltage.

B. Exhaust

1. Roof exhaust fans shall be of the belt drive, upblast, vertical discharge type. Housing shall be constructed of heavy gauge aluminum. The windband shall have a rolled bead and additional structural members for added strength. The fan wheel shall be of the backward inclined, centrifugal type, constructed of aluminum and statically and dynamically balanced for smooth, vibration free operation.

2. Construction shall include a built-in grease drain. Motors and drives shall be isolated from the airstream. Motors shall be permanently lubricated, heavy duty, ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase, and enclosure. Motors shall be cooled by air drawn from outside the exhaust airstream. The fan shaft shall be ground and polished steel mounted on heavy duty ball bearings. Bearings shall be selected for a minimum average (L50) life in excess of 200,000 hours at maximum cataloged operating speeds. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor sheaves shall be adjustable for final system balancing. Drives shall be sized for a minimum of 150% of driven horsepower. The entire fan and motor assembly shall be mounted on vibration isolators to prevent noise transmission.

3. The roof exhaust fans shall bear the AMCA certified ratings seals for air and sound performance.

4. Fans shall comply with UL 762 rating.

C. Heating Coils

1. Provide unit with ARI certified finned coils for heating of make-up air. Heating coil shall be vented and pitched in its casing. Provide an access door for coil inspection and service. Ship unit complete with coils and ready for field connection.

2.06 GRAVITY VENTS AND INTAKE VENTS

A. Gravity and intake vents (hoods) shall be constructed of heavy gauge aluminum. Hoods shall be constructed of precision formed, arched panels with interlocking seams. Bases shall be constructed so that the curb cap is 8" larger than the throat size. Base height shall be 12". Hood support members shall be constructed of galvanized steel and fastened so that the hood can be hinged open.

B. Birdscreens constructed of 1/2" galvanized steel mesh shall be mounted horizontally across the intake/discharge area of the hood.

C. Provide unit with motor operated damper and actuator. Coordinate damper requirements with Controls Contractor.

2.07 HOOD EXHAUST FANS (MODEL FH)

A. Discharge Cap and Damper:

1. Fans shall have a discharge cap with a deep spun steel discharge Venturi.

2. The discharge cap shall have a gravity operated damper to prevent backdrafts when the fan is not operating.

3. The dampers shall be protected by an encircling windband. The damper shall be furnished with large hinge pins that rotate in oil impregnated bronze bearings for maintenance free operation.

B. Backward Inclined Centrifugal Wheel: Shall be non-overloading backward inclined wheel. Blades shall be welded to the spun shroud and shall be statically and dynamically balanced.

C. Fan Housing: The housing shall be of heavy gauge steel and all-welded construction. The bearing assembly shall be contained in a tapered tube and completely welded.

D. Bearings and Shaft: Fans shall be equipped with cast iron, self-aligning pillow block bearings. Lubrication lines shall be extended to the outside of the fan for ease of maintenance. The fan wheel and drive pulley shall be curely fastened to the shaft with keys and set screws.

E. Drives: Units shall be furnished with adjustable pitch drives, providing speed adjustments to meet the application. All drives shall be based on a minimum 1.2 service factor.

F. Galvanized Curb Caps: Provide with heavy gauge steel, all-welded curb caps that are hot dip galvanized after fabrication. The curbs shall have a wiring post to facilitate running of conduit to the motor.

G. Weather Cover: Provide with a weather cover to protect the motor and drive from the elements.

H. Motors: Provide with totally enclosed motors.

I. Stack: Provide with 7’ high discharge stack.

J. Disconnect Switches: Provide NEMA 3R disconnect switches factory mounted to unit.

K. Prefab Curbs: Provide heavy gauge galvanized prefab 12” high roof curbs, sized to match the fan.

L. Refer to schedule on drawings for more information.

2.08 BELT DRIVEN FORWARD CURVED CENTRIFUGAL UTILITY FANS (MODEL SFB)

A. General Description:

1. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number

B. Wheel:

1. Forward curved centrifugal wheel.

2. Statically and dynamically balanced in accordance to AMCA Standard 204-05.

3. The wheel cone and fan inlet shall be matched and shall have precise running tolerances for maximum performance and operating efficiency.

C. Motor:

1. Motor enclosures: Totally enclosed fan cooled

2. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase

D. Shafts and Bearings:

1. Fan shaft shall be ground and polished solid steel with an anti corrosive coating

2. Permanently sealed bearings.

E. Housing:

1. Constructed of heavy gauge galvanized steel, with air tight lock formed seams

2. Shall be easily rotated in the field to any of the eight standard discharge positions

3. Housing and bearing supports shall be constructed of welded steel members to prevent vibration and to rigidly support the shaft and bearing assembly.

F. Housing Supports and Drive Frame:

1. Housing supports are constructed of structural steel with formed flanges

2. Provide pivoting motor plate with adjusting screws to make belt tensioning operations

3. Prepunched mounting holes for installation

G. Drive Assembly:

1. Belts, pulleys, and keys shall be oversized for a minimum of 150 percent of driven horsepower

2. Belts: Static free and oil resistant

3. Pulleys: Cast type, keyed, and securely attached to wheel and motor shafts

H. Options/Accessories:

1. Access Door:

a. Provides access for inspection and cleaning of wheel

b. Bolted access door

2. Belt Guards:

a. Three-sided fabricated steel belt guard around drive and motor

3. Weatherhood shall completely cover motor and drive compartments and shall be vented to provide sufficient motor cooling. Shall meet UL 705.

2.09 ROOF CURB

A. Prefabricated roof curb shall be of box section design, minimum 18 gauge galvanized steel construction, continuous mitered and welded corner seams, integral base plate, factory installed pressure treated wood nailer, and shall be insulated with 1½" thick, rigid fiberglass board insulation. To install properly, weld, bolt, or screw all curbing to the roof deck or substructure. Panel frames shall be rounded to reduce air flow interference. All curbs shall be minimum 16" high.

2.10 BASE FLASHING CAP SHEET

A. Provide SBS fiberglass reinforced, 98 mils (minimum) thickness membrane faced with embossed aluminum foil, weight 90 lbs. per 100 sq.ft. (minimum). Product shall be by one of the following:

1. Siplast - "Veral" aluminum surfaced cap sheet.

2. Soprema - "Sopralast 50 TV ALU" aluminum surfaced cap sheet.

2.11 BASE FLASHING BASE PLY

A. Provide either glass reinforced asphalt sheet or SBS modified bitumen sheet, weight 89 lbs. per 100 sq.ft. (minimum). Product shall be one of the following:

1. Siplast - "Irex 40."

2. Soprema - "Elastophene Flam."

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with stainless steel screws to roof curb and secure roof curb to roof.

3.02 INSTALLATION OF BASE FLASHING FOR CURBS

A. Install aluminum foil faced modified bitumen base flashing cap sheet and base ply by torching in strict accordance with manufacturer's directions. Follow manufacturer's torching precautions carefully.

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SECTION 15890

DUCTWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Ductwork.

B. Duct Cleaning.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15140 ..... Supports and Anchors.

C. Section 15290 ..... Ductwork Insulation.

D. Section 15856 ..... 100% Outside Air Dehumidification Unit.

E. Section 15870 ..... Power Ventilators.

F. Section 15875 ..... Power Roof Ventilators.

G. Section 15910 ..... Ductwork Accessories.

H. Section 15936 ..... Air Outlets and Inlets.

1.03 REFERENCES

A. ASHRAE—Handbook 1981 Fundamentals; Chapter 33 - Duct Design.

B. ASHRAE—Handbook 1983 Equipment; Chapter 1 - Duct Construction.

C. ASTM A90—Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

D. ASTM A167—Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

E. ASTM A653—Standard Specification for Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM B209—Aluminum and Aluminum Alloy Sheet and Plate.

G. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

H. SMACNA—HVAC Duct Construction Standards, Metal and Flexible, 1985 First Edition and 1995 Second Edition.

I. UL 181—Factory-Made Air Ducts and Connectors.

J. NFPA 96—Removal of Smoke and Grease-laden Vapors from Commercial Cooking Equipment.

1.04 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: Three pressure classifications:

1. 1/2 inch WG positive or negative static pressure and velocities less than 2,000 fpm;

2. 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm; and

3. 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

C. Medium Pressure: Two pressure classifications:

1. 3 inch WG positive or negative static pressure and velocities less than 4,000 fpm; and

2. 4 inch WG positive static pressure and velocities less than 4,000 fpm.

1.05 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and Supplementary General Conditions.

B. Submit ductwork shop drawings including plans and sections at a scale of 3/8" to a foot. Indicate duct pressure class, fittings, turning vanes, ductwork accessories, particulars such as gages, sizes, welds, duct reinforcement and configuration prior to start of work. Reproduction of the contract documents will not suffice. Shop drawings shall be submitted forty-five (45) days from the date of contract award.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 15010 and Supplementary General Conditions.

B. Store and protect products under provisions of Section 15010 and Supplementary General Conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. Steel Ducts: Galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq ft for each side in conformance with ASTM A90.

C. Fibrous Glass Ducts: Not to be used.

D. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

E. Stainless Steel Ducts: ASTM A167, Type 304.

F. Fasteners: Rivets, bolts, or sheet metal screws.

G. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded. Hang duct in trapeze fashion in accordance with SMACNA Standards.

I. Duct Supports: Straps may be used on ducts 24” wide and smaller, all others shall be supported on trapeze with hanger rods.

2.02 METAL DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures/pressure classifications indicated.

B. All ductwork shall be sealed in accordance with the requirements of Seal Class “A.” Seal all transverse joints, longitudinal seams, and duct wall penetrations.

C. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Provide turning vanes on all T's, bends, and elbows (including long radius elbows and short radius elbows).

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

F. Coordinate ductwork with building structure and all other trades prior to starting work to avoid conflicts.

G. Use double nuts and lock washers on threaded rod supports.

H. Formed on flanges (TDC/TDF/T25A/T25B) will be accepted. Formed on flanges shall be constructed as SMACNA T-25 flanges whose limits are defined on Page 1.36, 1995 SMACNA Manual, Second Edition. Formed on flanges are not allowed beyond 42" wide ductwork, or above 2" w.g. No other duct construction pertaining to formed on flanges will be accepted.

I. Construct rectangular ductwork to meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards, Metal and Flexible" 1985 First Edition. All ductwork shall comply with all local, state, and federal code requirements.

2.03 SCHEDULE OF DUCT CONSTRUCTION REQUIREMENTS

A. All Air Handlers (first 20 feet on supply side of unit connection): 4 inch WG positive static pressure and velocities less than 4,000 fpm. Test duct leakage in accordance with Seal Class A.

B. All Air Handlers (first 20 feet on return side of unit connection): 3 inch WG negative static pressure and velocities less than 4,000 fpm. Test duct leakage in accordance with Seal Class A.

C. Return Ductwork: 1 inch negative static pressure and velocities less than 2,500 fpm. Seal ductwork in accordance with Seal Class A. Testing may not be required if deemed acceptable by the Engineer during construction. Test duct leakage in accordance with Seal Class C.

D. Exhaust Ductwork and Unconditioned Outside Air Ductwork: 1 inch positive or negative static pressure and velocities less than 2,500 fpm. Seal ductwork in accordance with Seal Class A. Testing may not be required if deemed acceptable by the Engineer during construction. Test duct leakage in accordance with Seal Class C.

E. Transfer Ductwork: 1/2 inch positive or negative static pressure and velocities less than 2,000 fpm. Seal ductwork in accordance with Seal Class A. Testing may not be required if deemed acceptable by the Engineer during construction. Test duct leakage in accordance with Seal Class C.

F. All Others: Refer to SMACNA HVAC Duct Construction Standards, 1985, Table 1-1 and Table 1-2, unless noted otherwise herein.

2.04 RECTANGULAR SUPPLY AND RETURN DUCTWORK LOCATED WITHIN THE FIRST 20 FEET MINIMUM OF AIR HANDLING UNITS (SOUND ATTENUATED) [Refer to Floor Plans for Requirements beyond 20 feet]

A. Ductwork shall be rectangular as manufactured by United McGill Corporation, MetalMart, Express Metals, Inc., or approved equal.

B. Ductwork (including access doors) shall be double-wall, rectangular; duct and fittings shall be of Pittsburgh-lock longitudinal seam construction with transverse duct connectors. Duct shall be provided in lengths as required to meet the installation requirements of routing the ducts through the existing structure. Standard construction shall conform with the 1985 SMACNA HVAC Duct Construction Standards and TDC Lockformer Addendum to SMACNA. Duct and fittings shall be shipped fully assembled. The liner perforations shall be 3/32 inch diameter with an overall open area of 23%.

C. Duct and fittings shall be fabricated from a minimum G-60 galvanized steel. Fitting tap connections shall extend into liner of double wall ducts, flush with inner liner. Tape and seal along inside joint between inner liner and tap connection.

D. Square throat elbows and tees shall be provided with factory-installed, double-wall, hollow turning vanes in accordance with SMACNA recommendations. Turning vanes are required in all radius and square throat fittings.

E. Insulation shall be fiberglass that is 1" thick by 3 pounds per cubic foot (Type B duct liner board as specified in Section 15290) and shall be applied to the inner surface of the outer shell using duct liner adhesive. Insulated duct shall have a maximum thermal conductivity (k) of 0.27 Btu/hr/sq ft/°F/inch thickness at 75°F mean temperature. A UL approved mylar film and taped joints shall separate the internal fiberglass lining and the air stream.

F. Provide access doors on supply and return; 6-8 feet from the unit; minimum size 18"x18" and at 10 foot intervals to the end of the 20 foot length.

G. Refer to Schedule of Duct Construction Requirements for classification.

H. Ductwork Shop Drawings/Field Coordination: All double wall ductwork shall be factory premanufactured (fittings and straight lengths). As a basic part of this manufacturer's contractual requirements, they shall provide a minimum ¼" per foot, scaled, coordinated, ductwork shop drawings (coordination drawings). The coordination drawings shall be field verified by a certified manufacturer's representative and the installing contractor(s). The coordination drawings shall represent the actual routing, mounting locations, transitions, etc., as necessary to achieve the design intent while optimizing the use of the designated installation space as it relates to equipment and materials of other trades in that space (i.e., piping, air handlers, starters, building structure, electrical panels, etc). These coordination drawings shall be submitted to the A/E for review and approval prior to ordering materials. These coordination drawings shall be submitted to the A/E no later than four (4) weeks after the contract between Owner and Contractor is signed.

2.05 RECTANGULAR SUPPLY AND RETURN DUCTWORK LOCATED OUTDOORS (FROM THE EXTERIOR AHU TO INSIDE THE BUILDING AND DUCTWORK INSTALLED INSIDE APPARATUS BAY)

A. Provide double wall ductwork associated with exterior air handler unit as follows:

1. Supply ductwork from air handler supply connection to 5 ft inside the building.

2. Supply ductwork routed across the Apparatus Bay and to 5 ft on either side of the Apparatus Bay walls.

B. Ductwork shall be rectangular as manufactured by United McGill Corporation, MetalMart, Express Metals, Inc., or approved equal.

C. Ductwork (including access doors) shall be double-wall, rectangular; duct and fittings shall be of Pittsburgh-lock longitudinal seam construction with transverse duct connectors. Duct shall be provided in lengths as required to meet the installation requirements of routing the ducts through the existing structure. Standard construction shall conform with the 1985 SMACNA HVAC Duct Construction Standards and TDC Lockformer Addendum to SMACNA. Duct and fittings shall be shipped fully assembled. The liner perforations shall be 3/32 inch diameter with an overall open area of 23%.

D. Duct and fittings shall be fabricated from a minimum G-60 galvanized steel. Fitting tap connections shall extend into liner of double wall ducts, flush with inner liner. Tape and seal along inside joint between inner liner and tap connection.

E. Square throat elbows and tees shall be provided with factory-installed, double-wall, hollow turning vanes in accordance with SMACNA recommendations. Turning vanes are required in all radius and square throat fittings.

F. Insulation shall be fiberglass that is 2" thick by 3 pounds per cubic foot (Type B duct liner board as specified in Section 15290) and shall be applied to the inner surface of the outer shell using duct liner adhesive. Insulated duct shall have a minimum R-value of 6. A UL approved mylar film and taped joints shall separate the internal fiberglass lining and the air stream.

G. Provide access doors on supply; 6-8 feet from the unit; minimum size 18”x18”.

H. Refer to Schedule of Duct Construction Requirements for classification.

I. Ductwork Shop Drawings/Field Coordination: All double wall ductwork shall be factory premanufactured (fittings and straight lengths). As a basic part of this manufacturer’s contractual requirements, they shall provide a minimum ¼" per foot, scaled, coordinated, ductwork shop drawings (coordination drawings). The coordination drawings shall be field verified by a certified manufacturer’s representative and the installing contractor(s). The coordination drawings shall represent the actual routing, mounting locations, transitions, etc., as necessary to achieve the design intent while optimizing the use of the designated installation space as it relates to equipment and materials of other trades in that space (i.e., piping, air handlers, starters, building structure, electrical panels, etc). These coordination drawings shall be submitted to the A/E for review and approval prior to ordering materials. These coordination drawings shall be submitted to the A/E no later than four (4) weeks after the contract between Owner and Contractor is signed.

2.06 FLEXIBLE DUCT

A. Air Device Connection Ductwork: Flexible fiberglass duct with a maximum thermal conductivity of 0.24 BTU/HR - degrees F - Sq.Ft. at 75 degrees F mean temperature with a maximum flame spread rating of 25 and smoke developed rating of 50. Flexible fiberglass duct shall be Owens-Corning Valuflex or approved equal. The duct shall conform to NFPA 90A, 90B, and be listed by Underwriters Laboratories as 181 Class I Air Duct.

1. Flexible fiberglass duct shall be provided with bellmouth fitting, volume damper, and metal clamp.

2. Flexible fiberglass duct size shall be same as air device neck size unless otherwise noted.

3. Flexible fiberglass duct length shall be a maximum of 9 feet and a minimum of 4 feet.

2.07 KITCHEN HOOD DUCTWORK (GREASE DUCT)

A. Provide ductwork in accordance with NFPA -96, Standard for Ventilation, Control, and Fire Protection of Commercial Cooking Operations, and Florida Building Code, Mechanical, Grease Hood Duct Systems.

B. Exhaust outlets for ducts serving commercial food cooking and processing equipment shall terminate outside the building and shall be located 10 feet from any adjacent building, parking area, adjacent property line, window, door, or air intake opening and shall be located at least 10 feet above the adjoining grade level. Every exhaust outlet which is located above the roof shall terminate at least 40 inches above the roof surface.

C. Grease Duct Enclosure

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. American Metal Products; MASCO Corporation.

   b. Metal-Fab, Inc.

   c. Schebler Co. (The).

   d. Selkirk Inc.; Selkirk Metalbestos and Air Mate.

   e. Van-Packer Company, Inc.

2. Description: Double-wall metal vents tested according to UL 1978 and rated for 500 deg F continuously, or 2000 deg F for 30 minutes; with positive or negative duct pressure and complying with NFPA 211.

3. Construction: Inner shell and outer jacket separated by at least a 3-inch annular space filled with high-temperature, ceramic-fiber insulation.

4. Inner Shell: ASTM A 666, stainless steel.

5. Outer Jacket: Stainless steel.

6. Accessories: Tees, elbows, increasers, hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly. Include unique components required to comply with NFPA 96 including cleanouts, transitions, adapters and drain fittings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide openings in ductwork where required to accommodate smoke detectors and sensors. Provide pitot tube openings where required for testing of systems, complete with metal cap with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Install motorized control dampers, duct mounted temperature pressure sensors and air monitors in ductwork; dampers, sensors and air monitors supplied under Section 15975, installed by the Mechanical Contractor.

E. All ductwork connected to motor driven equipment shall be provided with flexible duct connections.

F. Install 18" x 18" duct access doors within 6-8 feet of each air handler for both the return and supply.

G. Aluminum ductwork serving wet areas shall be pitched for drainage toward registers. Bottom of ductwork shall be welded or soldered watertight.

H. Install duct smoke detectors in ductwork furnished by others as shown on the drawings and as recommended by the detector manufacturer and six (6) duct diameters after a bend or obstruction in the duct. Provide a minimum 8" x 8" access door in duct at location of detector for maintenance and inspection of tube.

3.02 ADJUSTING, TESTING, AND CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. All ducts of all pressures shall be leak-tested as per SMACNA 1985 Edition, HVAC Air Duct Leakage Test Manual, in the presence of the A/E and Owner's representative. The tabulated test results shall be submitted to the A/E. Duct shall be tested in accordance with the applicable leakage class as defined and scheduled herein. Reference Figure 4-1, Duct Leakage Classification, and Table 4-1, Applicable Leakage Classes, of SMACNA Manual. If the leakage constant determined from the tests is lower than or equal to the specified leakage class, the duct is in compliance. If the duct is not in compliance, the duct shall be resealed and retested until the duct is tested and found to be in compliance.

3.03 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM	MATERIAL
Low Pressure Supply	Galvanized Steel
Medium Pressure Supply	Galvanized Steel
Return and Relief	Galvanized Steel
General Exhaust	Galvanized Steel
Outside Air Intake	Galvanized Steel
Diesel Exhaust	Galvanized Steel
Shower Room Exhaust	Aluminum
Dishwasher Exhaust	Stainless Steel
Kitchen Hood Exhaust	(Refer to Kitchen Hood Ductwork, this section)

***** END OF SECTION *****

SECTION 15910

DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Volume Control Dampers.

B. Air Turning Devices.

C. Flexible Duct Connections.

D. Duct Test Holes.

E. Motor Operated Dampers.

F. Access Doors.

G. Fire Dampers.

H. Stationary Louvers.

I. Counterbalance Backdraft Dampers.

J. Combination Smoke/Fire Dampers.

K. Smoke Dampers.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15856 ..... 100% Outside Air Dehumidification Unit.

C. Section 15890 ..... Ductwork.

1.03 REFERENCES

A. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

B. SMACNA—Low Pressure Duct Construction Standards.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

PART 2 PRODUCTS

2.01 VOLUME CONTROL DAMPERS (BALANCING)

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate multi-blade damper of opposed blade pattern for ducts more than 12" in height and single blade dampers for ducts 12" in height or less with maximum blade length of 48 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

C. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Shaft shall extend beyond thickness of insulation to allow unobstructed operation of handle and locking mechanism.

2.02 AIR TURNING VANES

A. Turning Vanes Over 36 Inches:

Multi-blade device with double thickness air foil blades with long trailing edge vanes, aligned in short dimension, steel or aluminum construction, with individually adjustable blades, mounting straps. Refer to SMACNA HVAC Duct Construction Standards, First Edition, for spacing, reinforcing, and other construction quality details.

B. Turning Vanes up to 36 Inches:

Single blade device with long trailing edge vanes, aligned, steel or aluminum construction, with individually adjustable blades, mounting straps. Refer to SMACNA HVAC Duct Construction Standards, First Edition, for spacing, reinforcing, and other construction quality details.

2.03 DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Rectangular to Round Runout and Branch Connection:

1. Provide Bellmouth spin-in collar fittings installed per manufacturer's recommendation and in accordance with SMACNA. Provide metal clamps to secure insulation and vapor barrier over the core connection. If height of Bellmouth fitting does not work with duct dimensions, provide a flat oval Bellmouth fitting or rectangle to round fitting. All branch connections shall be provided with volume damper and extended handle/locking mechanism.

2. Fittings shall be completely sealed, insulated, taped, and masticed.

C. Air Handler Duct Connection:

1. Provide U.L. listed, fire-retardant, neoprene coated woven glass fiber fabric to NFPA 90A, minimum density, 36 oz. per sq.yd., approximately 6 inches wide, crimped into metal edging strip.

2. Connections shall be completely sealed, insulated, taped, and masticed.

2.04 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 MOTOR OPERATED DAMPERS

A. Dampers (except smoke or combination fire/smoke dampers) shall be furnished by automatic controls contractor and installed by the mechanical contractor.

2.06 ACCESS DOORS

A. Access doors shall be provided at all main volume dampers, automatic dampers, before and after booster heaters, air flow measuring stations, thermostats in fan discharges, control devices, fire dampers and other locations where duct access is required.

B. Doors shall be constructed of #22 gauge metal minimum or at least two (2) gauges heavier than duct. Door material shall be same as duct system.

C. Doors shall be provided with a flat iron or angle iron stiffening frame and so constructed that they can be operated without twisting or distortion. Doors on insulated ductwork shall be of double panel construction, provided with an approved type insulated filler not less than 1" thick. The duct opening at each door shall be provided with a continuous reinforcing galvanized bar or angle against which the door will close, this being provided with a latex foam gasket. Gasket shall be held to bar or angle by applying a flameproof adhesive. All access doors shall be hinged, minimum two (2) hinges.

D. Door frames on insulated ductwork shall be placed on an extended metal collar flush with the face of the finished insulation.

E. Doors shall be gasketed air tight.

F. Access door and hardware shall be submitted for approval before fabrication.

G. Access door on air handling unit shall open out on draw-through unit and open in on blow through units.

2.07 FIRE DAMPERS

A. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1½ hour (unless noted otherwise on the drawings) fire protection rating, 165°F fusible link, and shall include a UL label in accordance with established UL labeling procedures. All dampers shall be out-of-the-airstream type and shall be UL 555 classified static rated for use in HVAC systems that automatically shutdown in the event of a fire. Fire dampers shall be equipped for vertical or horizontal installation as required by the location shown on the drawings. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other materials, and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer's instructions. Dampers installed in HVAC systems that shall remain operational in the event of a fire (i.e.; smoke control systems) shall be UL classified dynamic rated with a 1½ hour (unless noted otherwise on the drawings) fire protection rating.

B. Approved Manufacturers

1. Ruskin.

2. Greenheck.

2.08 STATIONARY LOUVERS

A. Louvers shall bear the AMCA seal and shall have free area and pressure drop ratings certified to be obtained using AMCA standard tests.

B. Louvers shall have the following construction, unless noted otherwise.

1. Shall be stormproof drainable type.

2. Frame and Blades: 0.125 and 0.081 inch thick extruded aluminum respectively.

3. Finish: As scheduled on the drawings or selected by the Architect.

4. Screen: Aluminum bird screen, interior mount, removable with frame.

5. Mullion: Exposed (used only on louver widths over 60 inches).

C. Provide extruded aluminum brick or block vents with mesh insect screen where shown on the drawings.

D. Approved Manufacturers

1. Ruskin.

2. Greenheck.

2.09 COUNTERBALANCED BACKDRAFT DAMPER

A. Provide counterbalance backdraft dampers that meet the following minimum construction standards; frame shall be .125" wall thickness 6063-T5 extruded aluminum with 12 gage galvanized steel structural brace at each corner or 4" x 1" x .081". Blades shall be .070" wall thickness 6063-T5 extruded aluminum with extruded vinyl blade edge seals mechanically locked into blade edge. Adhesive or clip-on type seals are unacceptable. Bearings shall be corrosion resistant, long life synthetic type for quiet operation. Linkage shall be 1/2" wide tiebar connected to stainless steel pivot pins. Dampers shall be designed for maximum 3500 FPM spot velocities and up to 4" w.g. backpressure, depending on damper size. Damper shall be in all respects equivalent to Ruskin Model CBD4.

2.10 COMBINATION FIRE/SMOKE DAMPERS (MOTORIZED)

A. Shall be provided, wired (power and signal), tested and installed by the Mechanical Contractor as shown on the plans. Dampers shall close upon activation of fire alarm system. Refer to Sequence of Operations for applications to fire suppression systems (i.e.; FM 200 or Inergen). Coordinate with fire alarm/fire suppression system installer(s) and manufacturer's instructions for connection to that system.

B. Dampers shall be Greenheck [Model FSD-23, 33 or 28, CFSD-23 or OSFD-23 or 33], Ruskin [Model FSD-36, FSD-37, or FSD60-3], or pre-approved substitute.

C. Dampers shall be of the motorized multi-blade type construction. Dampers shall be 1½ hour fire resistence rated in accordance with UL Standard 555. Dampers shall meet all of the requirements for smoke dampers per the latest Edition of NFPA 90A. Dampers shall meet or exceed the dynamic closure rating maximum velocity of 2000 fpm and 8 inches w.g.

D. Dampers shall be UL 555S Leakage Class I rated, non-heat degradable design with friction free metal to metal seals incorporated into the blade and frame shapes. Other types of gasketing to achieve low leakage performance such as petrochemical (vinyl, plastic, etc.), spring stainless steel, or aluminum are not acceptable. Dampers and actuator shall be rated to 350°F.

E. Dampers shall be installed in accordance with the manufacturer's UL installation instructions.

F. Electric motor actuators shall be UL listed, factory installed for outside of the ductwork. The actuators shall be power open, spring closed, suitable to operate on 120 VAC, 60 cycle. Refer to the mechanical, electrical power and electrical systems drawings for coordination. The dampers shall be furnished with connecting shafts and linkage.

2.11 SMOKE DAMPERS

A. Smoke dampers shall be provided, wired (power and signal), tested, and installed by the Mechanical Contractor as shown on the plans. Dampers shall close upon activation of fire alarm system. Refer to Sequence of Operations for applications to fire suppression systems (i.e.; FM 200 or Inergen). Coordinate with fire alarm/fire suppression system installer(s) and manufacturer's instructions for connection to that system.

B. Dampers shall be Greenheck (Model SMD-23, 33 or 43), Ruskin Model SD-37, FSD-50, or SD-60, or pre-approved substitute.

C. Dampers shall be of the motorized multi-blade type construction. Dampers shall be 1½ Hour Fire Resistance Rated in accordance with UL Standard 555. Dampers shall meet all of the requirements for smoke dampers per the latest Edition of NFPA 90A. Dampers shall meet or exceed the dynamic closure rating maximum velocity of 2000 fpm and 4 inches w.g.

D. Dampers shall be UL 555S Leakage Class I rated, non-heat degradable design with friction free metal to metal seals incorporated into the blade and frame shapes. Other types of gasketing to achieve low leakage performance such as petrochemical (vinyl, plastic, etc.), spring stainless steel, or aluminum are not acceptable. Dampers and actuator shall be rated to 350°F.

E. Dampers shall be installed in accordance with the manufacturer's UL installation instructions.

F. Electric motor actuators shall be UL listed, factory installed for outside of the ductwork. The actuators shall be power open, spring closed, suitable to operate on 120 VAC, 60 cycle. Refer to the mechanical, electrical power, and electrical systems drawings for coordination. The dampers shall be furnished with connecting shafts and linkage

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

E. Provide duct test holes where required for testing and balancing purposes.

F. Motorized dampers are furnished under Section 15975, installed by the Mechanical Contractor.

G. Provide 18" x 18" access doors in ductwork within 6-8 feet of each air handler for both the return and supply.

***** END OF SECTION *****

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SECTION 15911

KITCHEN EXHAUST CANOPY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Canopy.

B. Filters.

1.02 RELATED WORK

A. Section 15140 ..... Supports and Anchors.

B. Section 15290 ..... Ductwork Insulation.

C. Section 15420 ..... Kitchen Canopy and Duct Fire Protection.

D. Section 15890 ..... Ductwork.

E. Section 15910 ..... Ductwork Accessories.

F. Section 15990 ..... Testing, Adjusting, and Balancing.

G. Section 16180 ..... Equipment Wiring Systems.

1.03 REFERENCES

A. ASTM A 167—Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. UL No. MH-11662.

C. NFPA 96.

1.04 REGULATORY REQUIREMENTS

A. Construct to NFPA 96 standards.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Sections 15010 and Supplementary General Conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products under provisions of Sections 15010 and Supplementary General Conditions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. BASIS OF DESIGN—Greenheck.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. Halton.

2. CaptiveAire.

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 EXHAUST CANOPY (MODEL GHEW)

A. Each Kitchen Ventilation Canopy shall be the perforated metal, low velocity, exhaust only wall type. Canopy shall be of full length capture type. The canopy shall be Type I, exhaust only hood and shall be UL 710 Listed. Canopy shall be fabricated in accordance with NFPA 96, shall bear the National Sanitation Foundation Seal of Approval (NSF).

B. The canopy shall be constructed with 18 gauge, type 304, stainless steel with all exposed surfaces, a number four polished finish. The exterior joints and seams on the canopies shall be liquid tight. The exposed external welds shall be ground down, smoothed and highly polished.

C. The canopy shall include a filter housing constructed of the same material as the interior liner complete with UL Classified stainless steel baffle type filters of sufficient numbers and sizes to insure optimum performance as specified by the filter manufacturer.

D. The filter housing shall terminate into a pitched full-length grease trough which shall drain into a removable grease cup.

E. Greaseproof, UL listed, incandescent light fixtures shall be installed at approximately 3 foot centers. The lights shall be prewired to a junction box situated on the top of the hood for field connection to power. The wiring shall conform to the requirements of the National Electrical Code.

F. A control panel shall be remotely mounted on the wall (location to be field verified). This panel shall include on/off toggle-type switches for the control of hood lights and fans. There shall be an indicator lamp next to each switch for positive function status identification. The panel shall have a stainless steel face plate with each switch identified for function.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with Manufacturer's instructions and in conformance with NFPA 96, state, and local codes.

B. Provide all wiring, contacts, relays, etc. for a complete operational canopy.

***** END OF SECTION *****

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SECTION 15936

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Registers/Grilles.

B. Diffusers.

1.02 RELATED WORK

A. Section 15010 ..... Basic Mechanical Requirements.

B. Section 15890 ..... Ductwork.

1.03 REFERENCES

A. ADC 1062—Certification, Rating and Test Manual.

B. AMCA 500—Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

D. ARI 650—Air Outlets and Inlets.

E. ASHRAE 70—Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA—Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Provide product data for items required for this project.

C. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

E. Submit engineering data in a manner to facilitate convenient review of aspiration ability, including temperature and velocity traverses, throw and drop, noise criteria ratings sizes, free area and quality of construction. Outlets shall be selected for maximum noise criteria level as scheduled on drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—CEILING DIFFUSERS AND REGISTERS

A. BASIS OF DESIGN—Titus.

B. PRE-APPROVED SUBSTITUTES (Approved to Bid)

1. MetalAire.

2. Price

C. OTHER SUBSTITUTES—Submit a written substitution request, prior to bid, to the Architect/Engineer in accordance with Specification Section 15010. Accepted substitutes will be notified via Addendum.

2.02 CEILING DIFFUSERS, REGISTERS, AND GRILLES

A. Fabricate aluminum and baked enamel white finish. (Refer to schedule on drawings.)

B. Provide opposed blade damper adjustable from diffusers and registers faces.

C. Coordinate frame type with latest architectural reflected ceiling plan.

D. Refer to schedule on drawings for type and model number.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers registers and grilles to ductwork with air tight connection.

D. Provide balancing dampers in diffusers and registers.

E. Paint ductwork visible behind air outlets and inlets matte black.

***** END OF SECTION *****

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SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SUMMARY STATEMENT

A. Test and balance of HVAC systems supply, return, and exhaust systems shall be performed by an independent test and balance agency certified by AABC or NEBB. The cost of the TAB services are a part of the base bid for this Contract. The TAB services provided herein shall be completed and the written report submitted to the Engineer a minimum of 15 days prior to Substantial Completion of each project phase. The Owner will then perform a verification TAB. If discrepancies are found, they will be corrected by this Contractor and the Contractor will be responsible to pay for additional trips for the Owner's TAB representatives to verify.

1.02 RELATED DOCUMENTS

A. The requirements set forth in the Bidding Requirements and the Contractual Conditions of Division One shall apply to this Section.

B. The requirements of Section 15010, Basic Mechanical Requirements, shall be adhered to in the test and balance work which shall include Section 15260, Piping Insulation; and Section 15890, Ductwork.

1.03 GENERAL

A. Scope

1. Description

a. The Contractor shall, at the Contractor's expense, procure the services of an independent testing and balance firm which specializes in the balancing and testing of heating, ventilating and air conditioning systems. This specialty services firm shall balance, adjust and test air moving equipment, air distribution and/or exhaust systems as herein specified.

b. Test and balance work shall not begin until all systems have been completed and are in full working order to the satisfaction of the Project Architect/Engineer and the Owner. This Contractor shall make all preliminary tests and adjustments before advising in writing that test and balance work is ready to begin and shall place all systems and equipment into full operation during each working day of testing and balancing.

2. Replacement pulleys (adjustable and non-adjustable), additional balancing dampers, pressure taps, balancing valves, cocks and fittings, etc., required to effect proper air and water balance shall be furnished and installed by this Contractor at no additional cost to the Owner. This Contractor shall do this work as soon as possible so as not to delay the completion of the test and balance work.

3. Air filters shall be replaced and strainers shall be cleaned by this Contractor before proceeding with test and balance and thereafter as required by the test and balance firm.

4. Systems shall be placed into service using approved start up procedures. This (mechanical) contractor shall be responsible for proper initial setting and adjustment of HVAC equipment, air handlers, VAV boxes, exhaust fans, etc. furnished and installed by him.

5. This Contractor shall provide test openings as required; shall operate HVAC equipment and provide trades persons to assist and make adjustments for test and balance during the process.

6. When the Owner's verification test and balance firm is ready to test according to the established schedule, but is prevented from testing and balancing, making adjustments or taking measurements due to incompleteness of the work, all extra charges for test and balance attributable to the delay may be back charged to this Contractor. The Project Architect/Engineer shall be the judge as to whether a delay has occurred and back charges due the Owner, and which, if judged proper, shall be effected through a Change Order reducing the Contract Sum.

7. The Contractor's test and balance firm shall periodically visit the site during construction of the HVAC system. No less than two visits per phase will be made. Should methods, materials or workmanship being used adversely affect balancing and adjusting work, the test and balance agency shall report its findings in writing to the Contractor with recommendations for correction.

8. The Contractor's test and balance firm has agreed or shall agree to carry out the test and balance in accordance with the AABC National Standards for Total Systems Balance, 1982 or the NEBB Procedural Standards for Testing, Adjusting and Balancing or Environmental Systems, Fourth edition, and in conformance with ASHRAE Handbook, 1991, Chapter 34, Testing, Adjusting and Balancing and as outlined in this Specification Section.

9. This Contractor shall furnish to the testing and balancing agency a complete set of plans and specifications, addenda, shop drawings, schedules and change orders as may be required.

B. Quality Assurance

1. The final result of balancing shall be to provide uniform air temperatures within a two (2) degree F spread in the conditioned space at peak load conditions.

2. All instruments used shall be accurately calibrated within six months of testing and balancing and shall be maintained in good working order.

3. In the event of dispute, the Owner or Contractor or Project Architect/Engineer may choose to provide verification of test and balance reports, and such verification shall be by a third independent agency selected by the Engineer. Reports found to be inaccurate will be disallowed, and the Contractor's test and balance firm will be required to repeat operations under the supervision of the third independent agency until accurate reports are completed and agreed upon, provided the Contractor's TAB firm is found to be at fault in the judgment of the Engineer. The cost of disputed test and balance work shall be borne by the Owner or Contractor (whichever is found to be at fault).

C. Submittals

1. The test and balance firm will submit two (2) copies of data for the testing and balancing for the approval of the Project Architect/Engineer and three (3) file copies to the Owner and two (2) copies to this Contractor.

2. All data and information shall be compiled in a neat, orderly format on 8-1/2" x 11" test forms and shall be signed and sealed by the certified individual as previously described.

2.01 EXECUTION

A. Air Balance

1. This Contractor shall prepare the air systems for balancing and verify same for test and balance firm as follows:

a. Mechanically check fans, blowers and air handling equipment and make such available to operate under design conditions.

b. Set volume dampers, air dampers and vanes in their normal position.

c. Set grilles, diffusers, etc. installed with vanes, blades in their normal position.

d. Mechanically check controls, whether they are electronic, electric or pneumatic or a combination thereof, and make available to operate under design conditions.

e. Mark damper shafts and locking devices to accurately represent the position of their respective dampers when in optimum position.

2. The Contractor's test and balance firm shall perform the following tests and balance system in accordance with these requirements:

   a. Test and adjust fan RPM to design requirements.

   b. Test and record motor full load amperes. Verify the sizing and settings of overloads as well as document same on reports. Coordinate with Division 16 to install and size overloads to NEC and manufacturers requirements.

   c. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.

   d. Test and record system total pressures, suction and discharge.

   e. Test and adjust system for design CFM recirculated air.

   f. Test and adjust system for design CFM outside air.

   g. Test and record coil entering air temperatures (D.B. heating and cooling).

   h. Test and record coil entering air temperatures (W.B. cooling).

   i. Test and record coil leaving air temperatures. (D.B. heating and cooling).

   j. Test and record coil leaving air temperatures (W.B. cooling).

   k. Adjust all main supply and return air ducts to proper design CFM.

   l. Adjust all zones to proper design CFM (±10%), supply and return. Show all DDC readings at time of measured readings. Coordinate with Controls Contractor to resolve differences.

   m. Test and adjust each diffuser, grille, and register to within ±10% of design requirements.

   n. Each grille, diffuser and register shall be identified as to location, area and system.

   o. Test and record all room temperatures, D.B. and W.B. Test shall be made near room thermostat where installed at four feet above floor.

3. Size, type and manufacturer of diffusers, grilles, registers, and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.

4. Readings and tests of diffusers, grilles and registers, shall include test resultant velocity, required CFM and test resultant CFM after adjustments.

5. In cooperation with the control manufacturer's representative, the test and balance firm shall set adjustments of automatically operated dampers to operate as specified, indicated, and/or noted.

6. Testing and balance firm shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.

7. Diffusers, grilles and registers shall be adjusted by the test and balance firm to minimize drafts in all areas.

8. The test and balance firm shall verify duct work leakage tests. Data from duct work leakage tests shall be tabulated and included with the test and balance report. Leakage tests per SMACNA requirements shall be performed.

9. Tested section of duct work shall be marked by this Contractor and verified by the test and balance firm. All tests and repairs shall be made before duct sections are concealed or insulated.

B. Sound Testing

1. Using approved instruments, the test and balance firm shall conduct tests in selected areas of the building as specified below. Sound level readings shall be measured in decibels on the "A" and "C" scales of the General Radio Company sound level meter, or equal sound level meter that meets the current American Standards (224.3-1944) based on the acoustic reference power of D.B./RE 10.13 watts. Readings shall set forth the total random sound level of the selected rooms or areas with the system in operation, as compared to total background sound level with the system not in operation. The system increase over the background level shall be recorded in decibels on the "A" and "C" scales. If sound levels are above those listed below, adjustments shall be made by this Contractor to bring the sound level within the range set forth. If this cannot be done with the equipment as installed, recommendations shall be made by the test and balance firm to correct the sound level to within the specified range. Additions of sound traps, insulation, or dampers shall be made by this Contractor under the direction of the balance agency at no additional cost to the Owner, provided the noise is due to Contractor's fault. Sound level readings (in decibels) shall be taken at each diffuser, grille or register in occupied areas. The sound levels shall be approximately 45 degrees to the center of the diffuser, etc., on the "A" and "C" scales of a General Radio Company sound level meter. The computed equivalent sound level meter readings weighting scale "A" (DBA) shall not exceed 40 for general office type space, 35 for classroom and conference room type space and 30 for sensitive areas such as libraries or auditoriums.

2. Sound measurements shall be taken in the following locations:

   a. A typical classroom remote from mechanical equipment rooms.

   b. A typical classroom adjacent to mechanical equipment room.

   c. Typical offices.

   d. Special assembly rooms such as auditoriums, music rooms, libraries.

3. When a typical space (a, b, or c above) has been tested and passed, all such spaces shall be considered complying. Conversely, if a typical space fails, all such spaces shall be considered as failed and require testing.

4. Unless test results indicate failure to comply with the intention of these Specifications, sound testing shall be done only once, preferably during cooling season.

5. Sound levels at maximum rates shall be listed on the TAB report on a point measured basis as required above.

C. Equipment

1. The test and balance agency shall submit, as part of its report, complete identification and operating data on the following:

   a. Air handling units.

   b. New and existing air devices (grilles, registers, diffusers).

D. Certification

1. The test and balance report to the Project Architect/Engineer and to the Owner shall be signed, "sealed" and certified by a certified balancing agent in the State of Florida whose specialty discipline is HVAC, together with a signed statement that this balancer's specialty is HVAC.

***** END OF SECTION *****

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1—General Requirements.

1.02 INTENT

A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use."

B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.

1.03 SURVEYS AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work. All material take-offs for the site shall be field measured prior to bids.

1.04 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Architect.

B. If directed by the Architect or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. At the time of each shop drawing submission, the Contractor shall call the Engineer's attention (in writing) to, and plainly mark on shop drawings, any deviations from the Contract Documents.

D. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, location, section and article number of specifications governing, Contractor's name, and name of job. All equipment shall be labeled to match labeling on contract documents.

E. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.

F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

G. All shop drawings shall be submitted to the A/E by Contractor no later than 30 days from the day of contract award.

H. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

I. Submit all Division 16 submittals at one (1) time in one (1) integral group. Piece-by-piece submission of individual items will not be acceptable. Engineer may check contents of each submittal set upon initial delivery; if not complete as set forth herein, submittal sets may be returned to Contractor without review and approval and will not be accepted until made complete.

J. At the close of the job, prior to final review, five (5) bound copies of the following shall be submitted by transmittal letter to the Engineer for review and acceptance.

1. Equipment warranties

2. Contractor's warranty

3. Parts list and manuals for all equipment

4. Operating Instructions (in writing)

5. Written instructions on maintenance and care of the system

1.05 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

B. NFPA 101—Life Safety Code.

1.06 SUBMITTALS

A. Submit under provisions of Division 1.

B. Proposed Products List: Include Products specified in the following Sections, but not limited to:

1. Section 16141.....Wiring Devices.

2. Section 16160.....Cabinets and Enclosures.

3. Section 16425.....Switchboards.

4. Section 16440.....Disconnect Switches.

5. Section 16461.....Dry Type Transformers.

6. Section 16470.....Panelboards.

7. Section 16480.....Motor Control.

8. Section 16485.....Contactors.

9. Section 16510.....Luminaires.

10. Section 16720.....Fire Alarm and Smoke Detection Systems.

11. Section 16781.....Television Distribution System.

C. It shall be understood that review of shop drawings by the Engineer does not supersede the requirement to provide a complete and functioning system in compliance with the Contract Documents.

1.07 SUBSTITUTIONS

A. Materials and equipment are specified herein by a single or by multiple Manufacturers to indicate quality and performance required. The drawings are based upon equipment scheduled on drawings and specified. If another Manufacturer is considered for substitution during the bidding process, the Electrical Contractor shall be responsible for coordinating all electrical, mechanical, structural, or architectural changes. Comparable equipment Manufacturers which are listed as equals shall be considered as substitutes. Manufacturers other than the basis of design shall submit a catalog information and 1/4" scale plan and section drawings showing proper fit and all clearances for maintenance items.

B. Substitutions of other Manufacturer's will be considered for use if, in the Engineers opinion, the item requested for substitution is equal to that specified. The Contractor shall provide to the Engineer a typed comparative list of the basis of design and the proposed substitute.

Request for approval of substitutions or equals prior to bid must be made in writing. The approval of any substitutions or equals prior to bid shall not be construed as a shop drawing approval. The substitute or equal must be submitted as described in the specifications and meet all the requirements of the specifications and drawings.

C. All requests for substitutions shall be submitted as described in paragraph 1.07, B., and specifically indicate any and all differences or omissions between the product specified as basis of design and the product proposed for substitution.

D. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or electrical, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted to the Architect/Engineer for approval.

E. Where such approved deviation requires quantity and arrangement of equipment from that specified or indicated on the drawings, any other additional equipment required by the system, at no additional cost to the Owner.

1.08 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the General Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. When work installed under this Division will be in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer/Architect, prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'0", clearly showing how work is to be installed in relation to the work of other trades. If the work is installed before coordinating with other trades, or so as to cause any interference with work of other trades, make all the necessary changes in work to correct the condition without extra charge.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.09 PROTECTION

A. Protect all work and material provided under this Division from damage. All damaged equipment work or material provided under this Division shall be replaced with new. Rebuilts are not acceptable.

B. Protect all work and equipment until inspected, tested, and accepted. Protect work against theft, injury, or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

1.10 SCAFFOLDING, RIGGING, AND HOISTING

A. Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.11 REMOVAL OF RUBBISH

A. This Contractor shall at all times keep premises free from accumulations of waste materials or rubbish caused by his employees or work. At completion of work he shall remove all his tools, scaffolding, materials, and rubbish from the building and site. He shall leave the premises and his work in a clean, orderly, and acceptable condition.

1.12 SAFETY

A. This Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.333), Title 29—Labor, Chapter XIII, Bureau of Standards, Department of Labor, Part 1518—Safety and Health Regulations for Construction; and that his housekeeping and equipment be maintained in such a manner that they comply with the Florida Industrial Commission Safety Code and Regulations of the Federal Williams—Steiger Occupational Safety and Health Act of 1970 (OSHA), wherein it states that the Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

1.13 SUPERVISION

A. This Contractor shall provide a competent, experienced, full time superintendent who is acceptable to the Architect/Engineer and Owner, and who is authorized to make decisions on behalf of the Contractor.

1.14 MATERIAL AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished. Refer to substitutions in this Section.

B. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Architect and Engineer in accordance with the recommendations of the Manufacturer. This includes the performance of such tests as the Manufacturer recommends.

1.15 QUIET OPERATION AND VIBRATION

A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer and the Owner. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer and the Owner shall be corrected in an approved manner at no additional expense to the Owner.

1.16 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all equipment furnished under this Division, and shall submit drawings to the Architect and Engineer for approval before purchase, fabrication or construction of same.

B. For all floor mounted equipment, provide concrete pads which extend six inches (6") beyond equipment base in all directions with top edge chamfered. Inset six inches (6") steel dowel rods into floors to anchor pads. Shop drawings of all foundations and pads shall be submitted to the Architect and Engineer for approval before same are constructed.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be the same materials and same quality of finish as the adjacent and surrounding flooring material.

D. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect and the Engineer, not strong enough shall be replaced as directed.

1.17 ACCESS DOORS FOR WALLS AND CEILINGS

A. Provide flush panel access doors with a 16 gauge steel frame and a 14 gauge steel door panel.

B. Finish is to be primed painted steel.

C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.

D. Provide access doors with a locked flush mounted vandal proof spanner head operated steel cams.

E. Provide 1-1/2 hour "B" label door for rated chase walls.

F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.

G. Provide a minimum 2'-0" by 2'-0" access doors unless shown or noted otherwise on the drawings.

H. Access doors for chase walls shall be mounted 16" off the finish floor.

I. Access doors for electrical equipment shall be a minimum of 12" larger than equipment all around.

1.18 REGULATORY REQUIREMENTS

A. Conform to applicable Codes and Standards as follows:

1. Standard:

a. Certain standard materials and installation requirements are described by reference to standard specifications. These standards are as follows:

NEMA .....National Electrical Manufacturers Association.

UL.....Underwriters Laboratories.

ANSI.....American National Standards Institute.

For additional standards and requirements see other sections of the specifications.

Whenever a reference is made to a standard, installation and materials shall comply with the latest published edition at the time project is bid unless otherwise specified herein.

2. Codes and Rules:

a. All material furnished and all work installed shall comply with the following codes as they apply to this project:

- NFPA 70 and NFPA 101.
- Regulations of the Florida Industrial Commission Concerning Safety.
- Applicable County, State, and Local Building Codes.
- Local and State Fire Marshal Rules and Regulations.
- Chapter 4A-47, Florida Administrative Code - Uniform Fire Safety Standards for Elevators.

- Occupational Safety and Health Agency Standards (OSHA).
- Florida State Board of Health Rules and Regulations.
- Florida Building Code.

Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

3. Permits, Fees and Inspections

   a. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all necessary approvals of all governmental departments having jurisdiction.

   b. Obtain all required certificates of inspection for his work and deliver to the Owner/Engineer the same certificates before request for acceptance and final payment for the work.

   c. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.

   d. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.19 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

D. The scope of the work included under this Division of the Specifications shall include complete electrical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipment, machinery, factory trained personnel, and any and all other items necessary to complete the electrical systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.

1.20 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Division 1.

1.21 LICENSE

A. The Subcontracting Firm for the electrical and systems installation shall be licensed by the State of Florida and the local authorities, regularly engaged in the installation of electrical systems and other related equipment. The Subcontracting Firm shall be familiar with all local conditions including interpretations, codes and shall have at least 5 years of successful installation experience on similar projects of the same magnitude and scope.

The Subcontracting Firm shall list at least three projects it has successfully completed over the last five years for proof of experience of this caliber. This list shall be included with submittals for review by Architect/Engineer. The Subcontracting Firm shall hold a Florida State Certified Electrical Contractor license for this project. The Subcontracting firm for the fire alarm system shall be a certified "EF" installer.

1.22 AS-BUILT DRAWINGS

A. The Contractor shall provide AutoCAD as-built drawings and copies of each AutoCAD file on CD before final payment will be issued.

***** END OF SECTION *****

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SECTION 16111

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal Conduit.

B. Flexible Metal Conduit.

C. Liquidtight Flexible Metal Conduit.

D. Electrical Metallic Tubing.

E. Nonmetal Conduit.

F. Fittings and Conduit Bodies.

1.02 RELATED SECTIONS

A. Section 16130 ..... Boxes.

B. Section 16170 ..... Grounding and Bonding.

C. Section 16190 ..... Supporting Devices.

D. Section 16195 ..... Electrical Identification.

1.03 REFERENCES

A. ANSI C80.1—Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3—Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1—Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70—National Electrical Code.

E. NECA "Standard of Installation."

F. NEMA TC 2—Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3—PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 1-1/4 inches.

B. Accurately record actual routing of all underground conduits.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Division 1.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch homeruns, only with a maximum of 3-phase conductors, one (1) neutral (or more for computer/clean power and lighting circuits), and one (1) equipment ground.

B. Underground Installations:

1. More than Five Feet from Foundation Wall: Use thickwall nonmetallic conduit, Schedule 40 PVC.

2. Within Five Feet from Foundation Wall: Use thickwall nonmetallic conduit, Schedule 40 PVC.

3. In or Under Slab on Grade: Use Schedule 40 PVC.

4. Minimum Size: ¾" (PVC).

5. Install rigid steel, long radius elbows for conduits larger than 1". Paint under slab conduit or poured-in concrete with a coat of Bitumastic, continuously and up through penetration of concrete slabs.

C. Outdoor Locations, Above Grade, Concealed: Use rigid aluminum and liquidtight flexible metal conduit.

D. Wet and Damp Locations: Use rigid steel and liquidtight flexible metal conduit.

E. Dry Locations:

1. Concealed: Use rigid steel, intermediate metal conduit, and electrical metallic tubing.

2. Exposed: Use rigid steel below eight feet and electrical metallic tubing above eight feet.

2.02 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings.

2.03 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel set screw type.

2.06 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls. Exposed conduits shall only be run in mechanical and electrical rooms.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. All conduit run in public areas, classrooms, offices, restrooms, hallways, etc., shall be concealed. Saw cut walls and floor slabs. Make arrangements with General Contractor to patch all areas with no additional cost to Owner.

M. Do not cross conduits in slab.

N. Provide nominal 4" cast-in-place concrete curbs at floor mounted electrical distribution panel conduit connections for conduits stubbed-up from below slab.

O. Maintain minimum six inch (6") clearance between conduit and piping.

P. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

Q. Cut conduit square using saw or pipecutter; de-burr cut ends.

R. Bring conduit to shoulder of fittings; fasten securely.

S. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

T. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

U. Install no more than equivalent of four 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender or factory elbows for bends in metal conduit larger than 2 inch size.

V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

W. Provide fittings designed to accommodate expansion and deflection where conduit crosses, control, and expansion joints.

X. Provide No. 12 AWG insulated conductor or suitable pull string in each empty conduit except sleeves and nipples.

Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Ground and bond conduit under provisions of Section 16170.

AA. Identify conduit under provisions of Section 16195.

AB. Install rigid steel long radius elbows, size 1-¼" and larger, in below grade and first floor slab conduit runs.

AC. Exterior conduit stub-ups shall be rigid galvanized coated with Bitumastic 1-¼" and larger. Concrete encase with a minimum 3" coverage from beginning of 90 degree elbow stub up to 3" above grade.

AD. Maintain Manufacturer's recommended minimum bending radius on flexible conduit.

AE. Flexible metal conduit shall not be over six feet (6') long. Motors three feet (3') long.

AF. Flexible metal conduit shall be used for a flexible connection only, not raceways.

AG. Liquid tight flexible conduit shall be used in wet location and mechanical room for flexible connections only.

AH. Install insulated bushing on all conduits.

AI. Install grounded metal insulated bushing with lug on all mains, sub-feeders, switchboards, panelboards, transformers, chillers, disconnects, and equipment rated at 100 amps and above.

AJ. Install and seal boxes and conduit in acoustical treated walls and ceilings per architectural acoustics specifications.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified under Division 7.

***** END OF SECTION *****

SECTION 16120

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Wire and Cable.

B. Remote Control and Signal Cable.

C. Power Limited Fire Protective Signaling Cable.

D. Wiring Connectors and Connections.

1.02 RELATED SECTIONS

A. Section 16111 ..... Conduit.

B. Section 16130 ..... Boxes.

C. Section 16195 ..... Identification.

1.03 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

B. NEMA WC5—Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.

1.04 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.05 COORDINATION

A. Coordinate work under provisions of Division 1.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.01 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper, #12 minimum, stranded.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THHN/THWN, XHHW material rated 90 degrees C.

2.02 CLASS 1 REMOTE CONTROL AND SIGNAL CABLE

A. Description: ANSI/NFPA 70, Type TFFN, THHN.

B. Conductor: Copper, stranded.

C. Insulation Voltage Rating: 600 volts.

2.03 CLASS 2 OR 3 REMOTE CONTROL AND SIGNAL CABLE

A. Description: NEMA/ICEA WC5, thermoplastic insulated cable, individual insulated conductors twisted together, metallic shielded and covered with PVC jacket when installed in metal raceway.

B. Conductor: Copper, stranded.

C. Insulation Voltage Rating: 300 volts.

2.04 CLASS 1 AND NON POWER—LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, type TFFN, THHN installed in metal raceway.

B. Conductor: Copper, stranded.

C. Insulation Voltage Rating: 600 volts.

2.05 POWER LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, type TFFN, THHN installed in metal raceway.

B. Conductor: Copper, stranded.

C. Insulation Voltage Rating: 600 volts.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire and cable (all types) in raceway.

B. Exposed Dry Interior Locations: For feeders, branch circuits, and class 1 remote control circuits, use only building wire in raceway. For class 2 or 3 control cable and power limited fire protective signaling cables run in raceway.

C. Above Accessible Ceilings: For feeders, branch circuits and class 1 remote control cables use only building wire in raceway. For class 2 or 3 remote control cables run exposed. For power limited fire protective signaling cables run in raceway.

D. Wet or Damp Interior Locations: For feeders, branch circuits and class 1 remote control cables use only building wire in raceway. For class 2 or 3 remote control cable and power limited fire protective signaling cables run in raceway.

E. Exterior Locations: For feeders, branch circuits and class 1 remote control cables use only building wire run in raceway. For class 2 or 3 remote control cables and fire protective signaling cables run in raceway.

F. Underground Installations: For feeders, branch circuits and class 1 remote control cables use only building wire run in raceway. For class 2 or 3 remote control cables and for power limited fire protective signaling cables run in raceway.

G. Use wiring methods indicated on Drawings.

3.04 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Each computer/clean power receptacle and lighting circuits shall have a dedicated neutral conductor.

C. Use stranded conductor for feeders and branch circuits 12 AWG and larger.

D. Use stranded conductors for control circuits and for feeder and branch circuits No. 12 and larger.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 14 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

I. All conductors size #6 and smaller shall be color coded insulation. Equipment grounding conductors #6 and smaller to have green or bare exterior finish per NEC 250-119(A). Grounded conductors (neutral) #6 and smaller to have a white or grey exterior finish per NEC 200-6. Conductors size #4 and larger shall be color code by use of colored plastic tape applied within 6" of each conductor end. All color coding shall be with the same color being used with its respective phase or bus through the entire job as follows:

208/120 VOLTS	277/480 VOLTS
Phase A.....Black	Phase A.....Brown
Phase B.....Red	Phase B.....Orange
Phase C.....Blue	Phase C.....Yellow
Neutral.....White	Neutral.....Gray
Ground.....Green	Ground.....Green

J. Grounding conductors shall be identified with a continuous outer finish that is either green, or green with one or more yellow stripe.

K. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

L. Protect exposed cable from damage.

M. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

N. Use suitable cable fittings and connectors.

O. Neatly train and lace wiring inside boxes, equipment, and panelboards.

P. Clean conductor surfaces before installing lugs and connectors.

Q. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

R. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

S. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

T. Terminate spare conductors with electrical tape.

U. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

V. Splice only in accessible junction boxes.

3.05 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 1.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

E. Verify continuity of each control circuit conductor.

F. Verify proper phasing of conductors.

***** END OF SECTION *****

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SECTION 16130

BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and Ceiling Outlet Boxes.

B. Floor Boxes.

C. Pull and Junction Boxes.

D. In-ground Cast Concrete Boxes.

1.02 RELATED SECTIONS

A. Section 16010 ..... Basic Electrical Requirements.

B. Section 16141 ..... Wiring Devices.

C. Section 16160 ..... Cabinets and Enclosures.

D. Section 16180 ..... Wiring Systems.

E. Section 16195 ..... Electrical Identification.

1.03 REFERENCES

A. ANSI/NEMA OS 1—Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

B. ANSI/NFPA 70—National Electrical Code.

C. NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum).

1.04 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes and outlets to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, cast feralloy deep type. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 FLOOR BOXES

A. Floor Boxes: ANSI/NEMA OS 1, fully adjustable.

B. Material: Cast metal with brass cover plate.

C. Shape: Round or Rectangular.

D. Conform to regulatory requirements for concrete-tight floor boxes.

E. Hubbell: B-2436, B-4233, and B-4333 Series.

F. Walker: 880CS1, 880CS2, and 880CS3.

G. Replace trims, covers, and device with new in existing floor boxes.

2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.

1. Material: Cast aluminum.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. In-Ground Cast Concrete Box: NEMA 250, Type 6, inside flanged, recessed cover box for flush mounting:

1. Material: Cast concrete or polymer concrete reinforced.

2. Cover: Nonskid cover with stainless steel cover screws capable of light vehicular traffic.

3. Cover Legend: Electric, telephone, fire alarm, CATV, etc.

4. Cut conduit openings using tools and methods recommended by the manufacturer.

5. In-ground pull boxes shall have solid bottoms with weep holes as manufactured by Quazite 'PG' series or approved equal.

6. Substitutions: Under provisions of Division 1.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 12 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

O. Use gang box where more than one device is mounted together. Do not use sectional box. Provide barriers to separate different voltage systems.

P. Use gang box with plaster ring for single device outlets.

Q. Use cast outlet box in exterior locations exposed to the weather and wet locations.

R. Set floor boxes level.

S. Large Pull Boxes: Boxes larger than 100 cubic inches (1 600 cubic centimeters) in volume or 12 inches (300 mm) in any dimension.

1. Interior Dry Locations: Use hinged enclosure under provisions of Section 16160.

2. Other Locations: Use surface-mounted cast metal box.

T. Identify boxes under provision or Section 16195.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations and sizes of required access doors with General Contractor and other trades.

B. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

C. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

D. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.03 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closure in unused box opening.

***** END OF SECTION *****

SECTION 16141

WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall Switches.

B. Wall Dimmers.

C. Receptacles.

D. Device Plates and Decorative Box Covers.

E. Floor Box Service Fittings.

F. Time Switch.

G. Occupancy Sensors.

1.02 RELATED SECTIONS

A. Section 16130 ..... Boxes.

B. Section 16510 ..... Luminaires.

1.03 REFERENCES

A. NEMA WD 1—General Purpose Wiring Devices.

B. NEMA WD 5—Specific Purpose Wiring Devices.

C. NEMA WD 6—Wiring Device Configurations.

D. Federal Specification—FS-W-C-596 Series—General Specifications.

E. Federal Specification—FS-W-S-896 Series—Toggle Switches.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Manufacturers:

1. Slater.

2. Hubbell.

3. G.E.

4. Leviton.

5. Pass & Seymour.

6. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, heavy-duty AC only general-use snap switch.

C. Device Body: White plastic with toggle handle.

D. Indicator Light: Separate pilot strap; red color lens.

E. Locator Light: Lighted handle type switch; red color handle.

F. Voltage Rating: 120-277 volts, AC.

G. Current Rating: 20 amperes.

H. Motor Rating: Motor rated for fractional horsepower.

I. Motors 1/2 HP and Smaller: Provide switch with thermal overloads to match motor nameplate rating, if motor does not have built-in overload protection.

2.02 WALL DIMMERS

A. Manufacturers:

1. Lutron.

2. Leviton.

3. G.E.

4. Pass & Seymour.

5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, Type I semiconductor dimmer for rated for use with the lamp-type specified on drawings.

C. Device Body: White plastic with push-button, rotary knob.

D. Voltage: 120 volts.

E. Power Rating: Match load shown on Drawings; 1000 Watts minimum.

2.03 RECEPTACLES

A. Manufacturers:

1. Slater.

2. Hubbell.

3. G.E.

4. Leviton.

5. Pass & Seymour.

6. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1; heavy-duty general-use receptacle, 20 amp.

C. Device Body: White plastic for general use receptacles. Gray plastic for clean/data communications receptacles. Red plastic for emergency power receptacles (refer to plans for locations).

D. Configuration: NEMA WD 6; type as specified and indicated.

E. Convenience Receptacle: NEMA Type 5-20.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

G. Childproof Receptacles: Shall be hospital grade with integral thermoplastic safety shutter to prevent access of foreign objects to the electrical contacts of the receptacle.

2.04 WALL PLATES

A. Decorative Cover Plate: White Lexan.

1. Slater.
2. Hubbell.
3. G.E.
4. Leviton.
5. Pass & Seymour.
6. Substitutions: Under provisions of Division 1.

B. Recessed Weatherproof Cover: U.V. Resistant polycarbonate recessed cover and outlet box. Gasketed with while-in-use device cover and recessed sleeve. Shall be in compliance with NEC 2005.

1. Intermatic.
2. Substitutions: Under provisions of Division 1.

2.05 FLOOR MOUNTED SERVICE FITTINGS

A. Flush Cover Convenience Receptacle:

1. Walker.
2. Hubbell.
3. Slater.
4. Steel City.
5. Substitutions: Under provisions of Division 1.
6. Material: Brass
7. Configuration: Duplex flap opening.

B. Flush Cover Combination Fitting:

1. Walker.
2. Hubbell.
3. Slater.
4. Steel City.
5. Substitutions: Under provisions of Division 1.
6. Material: Brass.

7. Configuration: Duplex flap opening.

C. Carpet or Tile Trim Ring: Brass.

1. Walker.

2. Hubbell.

3. Slater.

4. Steel City

5. Substitutions: Under provisions of Division 1.

2.06 TIME SWITCHES

A. Manufacturers

1. Intermatic.

2. Paragon.

3. Tork.

B. Furnish and install where shown time switches of the twenty-four hour or seven day type, powered by a self-starting synchronous motor, capable of being set for different on-off times each day of the week, to an operating accuracy of plus or minus 15 minutes of the desired time and with day omitting device.

C. Time switch contacts shall be capable of switching 40 amperes per pole continuously at rated voltage as indicated and shall have pole and switching arrangement as indicated on the drawings.

D. Removable on-off trippers shall make possible multiple on-off periods. Separate manual on and off levers shall enable operation by hand without disturbing automatic settings.

E. Enclosure shall be NEMA 1 for indoor flush use and NEMA 3R for outdoor use. NEMA 1 enclosure shall have combination 1/2" - 3/4" knock-outs on bottom and both sides. Provision shall be made for positive padlocking and/or sealing.

F. Terminals shall be capable of receiving up to #8 AWG wire.

2.07 OCCUPANCY SENSORS

A. Manufacturers

1. Leviton.

2. Novitas.

3. Lutron.

4. Hubbel.

B. Provide a lighting control design using the occupancy sensor types indicated below in the application suitable for the given lighting area to be controlled. Refer to the Electrical Lighting Drawings for the areas and lighting circuits to be controlled. Submit shop drawings indicating the layout and sensor type applicable to the area of coverage and size/type room to be controlled.

C. Dual Technology Sensor (Ceiling and Wall Type)

1. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

2. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.

3. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.

4. Ceiling mounted sensors shall have a flat, unobtrusive appearance and provide 360° coverage.

5. To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

6. Provide complete with power pack as required for operation and compatibility with lighting system.

7. Sensors shall have a time delay that is adjusted automatically or shall have a fixed time delay of 5 to 30 minutes, set by DIP switch.

8. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

9. The sensors shall feature terminal style wiring, which makes installation easier.

10. Sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

11. Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.

12. Sensors shall have standard 5 year warranty and shall be UL listed.

D. Wall Switch Sensor

1. These sensors are only permitted in rooms that are less than 200 square feet and each space shall be evaluated by the Engineer during submittal review for appropriate coverage.

2. The passive infrared sensor shall be a completely self contained control system that replaces a standard toggle switch. Switching mechanism shall be a latching air gap relay, compatible with electronic ballasts, compact fluorescent, and inductive loads. Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.

3. Sensor shall be capable of detecting presence in the control area by detecting changes in infrared energy. Small movements shall be detected, such as when a person is writing while seated at a desk.

4. Sensor shall have a time delay that is adjusted automatically or shall have a fixed time delay of 5, 10, 15, 20 or 30 minutes, walk-through mode, or test mode, set by DIP switch. In walk-through mode, lights shall turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

5. Sensor shall have the choice of light flash alert and/or audible alert of impending light shut off, selectable with DIP switch.

6. Sensor shall have sensitivity adjustment that is set to either automatic or reduced sensitivity, and is set with DIP switch.

7. Sensor shall have a built-in light level feature selectable with DIP switch. During set up of light level control, sensor shall learn desired hold-off level, requiring only one step.

8. Sensor shall have automatic-ON or manual-ON operation adjustable with DIP switch.

9. Sensor shall operate at universal voltages of 120, 230, or 277 VAC; 50/60 Hz.

10. Sensor shall have no minimum load requirement and shall be capable of switching 0 to 800 watts fluorescent/incandescent or 1/6 hp @ 120VAC, 50/60 Hz; 0 to 1200 watts fluorescent or 1/6 hp @ 230/277VAC, 50/60 Hz.

11. Sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options.

12. Sensor shall utilize a temperature compensated, dual element sensor, and a multi-element Fresnel lens.

13. For vandal resistance, Fresnel lens shall be made of hard, 1.0mm Poly IR 2 material that offers greater sensitivity to motion and superior detection performance. Lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

14. To assure detection at desktop level uniformly across the space, sensor shall have a 2 level, 28 segment, multi-element Fresnel lens system.

15. Sensor shall cover up to 300 sq ft for walking motion, with a field of view of 180 degrees.

16. Adjustments and mounting hardware shall be concealed under a removable, tamper resistant cover to prevent tampering of adjustments and hardware.

17. For safety, sensor shall have a 100% off switch with no leakage current to the load.

18. Sensor shall not protrude more than 3/8" from the wall and shall blend in aesthetically.

19. Sensor shall have standard 5 year warranty and shall be UL listed.

E. Spare Sensors and Parts

1. Provide ten (10) percent spare of each sensor type, power pack and device installed in the facility or five of each type, whichever is greater.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions under provisions of Division 1.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify floor boxes are adjusted properly.

E. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on top.

G. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

L. Assemble all devices and equipment shipped loose with furniture furnished by others as a part of this project. Provide all necessary wiring, plugs, conduit, etc., required to complete this work.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above backsplash of counter and coordinate with Architectural drawings.

E. Install dimmer 48 inches above finished floor.

F. Install telephones and computer outlet boxes eighteen inches (18") above finished floor.

G. Install telephone and computer outlet boxes six inches (6") above backsplash of counter.

H. Install wall switch occupancy sensors, and ceiling and wall dual technology occupancy sensors at the location indicated on the shop drawings as provided by the occupancy sensor manufacturer's performance design.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensors to eliminate nuisance outage of room lighting during occupancy periods. Adjust all control functions and time relays as coordinated with the owner at the time of substantial completion of the project. Provide a minimum of four (4) hours of on-site training to the owner and building staff within two weeks of the occupancy of the facility. During the training session include addition fine tuning and adjustments to the occupancy sensors as requested by the owner.

***** END OF SECTION *****

SECTION 16160

CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hinged Cover Enclosures.

B. Cabinets.

C. Terminal Blocks and Accessories.

1.02 REFERENCES

A. NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA ICS 1—Industrial Control and Systems.

C. ANSI/NEMA ICS 4—Terminal Blocks for Industrial Control Equipment and Systems.

D. ANSI/NEMA ICS 6—Enclosures for Industrial Control Equipment and Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1 steel.

B. Finish: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gage steel, white enamel finish.

2.02 CABINETS

A. Cabinet Boxes: Galvanized steel with removable endwalls, 24 inches wide, 24 inches high, 6 inches deep minimum. Provide 3/4 inch thick plywood backboard painted matte white, for mounting terminal blocks.

B. Cabinet Fronts: Steel, surface type with screw cover front, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.03 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

D. Copper Ground Bar Strip with #6 Copper Grounding: Electrode conductor to building steel.

2.04 MANUFACTURERS

A. Burndy #RK Series.

B. Buss.

C. Belden.

2.05 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide conduit hubs on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

***** END OF SECTION *****

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SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding Electrodes and Conductors.

B. Equipment Grounding Conductors.

C. Bonding.

1.02 RELATED SECTIONS

A. Section 16670 ..... Lightning Protection System.

1.03 REFERENCES

A. ANSI/NFPA 70—National Electrical Code.

1.04 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe.

B. Metal frame of the building.

C. Concrete-encased electrode.

D. Rod electrode.

1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 10 ohms.

1.06 SUBMITTALS

A. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of grounding electrodes.

1.08 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 20 feet.

2.02 MECHANICAL CONNECTORS

A. Material: Bronze.

2.03 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.

D. Provide bonding to meet Regulatory Requirements.

E. Bond together metal siding not attached to grounded structure; bond to ground.

F. Bond together each metallic raceway, pipe, and other metal objects.

G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Interface with systems installed under Sections 16450 and 16610.

3.04 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method. Submit test results to Engineer for review and approval.

***** END OF SECTION *****

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SECTION 16180

WIRING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Electrical connections to equipment specified under other Sections.

1.02 RELATED WORK

A. Section 15170 ..... Motors.

B. Section 16111 ..... Conduit.

C. Section 16120 ..... Building Wire and Cable.

D. Section 16130 ..... Boxes.

1.03 REFERENCES

A. FS W-C-596—Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. NEMA WD 1—General Purpose Wiring Devices.

C. NEMA WD 5—Specific-Purpose Wiring Devices.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—CORDS AND CAPS

A. Hubbell.

B. Slater.

C. G.E.

D. Leviton.

E. Pass & Seymour.

F. Substitutions: Under provisions of Division 1.

2.02 CORDS AND CAPS

A. Straight-blade Attachment Plug: FS W-C-596.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make flexible conduit connections to all equipment subject to vibration. Use liquidtight flexible conduit connections for all equipment located in damp or wet locations and in all pump rooms.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

G. Coolers and Freezers: Cut and seal conduit openings in Freezer and cooler walls, floor, and ceilings.

***** END OF SECTION *****

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SECTION 16190

SUPPORTING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Conduit and Equipment Supports.

B. Fastening Hardware.

1.02 COORDINATION

A. Coordinate size, shape and location of concrete pads.

1.03 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.01 MATERIAL/FINISH

A. General Locations: Steel equipment hangers, miscellaneous steel supports, hardware, bolts, washers, nuts, screws, etc., not specified to be plated or coated shall be hot dipped galvanized with a minimum of 1.50 oz/ft. on all sides and all field cuts shall be zinc coated.

B. Located In or Around Cooling Tower Yards: Pipe hangers, equipment supports, miscellaneous structure components, hardware, bolts, washers, nuts, screws, etc., shall be non-metallic polyester resin, vinyl ester resin, fiberglass, glass reinforced polyurethane, or 316 stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps, or spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. In wet locations install free-standing electrical equipment on concrete pads.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Safety of Overhead Materials, Fixtures, and Equipment:

1. Each troffer or surface mounted fixture (even if integral with the ceiling system) shall be independently secured by a secondary and supplementary system of one (1) separate wire from each of four (4) corners of the fixture to the building's structural framing above.

2. Each pendant mounted fluorescent light fixture shall be independently secured by a secondary and supplementary system of two (2) wires from the canopy and support system of each pendant leg of such fixtures to the building's structural framing above.

3. Each incandescent (or other fixture) shall be independently secured by a secondary and supplementary system of one (1) wire from the fixture can or canopy and support system of each such fixture to the building's structural framing above.

4. Other similar equipment (ceiling speakers, etc.) shall be similarly secured with an independent secondary and supplementary support system.

5. Connection to structure, fixtures, equipment:

   a. Wire shall penetrate the cans or canopies of light fixtures and equipment or otherwise connect to such in a fool-proof and positive manner. Wire shall loop through structural framing members above. Wire shall be turned back onto itself and be given two (2) minimum full twists with at least one inch (1") tail remaining beyond the twist. Wire kinked or evidencing failure at twists or elsewhere shall be replaced. Wire shall be installed in a taut fashion (not slack).

   b. Wire rope and cable shall penetrate or pass through a portion of the fixture or equipment in a manner adequate to sustain the force developed by the fixture or equipment should it drop or fail. Wire rope and cable shall be either turned back into itself or continue into a complete loop until it lays beside-itself. Wire rope and cable shall be secured to itself with a minimum of two (2) each swagings or clips fully tightened. A minimum of one inch (1") tails shall protrude after tightening of the clamping device.

   c. Chain shall pass through a portion of the fixture or equipment in manner adequate to sustain the force should the fixture or equipment drop or fail, or should the primary support system fail or fall. Chain shall be secured to the fixture or equipment and to the building's structural framing by means of special links, shackles or fittings.

   d. Wire, chain, wire rope, and cable shall be installed as nearly vertical as possible and in no event at an angle of more than 45 degrees from the vertical.

6. Materials

   a. Chain, General Specifications: Equivalent to Campbell Chain Company's specified system of steel, electrically welded standard finish (do not galvanize or electroplate), in continuous lengths. Comply with Manufacturer's recommendations.

   b. Drop Forged Chain Fittings (eye bolts, pad eyes, inks, chain shackles, snaps, anchor shackles, swivels, turn buckles): Of the same materials and finish as the chain and of the same or greater working load limits, of the same manufacturer or as may be specifically recommended by the chain manufacturer.

   c. General Specifications for Wire: 8-gauge galvanized annealed steel wire (multiple strands of lesser gauge will not be considered acceptable). Each wire shall, itself, be looped through the building structural framing above and not to other wiring systems. The angle of the wires shall be kept as vertical as possible and not over 45 degrees from the vertical.

d. Cable for Exposed-to-Public-View-Applications: Where suspended chandeliers, light fixtures, or special equipment occurs, stainless steel flexible aircraft cable or stainless steel flexible marine cable, 302/304, as manufactured by Paulsen, or equal, or Sailbryte as manufactured by Macwhyte corrosion resistant stainless steel or better, right regular lay, in continuous lengths, shall be used. Comply with manufacturer's recommendations.

e. Forged and other stainless steel fittings for stainless steel aircraft or marine cable (turnbuckles, swagings, Nicro-Press sleeves, wire rope clips, use only in concealed positions), connecting links shoulder rivets, jaw fittings, eye fittings, lifting eyes, thimbles, swivels, eye nuts, heavy thimbles, clevis nuts, eye pads, shoulder pins); of same material, of same or greater working loads limits as the cable, of the same manufacturer or as recommended by the cable manufacturer, of type 304/316 electro-polished finish, drop forged, non-magnetic (when available for particular fitting). Manufactured by Merrill or equal. See Workmanship paragraph below.

f. Stainless steel cable for loads (per cable) not exceeding 100 lbs.: 3/32" 7x19 with tensile load limit of 920 lbs. minimum.

g. Stainless steel cable for loads (per cable) not exceeding 500 lbs.: 3/16" 7x19 with tensile load limit of 3,700 lbs. minimum.

h. Workmanship: Stainless steel cable is required to be used only in areas where such is exposed to "public view" therefore only fittings designed for cold swaging or Nicro-Press fittings or swagless terminals such as Macwhyte Norseman Terminals are to be used whereby no wire ends, nuts, pins, or cotter keys, or clips are visible. Swaging shall be done only with a rotary swager (not a roll swager.) Manufacturer's recommendations and specifications shall be adhered to. Pertinent portions of the booklet Wire Rope Facts published by Banks Wire Rope and Sling, Inc. (available in Tampa) and Construction Care and Maintenance of Marine Rigging by Macwhyte Wire Rope Company (available at the Lazzerette Company) which may pertain also to stainless steel cable, shall be adhered to.

***** END OF SECTION *****

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Nameplates and Tape Labels.

B. Wire and Cable Markers.

C. Receptacle Labels.

C. Conduit System Junction Box and Pull Box Color Coding.

1.02 SUBMITTALS

A. Include schedule for nameplates and tape labels.

PART 2 PRODUCTS

2.01 MATERIALS

A. Equipment Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

C. Receptacle Labels: Laminated tape with adhesive backing, black letters on white background.

PART 3 EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Laminated tape will only be permitted for receptacle labeling.

3.02 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

3.03 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.

C. Individual Circuit Breakers, Switches, and Motor Starters In Panelboards,: 1/8 inch; identify circuit and load served, including location.

D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.

E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.

3.04 CONDUIT SYSTEM, JUNCTION BOX, AND PULLBOX COLOR CODING SCHEDULE

A. Coordinate color of paint with Section 09900, Painting, to identifying conduit system junction boxes and pull boxes as scheduled below.

B. Emergency Distribution System: Red.

D. 208 Volt, Single and Three Phase System: Black.

E. Fire Alarm System: Red.

F. Motor and Other Control Systems: Purple.

G. Telephone System: Yellow.

H. Television System: Brown.

I. Security System: White.

3.05 RECEPTACLE IDENTIFICATION

A. Provide label on each receptacle wall plate, identifying . Identify with panelboard and branch circuit number.

***** END OF SECTION *****

SECTION 16401

ABOVE GROUND STORAGE TANK EQUIPMENT (DIESEL)

PART 1 GENERAL

1.00 INTENT

A. It is the Intent that this Section of the specifications shall be a criteria basis for a turnkey fuel oil Above Ground Storage Tank Equipment.

B. Provide the following system functions:

1. Storage tank to be connected to:

a. Fuel connection for generator supply and return and required accessories.

b. Diesel fueling station remote pump mounted on side of storage tank.

c. Veeder Root tank level monitoring device (provided by Electrical Contractor).

2. Coordinate piping path from the storage tank to the supply and return fuel connection for generator (piping provided by Division 15).

3. Provide and install all equipment, controls, fittings, wiring and accessories for a complete fuel storage system to support connection to generator.

4. Coordinate piping path from storage tank to fueling station (piping provided by Division 15).

C. Wherein specific equipment manufacturers or products are listed in this Section, it is for reference and to establish functional performance standards only. Other equipment, manufacturers and products may be used provided the Engineer concurs the minimum functional criteria listed below are met.

D. Functional Criteria:

1. All devices shall be removable for maintenance, replacement and repair.

1.01 WORK SECTION INCLUDES

A. Types of fuel storage equipment required include, but are not limited to:

1. Double wall above ground fuel storage tank and accessories.

2. Electrical work.

3. Fuel dispensers.

1.02 RELATED WORK

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

B. Although such work is not specifically shown or specified all appurtenances and devices incidental to or necessary for a sound, secure, safe and complete installation shall be furnished and installed as a part of this work.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with the current provisions of all codes Federal, State, County and City related to work being accomplished and following codes, specifications and standards except where more stringent requirements are shown or specified.

1. Underwriters Laboratories (UL) codes.

2. National Fire Protection Agency (NFPA) codes.

3. National Electric (NEC) codes.

4. Environmental Protection Agency (EPA) codes.

5. Department of Environmental Regulation (DER) codes.

6. OSHA codes and guidelines.

7. Manufacturer's installation and operational guidelines.

B. Current National Fire Protection Agency, "Standard for the Installation of Oil Burning Equipment", NFPA 31 (ANSI Z95.1) and the "Flammable and Combustible Liquids Code, NFPA 30, FDER 17-761.

C. Current Petroleum Equipment Institute, "Recommended Practices for Installation of Underground Liquid Storage Systems", PEI/RP100.

D. Installer Qualifications: A Specialty Contractor with minimum of 6 years experience in performing installation and servicing of above ground fuel tanks.

E. Requirements of Regulatory Agency: All work shall conform to the applicable requirement of the Federal, State, County and City codes and NFPA 30. The monitoring system shall conform to the requirements of Florida Statute 376-303, Chapter 17-761, Stationary Tanks. All components shall be UL listed. If in any part of the plans and specifications conflict with the above codes, it shall be the responsibility of the Contractor to notify the Architect-Engineer before contract has been negotiated, it shall be the responsibility of the Contractor to conform with the above codes at no additional expense to the Owner and shall advise the Architect-Engineer before making any changes.

1.04 SUBMITTALS

A. General: All submittals shall follow guidelines as specified in Section 15010, Basic Mechanical Requirements, and Section 16010, Basic Electrical Requirements.

B. Product Data: Prior to placing any work, submit manufacturer's product data, specifications, installation and maintenance instructions and wiring diagrams for each type of equipment required to the Architect-Engineer. Submittals shall be in accordance with Section 16010 and shall include:

1. Equipment
2. Electrical wiring
3. Electrical devices
4. Electrical specialties
5. All items listed herein

Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manuals: Provide complete parts, operating, and maintenance manual covering equipment at time of installation including, but not limited to:

1. Description of system and components.
2. Schematic diagrams of electrical, hydraulic, and mechanical systems.
3. Manufacturer's printed operating instructions.
4. Printed listing of periodic preventative maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

5. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

6. Assemble and provide copies of manual 8 1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by photocopy method. Provide copies per provisions of Division I - General Requirements.

D. Shop Drawings: Provide and submit shop drawings and details for electrical wiring and equipment installation as required for this project.

E. Certificates: Dated certificates of inspection and system approval by all local, city, county, state, and federal governing authorities shall be delivered in triplicate to the Architect-Engineer prior to final acceptance of the work. The Contractor shall obtain written certification from all manufacturers that installer is approved by manufacturer for installation of specific system.

F. The Specialty Contractor shall provide primary products including tools and accessories necessary to perform the special work and/or approved by a single manufacturer.

G. The manufacturer determines the distributors or supplies of this product and directly or indirectly has responsibility for selecting the method of transport and of storage, therefore, the manufacturer must be considered fully responsible for materials until such are delivered into the hands and control of the Contractor or Subcontractors.

H. Templates: The Contractor shall provide and submit templates for anchor bolts and other items set in concrete.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Division 1, General Requirements, and products/handling/delivery/storage shall conform to the minimum recommendations of the manufacturers of the products herein specified.

1.06 ERRORS AND OMISSIONS

A. If, due to an error or omission in the scope of work, a particular item is not specifically included but is necessary to provide the Owner with a fully functional fueling facility, then that item is considered to be included in the scope of work just as if it had been listed in detail herein.

1.07 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1, General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturer's listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment items by Mark Number shall be provided in accordance with Division 1, General Requirements.

PART 2 PRODUCTS

2.01 RECTANGULAR ABOVE GROUND FUEL STORAGE TANK

A. General: The Contractor shall furnish and install diesel, above ground, UL labeled, dual wall storage tank as shown on the drawings. Configuration of tank shall comply with available concrete pad footprint.

Tank shall be supplied with the following integral features:

1. Tank shall be fabricated per UL-142 of mild carbon steel with shell seams of continuous lap weld construction.

2. Tank shall be of double wall construction and provide complete secondary containment of the primary storage tank’s contents by an impervious steel outer wall.

3. A minimum of 3” porous, lightweight monolithic thermal insulation material shall be installed at the factory within the interstitial space between the inner and outer wall. Thermal insulation material:

   a. Shall be in accordance with ASTM Standards C-332 & C-495

   b. Shall allow liquid to migrate through it to the monitoring point

   c. Shall not be exposed to weathering and shall be protected by the steel secondary containment outer wall

4. Lifting lugs shall be provided at balancing points to facilitate handling and installation.

5. Exterior Protective Coating:

    a. Surface Preparation: grit blast – SSPC-SP-6 White Blast

    b. Finish: White finish paint system 5-7 DFT on the shell and heads

6. Threaded fittings with thread protectors shall be supplied as follows (al fittings must be located on tank top per UL):

    a. One (1) 2" – Interstitial Monitoring

    b. One (1) 2" – Normal Vent, Primary Tank

    c. One (1) 4" – Emergency Vent, Primary Tank

    d. One (1) 4" – Emergency Vent, Secondary Tank

    e. One (1) 4" – Product Fill

    f. One (1) 2" – Product Pump or Supply

    g. One (1) 2" – Liquid Level Gauge

7. Accessories:

    a. UL listed Spill/Overfill Container – 5-15 gallon (minimum)

    b. Pump Mount(s) for Top Mount or for Free Standing Pumps and Dispensers on Standard or Split Tanks.

    c. "Spill-Mate" for remote fill

    d. Working platform and access ladder

    e. Standard diesel package

8. No steel or insulating material shall come in contact with the concrete or other corrosive material.

9. All openings shall be from the top only.

10. All exposed metal must be powder coated to inhibit corrosion.

11. The UL listed spill containment shall include a normally closed valve to release spilled product into the primary steel tank. Spill containments that route spilled product into the interstitial area will not be approved.

12. The protected and insulated AST systems shall have two (2) lugs for connecting grounding conductors for lightning protection in accordance with NFPA780.

13. Pre-engineered steel supports (solid channel or I-beam supports).

14. Suction pipe and sump for dewatering the secondary containment.

15. Tank manway cover (bolted) and manhole 22" diameter minimum.

B. Contractor shall submit five (5) copies of shop drawings for each tank showing locations of all fittings, accessories and critical dimensions. Also submit five (5) copies of current manufacturer's literature and complete current installation instructions.

C. Products: Tanks shall be manufactured by Fireguard, Modern Welding Company of Florida or approved equal.

D. Certification Plate: UL labels for petroleum products shall be affixed to each tank.

E. The Contractor shall provide and assist Owner with the completion of all forms which may be required for the installation or removal of the tanks.

F. Tank Testing:

1. Upon receipt of the tanks, the Contractor shall test the tanks using 5 psi air pressure and shall soap all seams and bung holes to assure tightness.

G. Tank Warranty: Tanks shall be warranted as follows:

1. Will be free from material defects in materials and workmanship for a period of one (1) year following date of building Substantial Completion.

2. Will not fail for a period of thirty (30) years from date of Substantial Completion due to external corrosion; and

3. Will not fail for a period of thirty (30) years from date of Substantial Completion due to internal corrosion provided tank is used solely with or without tank water bottoms for the following procedures:

a. Petroleum products including gasoline, jet fuel, av-gas, motor oil (new or used), kerosene, diesel fuel, or used for fuel oil at temperatures not to exceed 150 F.

4. Will not leak for a period of thirty (30) years from date of Substantial Completion due to structural failure, which shall be defined as breaking or collapse.

H. Design Loading Conditions

All tanks shall meet the following design criteria:

1. Primary Tank: Tank to withstand internal air pressure of 5 psi without leakage and to include a 5:1 safety factor. The manufacturer shall test every tank at 9.0 inches mercury vacuum to assure structural integrity.

2. Secondary Tank: Tank to withstand internal air pressure of 5 psi without leakage and to include a 5:1 safety factor.

3. Accessory Equipment Loads: Tank shall withstand loads imposed by drop tubes, submersible pump, piping, and related tank mounted items without damage.

I. Product Storage: All primary tanks must be vented. Tanks are designed for operation at atmospheric pressure only, except for use with vapor recovery system at a pressure or vacuum of approximately 1 psi. Tanks shall be capable of storing liquids with a maximum specific gravity of 1.1 and a maintained temperature of 150 F maximum at tank interior surface. Tanks shall be chemically inert to petroleum products.

J. Tank Dimensions and Capacity

1. Capacity: Refer to drawings. Nominal capacity of the tank.

2. Dimensions (L x W x H): Refer to drawings. Dimensions and device access shall allow for removal of devices in the area provided.

2.02 OVERFILL PROTECTION DEVICE

A. Specialty Contractor to furnish and install fill device with overfill protection device with cap.

Supply 4" fill riser pipe.

2.03 FILL LINE AND VENT LINE OVERSPILL PROTECTION DEVICE

A. Specialty Contractor to furnish and install an above ground remote trunk unloading connection and spill container.

B. Locate outside with closing/locking cover. Provide check valve, ball valve, and dry break quick connect.

2.04 DIESEL TANK VENT CAP

A. Specialty Contractor to furnish and install, UL listed and NFPA Code 30, vent cap on each diesel tank vapor vent line.

2.05 TANK LEVEL MODULE

A. The module shall have three standard alarm indications:

1. High Fuel—activates at 100% of normal fuel level.

2. Low Fuel—activates at 25% of normal fuel level.

3. Leak Detection—activates when fuel is detected in the interstice tank via float switch.

2.06 ANTI-SIPHONING VALVES

A. Contractor to furnish and install UL listed anti-siphoning valves at each fuel dispensing unit location capable of shutting off flow of fuel in event of fire or severe impact.

2.07 REMOTE FUEL DISPENSER SYSTEM

A. Contractor to furnish and install one UL listed, pump and meter fueling station as manufactured by Great Plains Industries, or approved equal. Dispenser shall be lockable. Mount dispenser approximately 4.5 to 5 feet above finished slab elevation. Mount dispenser on side of tank that is adjacent to the driveway or fueling area.

1. Remote Dispenser: Provide GPI MR-530 Remote Dispenser with non-computer with automatic reset. Non-computer, mechanical meter with four wheel, four digit transaction display. Meter shall indicate gallons and tenths. Fuel Dispenser shall be 115V.

   Totals per Transaction: Up to 999.9 gallons.

   Totalizer: Up to 999,999.9 gallons.

2. Hose: UL Listed 3/4" diameter, 20' long , Buna-N, statically grounded hose manufactured by Great Plains Industries, or approved equal.

3. Pump: Provide UL Listed remote pump M-3120-RDP manufactured by GPI, or equal. Pump shall be capable of supplying 20 gpm and shall be 115V.

4. Fuel Dispensing Nozzle: Provide heavy duty, shock proof, automatic, self-closing diesel fuel dispensing nozzle capable of supplying 20 gpm. The nozzle shall be manufactured by GPI, or approved equal.

4. Electrical Interface:

   a. Contractor to furnish and install rigid conduit, power wiring, junction boxes, panels and seal-offs as required for proper unit operation.

b. Contractor to furnish and install all control wiring, secure seal-offs and terminate dispensers per manufacturer's specifications.

8. Accessories:

a. Provide pulse out device for interface with Fuel Master System.

b. Provide shelf kit for mounting pump on the front of the aboveground tank.

c. Provide fuel dispensing filter.

d. Provide hose hanger with retractor capable of handling 25 feet of hose.

2.08 ELECTRICAL

A. General: Contractor shall provide electrical work related to storage tanks, pumps, fuel dispensing units, monitoring systems and other fuel storage or dispensing systems as work of this section.

B. Master Emergency Disconnect Switches: Contractor to furnish and install master emergency disconnect.

C. Contractor to terminate the connection of the emergency disconnect switches to pump contactor and to all fuel dispenser switches so that activation of either emergency switch will interrupt all power to pumps and fuel dispensers at one time.

D. Contractor to terminate connection of the pump contactor between master emergency disconnect switches and pump.

PART 3 EXECUTION

3.01 TANK PREPARATION

A. Discrepancies: Do not proceed with work, until all unsatisfactory conditions affecting scheduled work have been corrected to the satisfaction of the Electrical and Specialty Contractor and manufacturer of tanks.

3.02 TANK INSTALLATION

A. General: Tanks shall be tested and installed in full accordance with current installation instructions published by tank manufacturer. (These instructions must accompany tanks.)

B. Handling of tanks shall be in full compliance with manufacturer's methods and procedures.

C. Anchoring: Follow submitted design by a Florida Registered Structural Engineer.

D. Furnish and install one 4" diameter coaxial fill connections with OPW—overfill prevention valves.

E. Furnish and install venting and product lines as shown on drawings.

3.03 PREPARATION AND INSTALLATION OF PIPING

A. All Contractors shall follow current manufacturer's installation practices.

B. Vent Piping: Specialty Contractor shall install vertical vent piping. Install proper vent caps.

C. Electrical Contractor to install all rigid conduit, power wiring, wiring devices, controls panels, switches, emergency switches, disconnects, seal-offs, and other electrical items as required for a complete, operational system. All electrical services to the tanks shall be Class I, Division I, explosion proof.

D. Control Wiring: Specialty Contractor to furnish and install all control wiring, secure seal-offs and terminate all control panels, sensors and probes.

3.04 TANK LEAK DETECTION DEVICE TEST

A. Prior to final acceptance, the Specialty Contractor shall perform a leak detector test to ensure the proper functioning of the leak detector.

1. The leak detection performance of the monitoring system shall be tested and verified by a qualified independent consultant to detect leaks as small as 0.5 gallons per hour with a 95% probability of detection and less than a 5% probability of a false alarm.

2. Specialty Contractor shall have a precision hydrostatic test, PetroTite or equivalent testing as permitted by the local Health Department, performed on tanks and piping at the completion of the installation.

3.05 MISCELLANEOUS EQUIPMENT INSTALLATION/CLEAN-UP/TRAINING

A. Contractor shall install reinforced concrete apron of size, thickness, and reinforcing shown or required. Slope away from storage tank manholes and access boxes for drainage. Finish to smooth finish.

B. Testing: As work progress, perform testing of components and systems to verify compliance. Perform tests in presence of Owner and Architect/Engineer. Perform tests on subsurface and concealed items prior to backfilling and cover-up.

C. Contractor shall perform operational tests on entire fuel dispensing system when work is completed and at time of Substantial Completion.

D. Instructions to Owner's Personnel: Contractor shall instruct Owner's personnel in the proper operation and maintenance of fuel dispensing equipment.

E. Operational and Maintenance Manuals: Contractor shall provide properly bound and labeled fuel dispensing equipment operation and maintenance manuals. Comply with Division 1 requirements.

F. Clean-Up and Adjust: Contractor shall remove all debris, sweep broom clean, and wipe clean to remove dirt, oil, and grease. Adjust all equipment for proper operation.

***** END OF SECTION *****

SECTION 16402

ABOVE GROUND STORAGE TANK EQUIPMENT

(UNLEADED)

PART 1 GENERAL

1.01 GENERAL

A. Provide and install a 300 gallon UL-2085 Fireguard® Thermally Insulated, FG Double-Wall Steel Aboveground Storage Tank. Tank storage volume shall be 300 gallons. Tank shall be 3’ 2” in diameter x 5’ 0” long. Approximate weight shall be 1,874 (lb.).

B. The tank shall be designed for aboveground storage of flammable and combustible liquids at atmospheric pressure. Tank shall include integral steel secondary containment and thermal insulation that provides a minimum two-hour fire rating.

C. Each tank shall be delivered as a complete UL-listed assembly with two factory supplied, welded-on saddles. Size and location of saddles shall be as required by Highland Tank. Saddles to be set level on a solid foundation.

D. Tank shall be designed for possible relocation at a future date. Concrete encased tank designs are not equal and are required to be approved prior to bid by the Engineer.

E. Tank shall comply with the latest edition of National Fire Protection Association NFPA 30 Flammable and Combustible Liquids Code. The tank’s secondary containment must be tested for tightness in the factory and in the field before commissioning. Tank shall be supplied with emergency vents for the primary and the secondary containment tanks. Emergency venting by "form of construction" is not equal and will NOT be permitted.

F. Inner and Outer Tank shall be manufactured in accordance with UL-142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids. Entire tank shall be labeled for Underwriters Laboratories UL 2085 Standard for Insulated Secondary Containment Aboveground Tank for Flammable Liquids. The tank design shall comply with UL 2085 "Protected" Tank standard and shall be tested for Ballistics, Impact, Hose Stream, and Pool Fire UL-2085 performance standards.

G. Tank shall be manufactured and labeled in strict accordance with Steel Tank Institute (STI) Fireguard® Thermally Insulated, Double Wall Steel Aboveground Storage Tank standards as applied by a licensee of the STI. Tank shall be subject to the STI’s Quality Assurance program and shall be backed by the STI 30 year limited warranty.

1.02 WORK SECTION INCLUDES

A. Types of fuel storage equipment required include, but are not limited to:

1. Double wall steel above ground fuel storage tank and accessories.

2. Electrical work.

3. Fuel pumps.

4. Fuel dispensers.

1.03 RELATED WORK

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

B. Although such work is not specifically shown or specified all appurtenances and devices incidental to or necessary for a sound, secure, safe and complete installation shall be furnished and installed as a part of this work.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with the current provisions of all codes Federal, State, County and City related to work being accomplished and following codes, specifications and standards except where more stringent requirements are shown or specified.

1. Underwriters Laboratories (UL) codes.

2. National Fire Protection Agency (NFPA) codes.

3. National Electric (NEC) codes.

4. Environmental Protection Agency (EPA) codes.

5. Department of Environmental Regulation (DER) codes.

6. OSHA codes and guidelines.

7. Manufacturer's installation and operational guidelines.

B. Installer Qualifications: A Specialty Contractor with minimum of 6 years experience in performing installation and servicing of above ground fuel tanks.

C. Requirements of Regulatory Agency: All work shall conform to the applicable requirement of the Federal, State, County and City codes and NFPA 30. The monitoring system shall conform to the requirements of Florida Statute 376-303, Chapter 17-761, Stationary Tanks. All components shall be UL listed. If in any part of the plans and specifications conflict with the above codes, it shall be the responsibility of the Contractor to notify the Architect-Engineer before contract has been negotiated, it shall be the responsibility of the Contractor to conform with the above codes at no additional expense to the Owner and shall advise the Architect-Engineer before making any changes.

1.05 SUBMITTALS

A. General: All submittals shall follow guidelines as specified in Section 15010, Basic Mechanical Requirements, and Section 16010, Basic Electrical Requirements.

B. Product Data: Prior to placing any work, submit manufacturer's product data, specifications, installation and maintenance instructions and wiring diagrams for each type of equipment required to the Architect-Engineer. Submittals shall be in accordance with Section 16010 and shall include:

1. Equipment
2. Electrical wiring
3. Electrical devices
4. Electrical specialties
5. All items listed herein

Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manuals: Provide complete parts, operating, and maintenance manual covering equipment at time of installation including, but not limited to:

1. Description of system and components.
2. Schematic diagrams of electrical, hydraulic, and mechanical systems.
3. Manufacturer's printed operating instructions.
4. Printed listing of periodic preventative maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

5. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

6. Assemble and provide copies of manual 8 1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by photocopy method. Provide copies per provisions of Division I - General Requirements.

D. Shop Drawings: Provide and submit shop drawings and details for electrical wiring and equipment installation as required for this project.

E. Certificates: Dated certificates of inspection and system approval by all local, city, county, state, and federal governing authorities shall be delivered in triplicate to the Architect-Engineer prior to final acceptance of the work. The Contractor shall obtain written certification from all manufacturers that installer is approved by manufacturer for installation of specific system.

F. The Specialty Contractor shall provide primary products including tools and accessories necessary to perform the special work and/or approved by a single manufacturer.

G. The manufacturer determines the distributors or supplies of this product and directly or indirectly has responsibility for selecting the method of transport and of storage, therefore, the manufacturer must be considered fully responsible for materials until such are delivered into the hands and control of the Contractor or Subcontractors.

H. Templates: The Contractor shall provide and submit templates for anchor bolts and other items set in concrete.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 1, General Requirements, and products/handling/delivery/storage shall conform to the minimum recommendations of the manufacturers of the products herein specified.

1.07 ERRORS AND OMISSIONS

A. If, due to an error or omission in the scope of work, a particular item is not specifically included but is necessary to provide the Owner with a fully functional fueling facility, then that item is considered to be included in the scope of work just as if it had been listed in detail herein.

1.08 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1, General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturer's listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment items by Mark Number shall be provided in accordance with Division 1, General Requirements.

PART 2 PRODUCTS

2.01 CYLINDRICAL ABOVE GROUND FUEL STORAGE TANK

A. Construction

1. Tank shall be fabricated per UL-142 of mild carbon steel with shell seams of continuous lap weld construction.

2. Tank shall be of double wall construction and provide complete secondary containment of the primary storage tank's contents by an impervious steel outer wall.

3. A minimum of 3" of porous, lightweight monolithic thermal insulation material shall be installed at the factory within the interstitial space between the inner and outer wall. Thermal insulating material:

   a. Shall be in accordance with American Society of Testing Materials (ASTM) Standards C-332 and C-495.

   b. Shall allow liquid to migrate through it to the monitoring point.

   c. Shall not be exposed to weathering and shall be protected by the steel secondary containment outer wall.

4. Lifting lugs shall be provided at balancing points to facilitate handling and installation.

5. Exterior Protective Coating:

   a. Surface Preparation: Grit blast - SSPC-SP-6 White Blast.

   b. Finish: White finish paint system 5-7 DFT on the shell and heads.

6. Threaded fittings with thread protectors shall be supplied as follows (all fittings must be located on tank top per UL):

   a. One (1) 2" - Interstitial Monitoring.

   b. One (1) 2" - Normal Vent, Primary Tank.

   c. One (1) 4" - Emergency Vent, Primary Tank.

d. One (1) 4" - Emergency Vent, Secondary Tank.

e. One (1) 4" - Product Fill.

f. One (1) 2" - Product Pump or Supply.

g. One (1) 2" - Liquid Level Gauge.

7. Accessories:

a. UL listed Spill/Overfill Container – 5-15 gallon (minimum)

b. Pump Mount(s) for Top Mount, Side Mount, or for Free Standing Pumps and Dispensers on Standard or Split Tanks.

c. "Spill-mate" for remote fill.

d. External Ladder.

e. Standard Gasoline Package

8. No steel or insulating material shall come in contact with the concrete or other corrosive material.

9. All openings shall be from the top only.

10. All exposed metal must be powder coated to inhibit corrosion.

11. The UL listed spill containment shall include a normally closed valve to release spilled product into the primary steel tank. Spill containments that route spilled product into the interstitial area will not be approved.

12. The protected and insulated AST systems shall have two (2) lugs for connecting grounding conductors for lightning protection in accordance with NFPA780.

13. Pre-engineered steel supports (solid channel or I-beam supports).

14. Suction pipe and sump for dewatering the secondary containment.

15. Tank manway cover (bolted) and manhole 22" diameter minimum.

B. Contractor shall submit five (5) copies of shop drawings for each tank showing locations of all fittings, accessories and critical dimensions. Also submit five (5) copies of current manufacturer's literature and complete current installation instructions.

C. Products: Tanks shall be manufactured by Fireguard, Modern Welding Company of Florida or approved equal.

D. Certification Plate: UL labels for petroleum products shall be affixed to each tank.

E. The Contractor shall provide and assist Owner with the completion of all forms which may be required for the installation or removal of the tanks.

F. Tank Testing:

1. Upon receipt of the tanks, the Contractor shall test the tanks using 5 psi air pressure and shall soap all seams and bung holes to assure tightness.

2.02 FUEL DISPENSER SYSTEM

A. Contractor to furnish and install one UL listed fueling station as manufactured by Fill-rite, or approved equal, model FR610C. System shall be suitable for outdoor applications. Dispenser shall be lockable. Mount dispenser on side of tank that is adjacent to the driveway or fueling area.

B. System shall include

1. UL Listed 3/4" diameter, 10' long (minimum), Buna-N statically grounded hose

2. Manual farm-style nozzle capable of supplying 15 GPM of unleaded fuel

3. UL Listed 115 V motor.

C. Electrical Interface:

1. Contractor to furnish and install rigid conduit, power wiring, junction boxes, panels and seal-offs as required for proper unit operation.

2. Contractor to furnish and install all control wiring, secure seal-offs and terminate dispensers per manufacturer's specifications.

D. Accessories:

a. Provide rigid fuel piping for all exposed connections. Refer to Fuel Piping specifications.

b. Provide wall mount bracket for mounting system on the front of the aboveground tank.

c. Provide fuel dispensing filter package.

2.03 ELECTRICAL

A. General: Contractor shall provide electrical work related to storage tanks, pumps, fuel dispensing units, monitoring systems and other fuel storage or dispensing systems as work of this section.

B. Master Emergency Disconnect Switches: Contractor to furnish and install master emergency disconnect.

C. Contractor to terminate the connection of the emergency disconnect switches to pump contactor and to all fuel dispenser switches so that activation of either emergency switch will interrupt all power to pumps and fuel dispensers at one time.

D. Contractor to terminate connection of the pump contactor between master emergency disconnect switches and pump.

PART 3 EXECUTION

3.01 TANK PREPARATION

A. Discrepancies: Do not proceed with work, until all unsatisfactory conditions affecting scheduled work have been corrected to the satisfaction of the Electrical and Specialty Contractor and manufacturer of tanks.

3.02 TANK INSTALLATION

A. General: Tanks shall be tested and installed in full accordance with current installation instructions published by tank manufacturer. (These instructions must accompany tanks.)

B. Handling of tanks shall be in full compliance with manufacturer's methods and procedures.

C. Anchoring: Follow submitted design by a Florida Registered Structural Engineer.

D. Furnish and install three 4" diameter coaxial fill connections with OPW—overfill prevention valves.

E. Furnish and install venting and product lines as shown on drawings.

3.03 PREPARATION AND INSTALLATION OF PIPING

A. All Contractors shall follow current manufacturer's installation practices.

B. Vent Piping: Specialty Contractor shall install vertical vent piping. Install proper vent caps.

C. Electrical Contractor to install all rigid conduit, power wiring, wiring devices, controls panels, switches, emergency switches, disconnects, seal-offs, and other electrical items as required for a complete, operational system. All electrical services to the tanks shall be Class I, Division I, explosion proof.

D. Control Wiring: Specialty Contractor to furnish and install all control wiring, secure seal-offs and terminate all control panels, sensors and probes.

3.04 TANK LEAK DETECTION DEVICE TEST

A. Prior to final acceptance, the Specialty Contractor shall perform a leak detector test to ensure the proper functioning of the leak detector.

1. The leak detection performance of the monitoring system shall be tested and verified by a qualified independent consultant to detect leaks as small as 0.5 gallons per hour with a 95% probability of detection and less than a 5% probability of a false alarm.

2. Specialty Contractor shall have a precision hydrostatic test, PetroTite or equivalent testing as permitted by the local Health Department, performed on tanks and piping at the completion of the installation.

3.05 MISCELLANEOUS EQUIPMENT INSTALLATION/CLEAN-UP/TRAINING

A. Contractor shall install reinforced concrete apron of size, thickness, and reinforcing shown or required. Slope away from storage tank manholes and access boxes for drainage. Finish to smooth finish.

B. Testing: As work progress, perform testing of components and systems to verify compliance. Perform tests in presence of Owner and Architect/Engineer. Perform tests on subsurface and concealed items prior to backfilling and cover-up.

C. Contractor shall perform operational tests on entire fuel dispensing system when work is completed and at time of Substantial Completion.

D. Instructions to Owner's Personnel: Contractor shall instruct Owner's personnel in the proper operation and maintenance of fuel dispensing equipment.

E. Operational and Maintenance Manuals: Contractor shall provide properly bound and labeled fuel dispensing equipment operation and maintenance manuals. Comply with Division 1 requirements.

F. Clean-Up and Adjust: Contractor shall remove all debris, sweep broom clean, and wipe clean to remove dirt, oil, and grease. Adjust all equipment for proper operation.

***** END OF SECTION *****

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SECTION 16420

SERVICE ENTRANCE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

B. Underground Service Entrance.

1.02 SYSTEM DESCRIPTION

A. System Voltage: 208 volts, three phase, four-wire, 60 Hertz.

1.03 QUALITY ASSURANCE

A. Utility Company: Tampa Electric Co.

B. Install service entrance in accordance with Utility Company's rules and regulations.

PART 2 EXECUTION

2.01 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project and to maintain existing electrical service.

B. Underground: Install service entrance conduits and feeders from the transformer location to building service entrance equipment. Install primary conduits and coordinate routing.

C. Make arrangements with the Utility Company for extending and relocating primary feeder and transformer. The Electrical Contractor shall pay all costs incurred. Coordinate these requirements prior to bidding.

D. If pad mounted transformer is shown on the drawings, furnish and install concrete pad in a suitable size in accordance with Utility Company's requirements.

***** END OF SECTION *****

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SECTION 16425

SWITCHBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Main Switchboards.

1.02 RELATED WORK

A. Section 16420 ..... Service Entrance.

1.03 REFERENCES

A. ANSI C12—Code for Electricity Metering.

B. ANSI C39.1—Requirements for Electrical Analog Indicating Instruments.

C. ANSI C57.13—Requirements for Instrument Transformers.

D. FS W-C-375—Circuit Breakers, Molded Case, Branch Circuit and Service.

E. NEMA AB 1—Molded Case Circuit Breakers.

F. NEMA KS 1—Enclosed Switches.

G. NEMA PB 2—Dead Front Distribution Switchboards.

H. NEMA PB 2.1—Instructions for Safe Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; switchboard instrument details; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under provisions of Division 1.

B. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.

C. Store and protect products under provisions of Division 1.

D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

E. Handle in accordance with NEMA PB2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 SPARE PARTS

A. Keys: Furnish 5 each to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D.

B. General Electric.

C. Siemens.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.02 SWITCHBOARD CONSTRUCTION AND RATINGS

A. Factory-assembled, dead front, metal-enclosed, and self-supporting switchboard assembly conforming to NEMA PB2, and complete from incoming line terminals to load-side terminations.

B. Switchboard electrical ratings and configurations as shown on Drawings.

C. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials used.

D. Main Section Devices: Individually mounted.

E. Distribution Section Devices: Panel mounted.

F. Auxiliary Section Devices: Individually mounted and compartmented.

G. Bus Material: Copper, sized in accordance with NEMA PB 2.

H. Bus Connections: Bolted, accessible from front for maintenance.

I. Bus spacing based on air insulation.

J. Provide a one x 1/4 inch copper ground bus through the length of the switchboard.

K. Enclosure shall be NEMA PB 2 Type 1—General Purpose. Sections shall align at rear only.

L. Switchboard Height: NEMA PB2, excluding floor sills, lifting members and pull boxes.

M. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

N. Pull Section: Same construction as switchboard, size as required per NEC and switchboard manufacturer.

O. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Continuous current rating as indicated on Drawings.

P. Switchboard shall be UL listed and labeled for service entrance equipment.

2.03 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

B. Minimum Integrated Short Circuit Rating: 50,000 amperes rms symmetrical for 480 volt switchboards/panelboards, or as shown on Drawings. These ratings may be lowered by short circuit calculations performed by manufacturer stating actual A.I.C. ratings throughout entire system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Furnish and install 4" housekeeping pad for switchboards.

3.02 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

D. Physically test key interlock systems to insure proper function.

E. Switchboards and service entrances shall be inspected and certified by the Engineer's Representative prior to the Owner ordering energization by the utility company.

F. All service entrance conductors shall be meggar tested prior to terminating either end of conductors, to certify that the conductor insulation integrity has not been damaged from handling and/or installation. Contractor shall meggar test the insulation resistance of each conductor phase to phase and phase to neutral for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms. Provide written report of certification testing to Engineer, replace any damaged conductors as necessary prior to terminations.

3.03 ADJUSTING AND CLEANING

A. Adjust all operating mechanisms for free mechanical movement.

B. Touch up scratched or marred surfaces to match original finish.

C. Adjust trip and time delay settings to values as instructed by the Architect/Engineer.

***** END OF SECTION *****

SECTION 16440

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Disconnect Switches.

B. Fuses.

C. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C—High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E—Class R Fuses.

C. FS W-F-870—Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865—Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1—Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—DISCONNECT SWITCHES

A. Square D.

B. Siemens.

C. Cutler Hammer.

D. Substitutions: Under provisions of Division 1.

2.02 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Type HD, FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F- 870.

B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; as indicated on drawings.

2.03 ACCEPTABLE MANUFACTURERS—FUSES

A. Bussmann.

B. Gould-Schawmut.

C. Littelfuse Tracor.

D. Substitutions: Under provisions of Division 1.

2.04 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class J for feeders and transformer loads and class RK 5 for motor loads. Dual element, current limiting, time delay, one-time fuse, 250 or 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

C. Provide three (3) spare fuses for each different size and class of fuse being provided. Store in fuse cabinet (provided by Electrical Contractor) located by Architect/Engineer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

C. Disconnect switch enclosures shall be NEMA Type 3R for exterior applications unless otherwise noted on the drawings, except for installations in or around Cooling Tower Yards, in which the enclosure shall be NEMA Type 4X, stainless steel, unless otherwise noted on the drawings.

***** END OF SECTION *****

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SECTION 16461

DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Dry Type Two Winding Transformers.

1.02 REFERENCES

A. ANSI/NEMA ST 1—Specialty Transformers.

B. ANSI/NEMA ST 20—Dry Type Transformers for General Applications.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store and protect products under provisions of Division 1.

B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—DRY TYPE, TWO WINDING TRANSFORMERS

A. Square D.

B. General Electric.

C. I.T.E.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.02 DRY TYPE, TWO WINDING TRANSFORMERS

A. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings.

B. Insulation system and average winding temperature rise for rated KVA as follows:

RATING	CLASS	RISE (DEGREE C)
1-500	200	115

C. Case temperature shall not exceed 35 degrees C rise above ambient at its warmest point.

D. Winding Taps, Transformers Less than 15 KVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

E. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.

F. Sound Levels: ANSI/NEMA ST 20.

G. Sound Levels: Maximum sound levels are as follows:

KVA RATING	SOUND LEVEL
0-9	40 db
10-50	45 db
51-150	50 db
151-300	55 db

H. Basic Impulse Level: 10 KV for transformers less than 300 KVA, 30 KV for transformers 300 KVA and larger.

I. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

J. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

K. Coil Conductors: Continuous windings with terminations brazed or welded.

L. Enclosure: ANSI/NEMA ST 20; Type 1 or Type 3R as indicated on drawings. Provide lifting eyes or brackets.

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplate: Include transformer connection data, and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Set transformer plumb and level on 4" concrete housekeeping pad.

B. Use flexible conduit, 2 foot minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

3.02 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

***** END OF SECTION *****

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SECTION 16470

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Distribution Panelboards.

B. Lighting and Appliance Branch Circuit Panelboards.

1.02 REFERENCES

A. FS W-C-375—Circuit Breakers, Molded Case, Branch Circuit and Service.

B. FS W-P-115—Power Distribution Panel.

C. NEMA PB 1—Panelboards.

D. NEMA PB 1.1—Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 1.2—Application Guide for Ground-fault Protective Devices for Equipment.

1.03 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Division 1.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

1.04 SPARE PARTS

A. Keys: Furnish 5 each to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—PANELBOARDS

A. Square D.

B. General Electric.

C. I.T.E.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.02 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; bolted circuit breaker type.

B. Provide cabinet front with concealed trim clamps, and hinged door with flush lock. Finish in manufacturer's standard gray enamel.

C. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

D. Minimum Integrated Short Circuit Rating: As shown on drawings.

E. Molded Case Circuit Breakers: FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1 FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1; bolted circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3 R as shown on drawings.

C. Cabinet Size: 6 inches deep.

D. Provide flush or surface cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

F. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as shown on Drawings. These ratings may be lowered by short circuit calculations performed by manufacturer stating actual A.I.C. ratings throughout entire system.

G. Molded Case Circuit Breakers: FS W-C-375; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

H. Current Limiting Molded Case Circuit Breakers: FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

2.04 EXISTING BRANCH CIRCUIT PANELBOARDS

A. Distribution, Lighting, and Appliance Branch Circuit Panelboards: NEMA PB1; bolted circuit breaker type or plug-in circuit breaker type to match existing.

B. Minimum Integrated Short Circuit Rating: Match existing rms symmetrical amperes in existing panels.

C. Molded Case Circuit Breakers: FS W-C-375; bolt-on or plug-in type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb [and flush with wall finishes], in conformance with NEMA PB 1.1.

B. Height: 6 feet 6 inches.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard, new or existing. Revise directory to reflect circuiting changes required to balance phase loads. Trace out all circuits in existing panelboards to indicate an accurate directory per new space changes and room numbers.

E. Stub 5 empty one inch conduits to accessible location above ceiling out of each recessed panelboard.

F At a minimum, Contractor shall meggar test all feeder conductors larger than 300 kcm. Meggar testing shall be completed prior to terminating either end of the conductors, to certify that the conductor insulation integrity has not been damaged from handling and/or installation. Contractor shall meggar test the insulation resistance of each phase to phase, phase to neutral and phase to ground conductor for one minute each. Test voltage shall be 1000 volts, and minimum acceptable value for insulation resistance is 2 megohms. Provide written report of certification testing to Engineer, replace any damaged conductors as necessary prior to terminations.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

***** END OF SECTION *****

SECTION 16480

MOTOR CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Manual Motor Starters.

B. Magnetic Motor Starters.

C. Combination Magnetic Motor Starters.

D. Motor Control Centers.

1.02 RELATED WORK

A. Section 16190 ..... Supporting Devices.

1.03 REFERENCES

A. ANSI/NEMA ICS 6—Enclosures for Industrial Controls and Systems.

B. ANSI/UL 198E—Class R Fuses.

C. FS W-F-870—Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865—Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA ICS 2—Industrial Control Devices, Controllers, and Assemblies.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions. Include conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

C. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

D. Submit manufacturers' instructions under provisions of Division 1.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.07 SPARE PARTS

A. Keys: Furnish 5 each to Owner.

B. Fuses: Furnish to Owner 2 spare fuses of each type and rating installed.

C. Fuse Pullers: Furnish one fuse puller to Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS—MOTOR STARTERS

A. Square D.

B. General Electric.

C. I.T.E.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.02 MANUAL MOTOR STARTERS

A. Manual Motor Starter: NEMA ICS 2; size as noted on drawings. AC general-purpose Class A manually operated non-reversing full-voltage controller for induction motors rated in horsepower, with overload relay, red pilot light, and key toggle operator.

B. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, 1 pole full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and key toggle operator.

C. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 1 pole full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, key toggle operator.

D. Phase Failure and Undervoltage Relay: Contacts and locking potentiometer with undervoltage adjustment and led indicator.

E. Enclosure: ANSI/NEMA ICS 6; as noted on drawings.

2.03 MAGNETIC MOTOR STARTERS

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Provide with all accessories listed below.

B. Full Voltage Starting: Non-reversing type.

C. Reduced Voltage Starting: Closed-circuit transition wye-delta type.

D. Two Speed Starting: Two speed, two winding, variable torque type. Include integral adjustable time delay transition between FAST and SLOW speeds. Coordinate actual time setting required for motor that starter is connected to with manufacturer.

E. Coil Operating Voltage: 120 volts, 60 Hertz. Coordinate other voltages with Controls Contractor prior to ordering.

F. Size: NEMA ICS 2; size as shown on Drawings.

G. Overload Relay: NEMA ICS 2; bimetal.

H. Enclosure: NEMA ICS 6; Type as shown on drawings. Enclosures for exterior applications shall be NEMA Type 3R unless otherwise noted on the drawings, except for installations in or around Cooling Tower Yards, in which the enclosure shall be NEMA Type 4X – Stainless Steel unless otherwise noted on the drawings.

I. Combination Motor Starters: Combine motor starters with fusible switch disconnect in common enclosure.

J. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact shall be provided.

K. Indicating Lights: NEMA ICS 2; RUN: green in front cover shall be provided.

L. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, locking type, in front cover shall be provided.

M. Relays: NEMA ICS 2. Provide as necessary for control functions.

N. Control Power Transformers: 120 volt secondary in each motor starter shall be provided.

O. Phase Failure and Undervoltage Relay: Contacts and locking potentiometer with undervoltage adjustment and led indicator shall be provided.

2.04 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

A. Fusible Switch Assemblies: NEMA KS 1; FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F- 870. Designed to accommodate Class R fuses.

2.05 ACCEPTABLE MANUFACTURERS—MOTOR CONTROL CENTER

A. Square D.

B. General Electric.

C. I.T.E.

D. Substitutions: Under provisions of Division 1.

2.06 MOTOR CONTROL CENTER

A. Motor Control Centers: NEMA ICS 2; Class I, Type B.

B. Main Overcurrent Protection: As scheduled.

C. Motor Starters: As scheduled with accessories as mentioned in "Magnetic Motor Starters".

D. Feeder Tap Units: As scheduled.

E. Voltage Rating: 480 volts, three phase, three wire, 60 Hertz.

F. Horizontal Bussing: Copper with a continuous current rating as scheduled. Include copper ground bus entire length of control center.

G. Vertical Bussing: NEMA ICS 2; copper with a continuous current rating and run the full height.

H. Integrated Equipment Short Circuit Rating: 100,000 amperes rms symmetrical at 480 volts.

I. Configuration: Units front mounting only, accessible from the front only.

J. Enclosure: ANSI/NEMA ICS 6; Type 1.

K. Finish: Manufacturer's standard gray enamel.

2.07 ACCEPTABLE MANUFACTURERS—FUSES

A. Bussmann.

B. Gould-Schawmun.

C. Littelfuse Tracor.

D. Substitutions: Under provisions of Division 1.

2.08 FUSES

A. Fuses: ANSI/UL 198E, Class RK5; dual element, current limiting, time delay, one-time fuse, 250 or 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Motor starters supplied by the Electrical Contractor unless otherwise indicated.

C. Install fuses in fusible switches.

D. Select and install heater elements in motor starters to match installed motor characteristics.

E. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

***** END OF SECTION *****

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SECTION 16485

CONTACTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Purpose Contactors.

B. Lighting Contactors.

1.02 REFERENCES

A. ANSI/NEMA ICS 6—Enclosures for Industrial Controls and Systems.

B. NEMA ICS 2—Industrial Control Devices, Controllers, and Assemblies.

C. ANSI/NFPA 70—National Electrical Code.

1.03 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Include dimensions, size, voltage ratings and current ratings.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of each contactor and indicate circuits controlled.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS—GENERAL PURPOSE CONTACTORS

A. Square D.

B. General Electric.

C. I.T.E.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.02 GENERAL PURPOSE CONTACTORS

A. Description: NEMA ICS 2, AC general purpose magnetic contactor.

B. Coil Voltage: 120 or 277 volts, 60 Hertz.

C. Poles: As scheduled.

D. Size: As scheduled.

E. Enclosure: ANSI/NEMA ICS 6, Type as required to meet conditions of installation.

2.03 MANUFACTURERS—LIGHTING CONTACTORS

A. Square D.

B. General Electric.

C. I.T.E.

D. Cutler Hammer.

E. Substitutions: Under provisions of Division 1.

2.04 LIGHTING CONTACTORS

A. Description: NEMA ICS 2, magnetic lighting contactor.

B. Configuration: Electrically held, 2 wire control.

C. Coil Voltage: 24, 120 or 277 volts, 60 Hertz as coordinated with mechanical and electrical drawings for intent of design for control method.

D. Poles: As indicated.

E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.

F. Enclosure: ANSI/NEMA ICS 6, Type as required to meet conditions of installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Lighting and power contactors to be located in same room/space as electrical panel serving same equipment. Electrically held contactors shall not located in any space or room sensitive to the contactor holding coil noise output.

***** END OF SECTION *****

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SECTION 16495

TRANSFER SWITCH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automatic Transfer Switch.

1.02 REFERENCES

A. NEMA ICS 1—General Standards for Industrial Control and Systems.

B. NEMA ICS 2—Standards for Industrial Control Devices, Controllers, and Assemblies.

C. NEMA ICS 6—Enclosures for Industrial Controls and Systems.

D. NFPA-110—Standard for Emergency and Standby Power Systems.

1.03 QUALITY ASSURANCE

A. Manufacturer: Company specializing in automatic transfer equipment with three (3) years experience.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.

C. Submit manufacturer's installation instructions under provisions of Division 1.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1.

B. Include instructions for operating equipment.

C. Include instructions for operating equipment under emergency conditions.

D. Identify operating limits which may result in hazardous or unsafe conditions.

E. Document ratings of equipment and each major component.

F. Include routine preventive maintenance and lubrication schedule.

G. List special tools, maintenance materials, and replacement parts.

1.06 REGULATORY REQUIREMENTS

A. Conform to NFPA 110 code for emergency electrical systems.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automatic Switch Co.

B. Kohler

C. Russ Electric

D. Onan.

E. Zenith Controls

F. Challenger.

G. Substitutions: Under provisions of Division 1.

2.02 AUTOMATIC TRANSFER SWITCH

A. Description: NEMA ICS 2; automatic transfer switch.

B. Configuration: Electrically-operated, mechanically-held transfer switch.

2.03 RATINGS

A. Ratings: NEMA ICS 2; as scheduled on drawings.

2.04 AUTOMATIC SEQUENCE OF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

B. Time Delay to Start Alternate Source Engine Generator: 0 to 60 seconds, adjustable, set at two (2) seconds.

C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

D. Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable, set at 3 seconds.

E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.

F. Time Delay Before Transfer to Normal Power: 0 to 60 seconds, adjustable, set at 3 seconds; bypass time delay in event of alternate source failure.

G. Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, set at 5 minutes, of unloaded operation.

H. Engine Exerciser: Start engine every thirty (30) days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

I. Alternate System Exerciser: Transfer load to alternate source during engine exercise period.

2.05 ENCLOSURE

A. Enclosure: ICS 6; Type 1.

2.06 ACCESSORIES

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.

B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.

C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.

D. Transfer Switch Auxiliary Contacts: Two (2) normally open; two (2) normally closed.

E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 Hertz from rated nominal value.

F. In-Phase Monitor: Inhibit transfer until source and load are within 5 electrical degrees.

G. Remote Transfer Switch: Alarm and indication panel in building per NFPA 110 and Local Code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify field measurements are as shown on Drawings.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

***** END OF SECTION *****

SECTION 16510

LUMINAIRES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Luminaires and Accessories.

B. Exit Signs.

C. Ballasts.

D. Lamps.

E. Luminaire Accessories.

1.02 RELATED SECTIONS

A. Section 16130 ..... Boxes.

1.03 REFERENCES

A. ANSI C78.379—Electric Lamps—Incandescent and High-Intensity Discharge Reflector Lamps—Classification of Beam Patterns.

B. ANSI C82.1—Ballasts for Fluorescent Lamps—Specifications.

C. ANSI C82.4—Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

D. ANSI/NFPA 70—National Electrical Code.

E. ANSI/NFPA 101—Life Safety Code.

F. NEMA WD 6—Wiring Devices-Dimensional Requirements.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of each luminaire.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Maintenance Data: Include replacement parts list.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three (3) years experience.

1.08 EXTRA MATERIALS

A. Furnish under provisions of Division 1.

B. Provide two (2) of each plastic lens type installed.

C. Provide one (1) replacement lamp for each type lamp installed.

D. Provide two (2) of each ballast type.

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Furnish products as specified on Drawings.

B. Substitutions: Under provisions of Division 1.

C. Install ballasts, lamps, and specified accessories at factory.

2.02 BALLASTS

A. Fluorescent Ballast:

1. Description: ANSI C82.1, high power factor type electronic ballast class "P" energy efficient type. Input current third harmonic content is held to below 13% of the input current.

2. Provide ballast suitable for lamps specified.

3. Voltage: Match luminaire voltage.

4. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.

5. Ballast shall be fused and have class "A" sound rating.

6. Ballast shall not contain PCBs.

B. High Intensity Discharge (HID) Ballast:

1. Description: ANSI C82.4, as scheduled.

2. Provide ballast suitable for lamp specified.

3. Voltage: Match luminaire voltage.

4. LS-NC Rating: NEMA LE2; equal to or less than ratings listed in Table C-1.

2.03 LAMPS

A. Incandescent Lamp Inside—Frosted type.

B. Fluorescent Lamp—Warm white all by the same manufacturer.

C. Reflector Lamp Beam Patterns: ANSI C78.379.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

C. Support all luminaires independent of ceiling framing.

D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

F. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.

G. Install recessed luminaires to permit removal from below.

H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Install clips to secure recessed grid-supported luminaires in place. Provide extra tie wires from "T" ceiling bars to structure at each corner of fixture to support fixture.

J. Install wall mounted luminaires, emergency lights, and exit signs at height as indicated on Drawings.

K. Install accessories furnished with each luminaire.

L. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 16130 using flexible conduit as indicated.

M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

N. Bond products and metal accessories to branch circuit equipment grounding conductor.

O. Install specified lamps in each luminaire and exit sign.

P. Fixtures are not to be used as a raceway unless stamped for use as raceway by Manufacturer. Single fixture in lay-in ceilings shall not be used for raceway and shall be connected to an outlet box located within 6'-0" of fixture with flexible 3/8" conduit or 3/8" MC cable. #14 THHN/THWN is OK for single fixture connections.

3.03 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.04 ADJUSTING

A. Adjust Work under provisions of Division 1.

B. Aim and adjust luminaires as directed.

C. Adjust exit sign directional arrows as indicated.

D. Relamp luminaires that have failed lamps at Substantial Completion.

3.05 CLEANING

A. Clean work under provisions of Division 1.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.06 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Provide minimum of two (2) hours demonstration of luminaire operation.

C. Light bulb replacement guarantee shall be limited to ninety (90) days after the date of Substantial Completion. The Electrical Contractor shall, at the end of this period, inspect the work and replace all burned out or defective light bulbs.

***** END OF SECTION *****

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SECTION 16530

SITE LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior Luminaires and Accessories.

B. Poles.

1.02 REFERENCES

A. ANSI C78.379—Electric Lamps—Incandescent and High-Intensity Discharge Reflector Lamps—Classification of Beam Patterns.

B. ANSI C82.4—Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

C. ANSI/NFPA 70—National Electrical Code.

D. ANSI/IES RP-20—Lighting for Parking Facilities.

1.03 SYSTEM DESCRIPTION

A. Parking area/exterior lighting as indicated on documents and described herein.

1.04 DESIGN REQUIREMENTS

A. Design and layout lighting system in conformance with IES recommended procedures.

B. Parking Lot: ANSI/IES RP-20, high activity level.

1.05 PERFORMANCE REQUIREMENTS

A. Parking Area: Provide illumination levels and uniformity indicated on Drawings.

1.06 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate dimensions and components for each luminaire which is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under "Regulatory Requirements".

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.07 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations of each luminaire.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Maintenance Data: Include instructions for maintaining luminaires.

1.09 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.10 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division 1.

B. Accept products on site. Inspect for damage.

C. Protect poles from finish damage by handling carefully.

1.12 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.13 EXTRA MATERIALS

A. Furnish under provisions of Division 1.

B. Provide two of each lamp type and wattage installed.

C. Provide two of each ballast type.

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Furnish products as specified on Drawings.

B. Substitutions: Under provisions of Division 1.

2.02 BALLASTS

A. High Intensity Discharge (HID) Ballast:

1. Description: ANSI C82.4, as scheduled.

2. Provide ballast suitable for lamp specified.

3. Voltage: Match luminaire voltage.

2.03 LAMPS

A. Provide lamp type specified for luminaire.

2.04 POLES

A. Manufacturers: As noted on documents.

B. Material and Finish: As noted on documents.

C. Section Shape and Dimensions: As scheduled.

D. Height: As scheduled.

E. Base: As indicated on drawings.

F. Accessories:

1. Handhole.

2. Fusing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine excavation and concrete foundation for lighting poles.

B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

A. Install in accordance with manufacturers' instructions.

B. Install lighting poles at locations indicated.

C. Install poles plumb. Provide means to adjust plumb. Grout around each base.

D. Install lamps in each luminaire.

E. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.03 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Aim and adjust luminaires to provide illumination levels and distribution as directed.

C. Relamp luminaires which have failed lamps at Date of Substantial Completion.

3.05 CLEANING

A. Clean work under provisions of Division 1.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

***** END OF SECTION *****

SECTION 16600

TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work required under this Division shall include all materials, labor and auxiliaries required to furnish and install complete surge suppression for the protection of building electrical and electronics systems from the effects of line induced transient voltage surge and lightning discharge as indicated on drawings and specified in this Section.

B. Related work specified elsewhere:

1. Section 16010..... Basic Electrical Requirements.

2. Section 16111..... Conduit.

3. Section 16120..... Building Wire and Cable.

4. Section 16130..... Boxes.

5. Section 16480..... Motor Control.

6. Section 16670..... Lightning Protection System.

1.02 QUALITY ASSURANCE

A. All transient voltage surge suppression (TVSS) devices shall be manufactured by a company normally engaged in the design, development, and manufacture of such devices for electrical and electronics systems equipment.

B. The surge suppressor manufacturer shall offer technical assistance through support by a factory representative and local stocking distributor.

C. Submittals: Surge suppression submittal shall include:

1. Schematic data on each suppressor type indicating component types.

2. Dimensioned drawing of each suppressor type.

3. Manufacturer's performance data for each suppressor type.

4. Manufacturer shall furnish complete maintenance and installation manuals and a list of replacement parts.

5. The manufacturer shall certify that their TVSS device has been designed and tested to fail in a safe, non-violent mode with no smoke, fire, flame, case, or module physical damage.

6. Manufacturer shall provide data indicating how matched M.O.V.'s (sharing of surge currents) were selected and how each M.O.V. would share a surge current.

7. Manufacturer shall provide independent third party test data confirming unit will not have any holdover current.

8. Manufacturer shall submit the cover page of the manufacturer's UL Test Report to show compliance with UL 1449, Second Edition.

D. Equipment Certification: Items shall be listed by Underwriters' Laboratories, shall bear the UL seal and be marked in accordance with referenced standard U.L. 1449, Second Edition. Protection modes shall be as follows: seven (7) modes Wye = L-N, L-G, N-G; six (6) modes Delta = L-G, L-L.

E. Surge suppression devices shall be installed and located in accordance with requirements of all applicable National Fire Protection Association (NFPA) Codes.

1.03 WARRANTY

A. All surge suppression units shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of five (5) years.

B. Any suppressor unit which shows evidence of failure or incorrect operation during the warranty period shall be replaced/installed by the Manufacturer at no cost to the Owner.

1.04 CODES AND STANDARDS

A. The following standards and publications are referenced in various parts of this specification and shall apply.

1. UL 1449, Second Edition—Transient Voltage Surge Suppressors.

2. ANSI/IEEE C62.41-1991 (IEEE 587)—Guide for Surge Voltages in Low-Voltage AC Power Circuits.

3. ANSI/IEEE 62.11-1987—Standard for Testing Heavy Duty Service Entrance Surge Arrestor.

4. ANSI/IEEE C62.45-1992—IEEE Guide for Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

5. MIL-STD-220A—50 Ohm Insertion Loss Method.

6. UL 1283—Standard for Electromagnetic Interference Filters.

1.05 REQUIRED SUPPRESSORS

A. Provide U.L. transient voltage surge suppression for the equipment described herein and as indicated on the drawings:

1. On electrical service entrance panels.

2. On distribution and branch circuit panels.

PART 2 PRODUCTS

2.01 SUPPRESSORS FOR ELECTRICAL SERVICE ENTRANCE PANELS, SECONDARY PANELS, OR BRANCH PANELS

A. Transient voltage surge suppressors shall be installed at the service entrance on the load side of the first main disconnect.

B. Suppressors shall be installed as close as feasible to the device being protected in a position which will minimize lead length between suppressor and the buses or control breaker to which the suppressor connects. Suppressor leads shall not extend beyond the suppressor manufacturer's recommended maximum lead length without specific approval of the Engineer.

C. Suppressors shall be independently third party tested with a Category C3 high exposure waveform (20 kv-1.2/50 us, 10 kA-8/20 us) per ANSI/IEEE C62.41-1991.

D. Suppressors shall be designed for the specific type and voltage of electrical service and shall provide clamping action for line to neutral, line to ground, and neutral to ground.

E. Suppressors shall be designed to withstand a maximum continuous operating voltage of not less than 125% of nominal RMS line voltage for 120V and 115% of nominal RMS line voltage for 277V.

F. The Transient Voltage Surge Suppressor shall be life cycle tested as per ANSI/IEEE 62.45-1992 to withstand 1,000 test surges at 10 KA for service entrance devices and 1,000 test surges at 3 KA for all other applications without failure or degradation of UL 1449 clamp voltages by more than 10%.

G. All surge suppression devices utilizing M.O.V.'s shall use only matched M.O.V.'s with similar electrical characteristics allowing each M.O.V. to share surge currents.

H. Suppressors shall be UL 1449, Second Edition, listed for all specified suppression modes and shall be approved for the location in which they are installed.

I. Suppressors shall have an operating temperature range of -40 degrees C to +50 degrees C.

J. The TVSS device shall provide up to 50 db EMI/RFI attenuation from 10 KHz to 50 KHz.

K. Provide visible/audible or redundant visible alarm systems to indicate when the unit is operable and when it has failed. The alarm system shall be provided for each coupling mode.

L. When suppressors utilize replaceable module design, each module shall have individual alarm systems providing either visible/audible or redundant visible indication of when the module is operable and when it has failed.

M. Suppressors shall utilize copper bus bars.

N. Maximum response time of the unit shall be less than 5 nanoseconds.

2.02 SUPPRESSOR CRITERIA: SUPPRESSORS SHALL MEET OR EXCEED THE FOLLOWING CRITERIA

A. Service Entrance

1. 277/480 Volt, 3 Phase, 4 Wire, Wye

a. Minimum Single Impulse Current Rating: 75,000 amperes per coupling mode (8/20 us waveform).

b. Suppressors shall be failsafe, shall not holdover current, shall have repeated surge capability, shall be solid state with replaceable modules, shall be self-restoring, and shall be fully automatic.

c. The UL 1449 clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
120/208	700	700	700
277/480	1,200	1,200	1,200

d. The ANSI/IEEE C62.41-1991 Category C3 clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
120/208	700	700	700
277/480	1,200	1,200	1,200

e. Terminals shall be provided for all of the necessary power and ground connections. Each terminal shall accommodate wire sizes of #8 to #1 AWG.

f. Suppressors shall be equipped with the following items:

1. Dry contacts (isolated from rest of system).

2. Integral UL listed disconnect switch.

B. Distribution Panel (Non-Modular Design):

1. 277/480 Volt, 3 Phase, 4 Wire, Wye

a. Minimum Single Impulse Current Rating: 40,000 amperes per coupling mode (8/20 us waveform).

b. The UL 1449 clamping voltage shall not exceed the following (not including any integral connections):

VOLTAGE	L-N	N-G	L-G
120/208	700	700	700
277/480	1,200	1,200	1,200

C. Branch Circuit Panel (Non-Modular Design):

1. 120/208 Volt, 3 Phase, 4 Wire, Wye

a. Minimum Single Impulse Current Rating: 25,000 amperes per coupling mode (8/20 us waveform).

b. The UL 1449 clamping voltage shall not exceed the following (not including any integral disconnects):

VOLTAGE	L-N	N-G	L-G
120/208	700	700	700
277/480	1,200	1,200	1,200

2.03 ACCEPTABLE MANUFACTURERS

A. Liebert.

B. Advanced Protection Technologies.

C. EFI.

D. L.E.A. International.

E. Current Technology.

F. Northern Technologies.

G. Intermatic.

H. Atlantic Scientific.

I. Substitutions: Under provisions of Division 1.

PART 3 EXECUTION

3.01 INSTALLATION OF SUPPRESSORS

A. Suppressors shall be installed as close as practical to the electric panel to be protected, consistent with available space.

B. Suppressors shall be installed in a neat, workmanlike manner. Lead dress shall be as short and as straight as possible and be consistent with recommended industry practices for the system on which these devices are installed.

C. Equipment shall be installed following manufacturer's recommendations and guidelines in compliance with NEC Article 280/250 for grounding and bonding; NEC Article 110-9 and 110-10 for overcurrent protection.

D. All surge suppression devices specified in this specification section shall be designed and installed such that normal operation of the system shall not be impaired by the installation of these devices.

***** END OF SECTION *****

SECTION 16622

PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged Diesel Fuel Engine Generator System.

B. Exhaust Silencer and Fittings.

C. Battery and Charger.

D. Weatherproof Enclosure.

E. Remote Annunciator Panel

F. Sub-Base Mounted Fuel Tank

1.02 RELATED SECTIONS

A. Section 16495 ..... Transfer Switches.

1.03 REFERENCES

A. ANSI/NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA MG 1—Motors and Generators.

C. ANSI/NFPA 70—National Electrical Code.

D. ANSI/NFPA 110—Emergency and Standby Power Systems.

E. ANSI/NEMA AB 1—Molded Case Circuit Breakers.

1.04 SYSTEM DESCRIPTION

A. Engine generator system to provide source of emergency and standby power.

B. Operation: In accordance with ANSI/NFPA 70 and 110.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions.

C. Submit manufacturer's data, including sound reduction test data, on weatherproof sound attenuated enclosure.

1.06 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1.

B. Accurately record location of engine generator and mechanical and electrical connections.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Accept packaged engine generator set and accessories on site in crates and verify damage.

D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Caterpillar.

B. Kohler.

C. Onan.

D. Substitutions: Under provisions of Division 1.

2.02 ENGINE

A. Type: Water-cooled in-line or V-type, four stroke cycle, internal combustion engine.

B. Rating: Sufficient to operate at 10 percent overload for one hour at specified elevation and ambient limits.

C. Fuel System: Appropriate for use of diesel fuel.

D. Engine Speed: 1800 rpm.

E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F (32 degrees C), and suitable for operation on 120volts AC or as otherwise indicated on the drawings.

I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F (43 degrees C). Radiator Air Flow Restriction: 0.5 inches of water (9.34 mm of mercury), maximum.

J. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine-generator control panel.

K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.03 GENERATOR

A. Generator: ANSI/NEMA MG 1; three phase, four pole, reconnectible brushless synchronous generator with brushless exciter.

B. Rating: As indicated on drawings.

C. Insulation: ANSI/NEMA MG 1, Class F.

D. Temperature Rise: 130 degrees C standby.

E. Enclosure: ANSI/NEMA MG 1; open drip proof.

F. Voltage Regulation: Include generator-mounted volts per Hertz exciter-regulator to match engine and generator characteristics, with voltage regulation +/- one percent from no load to full load. Include manual controls to adjust voltage drop +/- 5 percent voltage level, and voltage gain.

2.04 ACCESSORIES

A. Exhaust Silencer: Critical type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions.

B. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, shall have minimum ampere-hours capacity to comply with NFPA 110, Emergency and Standby Power Systems. Match battery voltage to starting system. Include necessary cables and clamps.

C. Battery Tray: Plastic coated metal or wooden tray treated for electrolyte resistance, constructed to contain spillage of electrolyte.

D. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.

E. Line Circuit Breaker: NEMA AB 1 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; number and rating as indicated. Include battery-voltage operated shunt trip, connection to open circuit breaker on engine failure. Mount unit in enclosure to meet ANSI/NEMA 250, Type 1 requirements.

F. Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provisions for the following equipment and features:

1. Frequency Meter: 45-65 Hz range, 3-1/2 inch dial.

2. AC Output Voltmeter: 3-1/2 inch dial, 2 percent accuracy, with phase selector switch.

3. AC Output Ammeter: 3-1/2 inch dial, 2 percent accuracy, with phase selector switch.

G. Remote Annunciator.

1. Provide a remote annunciator as manufactured by the generator manufacturer and designed for the generator controller to meet the NFPA 110, level 1 requirements including: level 1 alarm/status monitoring, and monitoring of the normal/emergency sources.

2. This contractor shall coordinate the exact location of the remote annunciator with the owner/engineer prior to rough-in. For the basis of bidding the project, the panel shall be flush mounted at the nearest wall adjacent to the administration office front desk or as otherwise indicated on the floor plans. This contractor shall provide a minimum 1 inch conduit with RS-485 communication cabling from the generator controller to the remote annunciator and back to the transfer switch.

3. Provide with all necessary Modbus/Ethernet converters, power source adapters, signal boosters and communication modules as necessary for a complete, operational and tested remote annunciator system.. This contractor shall provide a 12/24 volt DC power supply as necessary for the operation of the remote annunciator.

4. Remote annunciator shall be provided with the following safety indications and shutdowns.

    a. Overcrank

    b. Low water temperature (<70°F)

    c. High engine temperature pre-alarm

    d. High engine temperature

    e. Low lube oil pressure pre-alarm

    f. Low lube oil pressure

    g. Overspeed

    h. Low fuel main tank

    i. Low coolant level

    j. Control switch not in Auto position

    k. Contacts for local and remote common alarm

    l. Audible alarm silencing switch

H. Sub-Base Mounted Fuel Tank

1. Capacity: Provide storage capacity for 24 hour runtime at 100% full load, unless otherwise noted on the drawings. UL listed (Label #142) fuel tank construction.

2. Construction:

    a. Heavy-Gauge Steel: Tank to be installed in generator footprint. All tanks are tested to 5 psi using the water/soap solution technique.

b. The sub-base tank is UL Listed (Label #142). In addition to the standard features listed below, all UL Listed tanks shall have additional internal reinforcement, an emergency vent (properly sized to the tank), and a UL Listed label (File #MH17469 - Flammable and Combustible Liquids Code).

c. The sub-base tank design shall include a totally enclosed outer shell resulting in a double wall construction. The double wall area, or the outer tank, is independent of the inner sub-base tank fuel storage area. Both the inner and outer tanks are vented separately and are pressure tested as described above. The outer tank has provision for leak detection, venting, and a drain. The inner tank overflow port and drain are piped through the outer tank.

3. Standard features include:

a. Heavy Gauge Steel: 7-gauge for the top and side channels -- 12-gauge for bottom, ends, and internal baffles.

b. Internal Structural Baffles: Located every mounting point (no more than 24" apart). These baffles contribute to the overall strength of the tank but allow free flow of fuel.

c. Hot/Cold Baffles: This baffle is located between the engine-supply and the fuel return ports. Its purpose is to separate the hotter returned fuel from the cooler supply fuel thus improving engine performance.

d. Drain: 3/8" in tanks up to 200 gallons and 1" in 200+ gallon tanks.

e. Double wall tanks have a drain for both containment areas: The inner tank drain is "hard-plumbed" through the outer area.

f. Connections - (1 ea.) 1-1/2" for fuel level gauge; (2 ea.) 2" NPT for lockable fill cap and for vent; (2 ea.) 1/2" for engine suction and for engine return; and (1 ea.) extra 1" opening for option, etc.

g. Welded by Certified Welders and Supervisor tested to 5 psi.

h. Finish: Primer and choice of industrial color enamel.

i. Fuel Tank Remote Annunciator Panel with leak and high fuel level safety indications.

2.05 MANUFACTURERS (WEATHERPROOF SOUND ATTENUATED ENCLOSURE)

A. Pritchard Brown.

B. Phoenix Products

C. Substitutions: Under provisions of Division 1.

2.06 WEATHERPROOF SOUND ATTENUATED ENCLOSURE

A. The intent of this specification is to provide the Owner with a type generator set enclosure complete in every detail and requiring no additional in-field modifications or assembly, except where specifically allowed by these specifications. The enclosure is to be accurately dimensioned so as to be in compliance with the National Electrical Code (NEC), and the National Fire Protection Association (NFPA) for clearance of all specified items included therein, and all applicable fire codes for a structure and application of this type.

1. Construction: The enclosure shall consist of a roof, two (2) side walls and two (2) end walls of prepainted, aluminum, stressed-skin, semi-monocoque construction. The roof shall be a one piece cambered sheet of .040" thick aluminum with 1/8" thick extruded aluminum recessed side and end rails with cast aluminum corners. Extruded aluminum I-beam roof bows shall be spaced on 12" centers. The side and end wall shall be .040" thick aluminum sheet mill-prepainted and riveted on 3" centers with 1/8" extruded aluminum hat sections, and with side posts on 24" centers. The corner posts shall be a radius type extruded aluminum alloy.

2. Doors: All doors on the enclosure shall be strategically located in areas as to allow ease of maintenance on the generator set and allow good access to and visibility of instruments, controls, engine gauges, etc. The door frames shall be welded aluminum consisting of extruded aluminum riveted to the side panels. Forged aluminum hinges with stainless steel pins and nylon bushings shall also be provided. The personnel doors shall be manufactured from aluminum and fully gasketed to form a weather-tight perimeter seal. A three-point latching assembly with interior latch release and exterior padlocking provisions shall also be provided.

3. Louvers: Provide gravity louver at discharge. Louvers shall be designed to prevent the entrance of driving rainwater, but shall have sufficient free area to allow for 120% of the total engine/generator cooling air requirements used in this application. Louvers shall be of all aluminum construction.

4. The manufacturer of the enclosure shall provide mounting brackets for the exhaust silencer specified. In addition, the exhaust silencer shall be installed outside the enclosure.

5. Finish: Upon final assembly of the enclosure, it shall be prime painted with a minimum of two (2) coats of aluminum primer. The final finish painting shall be a minimum of two (2) coats of enamel. Four (4) spray cans of exterior touch-up paint shall be included with the unit. The interior of the enclosure shall be finish painted in white enamel and two (2) spray cans of interior touch-up paint shall also be included with the unit. Exterior finish painted color selected by the Architect.

6. Sound Attenuation: The entire enclosure except for the louvered openings shall have sound attenuation material mechanically attached to the interior surfaces of the unit. Sound absorbing material shall be held in place by expanded aluminum metal to form a removable section easily inspected by maintenance personnel. The sound attenuation material and fastening system shall apply to the enclosure roof as well as the side panels and doors, and shall consist of a minimum of two inches (2") of fiberglass covered by one-half inch (1/2") thick sound attenuation foam. The enclosure, including louvered sections, must be capable of reducing generator sound by 10 DBA at 12 feet.

7. Bird Screens: Provide bird screens at all inlet and outlet openings.

8. Door Hardware: Add crash bar emergency exit door hardware on generator enclosure exit door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Provide full load test utilizing portable test bank for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal. Generator Manufacturer to provide load bank test.

C. During test, record the following at 20 minute intervals:

1. Kilowatts.

2. Amperes.

3. Voltage.

4. Coolant temperature.

5. Room temperature.

6. Frequency.

7. Oil pressure.

D. Test alarm and shutdown circuits by simulating conditions.

3.04 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems under provisions of Division 1.

3.05 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Adjust generator output voltage and engine speed.

3.06 CLEANING

A. Clean work under provisions of Division 1.

B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.07 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Describe loads connected to emergency and standby system and restrictions for future load additions.

C. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency and standby power.

***** END OF SECTION *****

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SECTION 16670

LIGHTNING PROTECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air Terminals and Interconnecting Conductors.

B. Grounding and Bonding for Lightning Protection.

C. Related Sections to include the following:

1. Division 6 Section "Exterior Finish Carpentry" for aluminum finials atop cupolas serving as air terminals.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 16111 ..... Conduit.

1.03 REFERENCES

A. ANSI/NFPA 78—Lightning Protection Code.

B. ANSI/UL 96—Lightning Protection Components.

C. LPI—Lightning Protection Institute.

D. UL 96A—Installation Requirements for Lightning Protection Systems.

1.04 SYSTEM DESCRIPTION

A. Lightning Protection System: ANSI/NFPA 780; Class I UL 96A; consisting of air terminals on roofs, roof-mounted mechanical equipment, chimneys and stacks, and penthouse roofs; bonding of structure and other metal objects; grounding electrodes; and interconnecting conductors. Run all cabling concealed. Protect diesel fuel tank as part of building system.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Submit shop drawings showing layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.

C. Submit product data showing dimensions and materials of each component, and include indication of listing in accordance with ANSI/UL 96.

D. Submit manufacturer's installation instructions under provisions of Division 1.

1.06 PROJECT RECORD DOCUMENTS

A. Submit project record documents under provisions of Division 1.

B. Accurately record actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in lightning protection equipment with minimum three (3) years documented experience.

B. Installer: Authorized installer of manufacturer with minimum three (3) years documented experience.

C. The lightning protection system shall be installed by a firm actively engaged in the installation of Underwriters Laboratories (UL) Letter of Certification program for Lightning Protection Systems and shall be so listed by Underwriters Laboratories Inc. The completed system shall comply with the latest editions of the Installation Requirements for Lightning Protection Systems, UL96A and of the National Fire Protection Association's Lightning Protection Standard, NFPA 780.

1.08 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference one (1) week prior to commencing work of this Section, under provisions of Division 1.

1.09 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.

B. Coordinate the work of this Section with roofing and exterior and interior finish installations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thompson.

B. Harger.

C. Robbins.

D. Heary Bros.

E. Substitutions: Under provisions of Division 1.

2.02 MATERIALS

A. Components: In accordance with ANSI/UL 96.

B. Air Terminals: Aluminum.

C. Grounding Rods: Solid copper clad.

D. Ground Plate: Copper.

E. Conductors: Copper cable. Where in contact with aluminum roofing material, conductors shall be aluminum.

F. Connectors and Splicers: Bronze.

G. Down Leads: Run in PVC concealed.

H. Class I materials shall be used on structures that do not exceed 75 feet in height and Class II materials shall be used on structures that are 75 feet or higher above average grade.

2.03 AIR TERMINALS

A. Air terminals shall project a minimum of ten inches above the object or area it is to protect and shall be located at intervals not exceeding 20'-0" along ridges and along the perimeter of flat or gently sloping roofs (flat or gently sloping roofs include roofs that have a pitch less than 3:12). Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'. Air terminals shall be located within two feet of roof edges and outside corners of protected areas.

B. Air terminals shall be installed on stacks, flues, mechanical units and other metallic objects not located within a zone of protection and which have an exposed metal thickness less than 3/16 of an inch. Objects having an exposed metal thickness 3/16 of an inch or greater shall be connected to the lightning protection system as required by the specified standards using main size conductor and bonding plates having a minimum of 3 square inches of surface contact area.

1. Aluminum finials atop cupolas shall be connected to the conductor system.

C. Air terminal bases shall be securely fastened to the structure in accordance the specified standards including the use of adhesive that is compatible with the surface it is to be used on or stainless steel fasteners.

D. Main conductors shall be sized in accordance with the specified standards for Class I or Class II structures and shall provide a two way horizontal or downward path from each air terminal to connections with the ground system. Conductors shall be free of excessive splices and no bend of a conductor shall form a final included angle of less than neither 90 degrees nor have a radius of bend less than 8 inches.

E. Down conductors shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. In no case shall a structure have fewer than two down conductors. Where down conductors are installed exposed on the exterior of a structure and are subject to physical damage or displacement, guards shall be used to protect the conductor a minimum of 6 feet above grade. Metallic guards shall be bonded at each end.

F. In case of structural steel frame construction, down conductors may be omitted and roof conductors shall be connected to the structural steel frame at intervals not exceeding 100 feet along the perimeter of the structure.

2.04 ROOF PENETRATIONS

A. Roof penetrations required for down conductors or for connection to structural steel framework shall be made using thru-roof assemblies with solid riser bars and appropriate roof flashing. Conductors shall not pass directly through the roof. The roofing contractor shall furnish and install the materials required to properly seal all roof penetrations of the lightning protection components and any additional roofing materials or preparations required by the roofing manufacturer for lightning conductor runs to assure compatibility with the warranty for the roof including roof pads that may be required to protect the roof under each of the lightning protection components. Contractor shall ensure that conductors do not come in contact with dissimilar metals.

2.05 GROUND TERMINATIONS

A. Ground electrodes shall be copper clad steel and a minimum 5/8" diameter and 10 feet long. A ground electrode shall be provided for each down conductor. The down conductor shall be connected to the ground electrode using a bronze ground rod clamp having a minimum of 1 ½" contact between the ground electrode and the conductor measured parallel to the axis of the ground electrode, or by an Ultraweld exothermically welded connection. Ground electrodes shall be located a minimum of 2 feet below grade and shall be installed below the frost line where possible (excluding shallow topsoil conditions).

B. Where the structural steel framework is utilized as the down conductor for the system, ground terminals shall be connected to columns around the perimeter of the structure at intervals averaging not more than 60 feet apart. Columns shall be grounded using either bonding plates having 8 square inches of surface contact area or by Ultraweld exothermically welded connections.

C. All ground electrodes shall be interconnected with a ground loop conductor on structures that exceed 60 feet in height. The ground loop conductor shall be sized in accordance with the specified standards and in no case shall be smaller than the main roof conductor.

2.06 EQUIPOTENTIAL GROUNDING

A. Common interconnection of all grounded systems within the building shall be ensured by interconnecting to the lightning protection system using main size conductor and fittings.

B. This interconnection shall include but is not limited to the electrical service, telephone and antenna system grounds as well as all underground metallic piping systems including water, gas and sewer. Interconnection to a gas or water line shall be made on the customer's side of the meter.

C. Grounded metal bodies located within the required bonding distance as determined by the bonding distance formula in the latest edition of NFPA-780 Standard for the Installation of Lightning Protection Systems shall be bonded to the lightning protection system using the required bonding conductors and connections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that field measurements are as shown on shop drawings.

C. Beginning of installation means installer accepts existing conditions.

3.02 PROTECTION OF SURROUNDING ELEMENTS

A. Protect elements surrounding work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with UL 96A.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Obtain the services of Underwriters Laboratories, Inc. to provide inspection and certification of the lightning protection system under provisions of UL 96A.

C. Upon completion of the installation of the lightning protection system the contractor shall furnish the owner with a UL Letter of Certification that is to be issued by Underwriters Laboratories Inc.

***** END OF SECTION *****

SECTION 16720

FIRE ALARM AND SMOKE DETECTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire Alarm and Smoke Detection Systems.

1.02 RELATED SECTIONS

A. Section 16120 Building Wire and Cable.

B. Section 16130 Boxes.

C. Section 16195 Electrical Identification.

1.03 REFERENCES

A. The equipment and installation shall comply with the current provisions of the following codes and standards:

1. NFPA 70—National Electrical Code.

2. NFPA 72—National Fire Alarm Code.

3. ANSI A117.1—American National Standard for Building and Facilities Providing Accessibility and Usability for Physically Handicapped People.

4. NFPA 101—Life Safety Code.

5. NEC Article 760—Fire Protective Signaling Systems.

6. Americans with Disabilities Act.

7. Florida Accessibility Code for Building Construction.

8. Florida Fire Prevention Code.

1.04 REGULATORY REQUIREMENTS

A. System: UL listed.

B. Conform to requirements of NFPA 101.

C. UL Listed—UL 1076.

1.05 SYSTEM DESCRIPTION

A. Furnish, install, and place in operating condition an electronically operated fire alarm system as described herein and shown in the plans. All units on the fire alarm system shall be listed by Underwriters' Laboratories, Inc. for fire alarm use, and the control panel shall bear the UL label. The system shall be installed in accordance with requirements set by National Electrical Code and in compliance with applicable provisions of Standard 72 published by the National Fire Protection Association (NFPA).

B. Fire Alarm: The system shall be a microprocessor based point annunciated fire alarm system with walk-through test capability. The control panel and each individual component used in conjunction with the system shall be UL listed for its use. The system shall be totally supervised with a dynamic LCD display. The control panel shall also be able to monitor and receive analog signals from smoke and duct smoke detectors which indicate obscuration rate and set detector sensitivity. The input power shall be 120 volts, A/C 60 Hz connected per NFPA 72 and NEC. The operating power shall be single power source of 24 volts DC and filtered and regulated within 110% of the normal rating. Total power supply capacity shall be 50% greater than the total alarm load. The control panel shall be supervised on the input power line with automatic switch over to battery backup. The battery backup supply shall be capable of powering the system for at least 24 hours and still be capable of energizing all signal devices for a period of at least five minutes. Battery backup shall not be provided as a separate cabinet. Bypass switches shall be provided for gas shutdowns and door holders.

C. System's Connection: The control panel shall be capable and wired so that any one or multiples of fire alarm devices, upon activation, shall sound alarm throughout the entire facility.

D. Provide coordination with access control vendor to interface the Fire Alarm Control Panel (FACP) and the Access Control Panel for release of magnetic door locks when the FACP goes into alarm.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five years documented experience.

B. Installer: Company specializing in smoke detection and fire alarm systems with five years experience, certified by Florida State Licensing Board as fire alarm and security system installing contractor.

1.07 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Provide wiring diagrams, point to point with voltage drop calculations, data sheets, and equipment ratings, layout, dimensions, finishes, and battery calculations.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit manufacturer's certificate under provisions of Division 1 that system meets or exceeds specified requirements, certification per NFPA 72.

E. Provide training for two people on the operation, maintenance, and repair of the system at the Contractor's expense. Training shall be certified by the manufacturer and be at different times for each person. Include transportation, room and board where needed.

1.08 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Division 1.

B. Include location of end-of-line devices.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Division 1.

B. Include operating instructions, and maintenance and repair procedures, with parts list. Three copies of complete troubleshooting and repair manuals.

C. Include manufacturer representative's letter stating that system is operational.

D. Maintain system for a minimum of one year, after complete acceptance by the Owner, in accordance with NFPA 72.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

1.11 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 1.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The system design is based on the Edwards Systems Technology (EST) catalog numbers shown and constitute the type and quality of equipment to be furnished.

B. Additional Approved Manufacturers:

1. Notifier.

2. Siemens Cerberus.

3. Simplex.

C. If equipment of another manufacturer is to be submitted for approval as equal, the Contractor shall, at the time of bid, list all exceptions taken to these Specifications, all variances from these Specifications, and all substitutions of operating capabilities or equipment called for in these Specifications and forward said list to the Engineer. Any such exceptions, variances, or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these Specifications shall rest with the Engineer, who, at his discretion, may require proof of performance.

2.02 FIRE ALARM PANEL (FACP) EDWARDS SYSTEMS TECHNOLOGY (EST 2)

A. Control panel construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.

B. A local audible device shall sound during alarm, trouble or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

C. The following primary controls shall be visible through a front access panel:

- ❒ Eighty character liquid crystal display.
- ❒ Individual red system alarm LED
- ❒ Individual yellow supervisory service LED.
- ❒ Individual yellow trouble LED.
- ❒ Green "power on" LED.
- ❒ Alarm acknowledge key.
- ❒ Priority two alarm acknowledge key.
- ❒ Supervisory acknowledge key.
- ❒ Trouble acknowledge key.
- ❒ Alarm silence key.
- ❒ System reset key.

D. The control shall provide the following:

☒ Setting of time and date.

☒ LED testing.

☒ Alarm, trouble, and abnormal condition listing.

☒ Enabling and disabling of each monitor point separately.

☒ Activation and deactivation of each control point separately.

☒ Changing operator access levels.

☒ Walk test enable.

☒ Running diagnostic functions.

☒ Displaying software revision level.

☒ Displaying separate alarm and trouble logs.

☒ Displaying card status.

☒ Point listing.

☒ Monitoring detector obscuration rate.

☒ Setting of detector sensitivity.

E. For maintenance purposes, the following lists shall be available from the point lists menu.

☑ All points listed by address.

☑ Monitor point list.

☑ Signal/speaker list.

☑ Auxiliary control list.

☑ Feedback point list.

☑ Pseudo point list.

☑ LED/switch status list.

☑ Horn silence switch.

☑ AHU shutdown override switch.

☑ Power supply current draw in alarm condition.

☑ Power supply current draw in standby condition.

2.03 GENERAL

A. Provide a complete fire alarm system including, but not limited to, the following components: EST2.

2.04 DEVICES AND ACCESSORIES

A. All devices on system shall be addressable. Addressable shall be defined as a smart device that is assigned an address in plain language for monitoring on the LCD and printer tapes and is field programmable by the Maintenance Personnel. All addressable devices shall have the capability of being disabled or enabled individually.

B. Should a device fail, it will not hinder the operation of other system devices.

C. All devices on system shall be supervised. A supervised system shall detect troubles in panel or wiring, removal or tampering of point devices, monitor either open or closed circuits, and verifies system integrity.

D. The communication format must be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.

E. Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping and the addition of an addressable device between existing devices requires reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.

F. All addressable smoke and heat detector heads as specified below will be pluggable into their bases. The bases will contain electronics that communicate the detector status (normal, alarm trouble) to the control panel over two wires. The same two wires shall also provide power to the base and detector. Different detectors heads (smoke or heat) must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel. Auxiliary contacts shall be provided and wired to the elevator controller where shown as smoke detectors with elevated recall contacts.

1. TRUE ALARM PHOTOELECTRIC DETECTOR HEAD

a. The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base and shall be UL approved. Detector to provide an analog signal to the panel for monitoring of obscuration rate and maintenance of constant detector sensitivity.

b. To minimize nuisance alarm, voltage and RF transient suppression techniques shall be employed as-well-as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning.

c. The detectors shall be of the solid state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear air flow entry.

d. The detector shall fit into a verifiable type base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations and addressable zone adapter modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable zone adapter module.

e. There shall be no limit to the number of detectors or zone adapter modules which may be activated or in alarm simultaneously. The operating voltage shall be 24 VDC and operate on a supervised loop.

f. The control panel shall maintain a moving average of the sensors' smoke chamber value to automatically compensate for duct and dirty conditions that could affect detection operations. The adjustable level shall be between 0.2% and 3.7% smoke obscuration.

g. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "DIRTY SENSOR" trouble condition shall be audibly and visually indicated at the control panel. Additionally, the LED on the sensor base shall glow steady. If a "DIRTY SENSOR" is further contaminated, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel.

h. The control panel shall continuously perform an automatic self test routine on each sensor to ensure the accuracy of the values being transmitted to the control panel by the sensor. Any problem with the self test shall be indicated by a "SELF TEST ABNORMAL" trouble condition at the panel.

i. Each sensor shall be capable of being individually set for percent smoke, time of day for percent, and multiple threshold settings.

2. ADDRESSABLE PULL STATIONS

a. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the stations. They shall be manufactured from ABS plastic with raised white lettering and a smooth high gloss finish. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations shall be normally open, single action manual stations.

b. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset will not be accepted.

c. The addressable manual station shall be capable of field programming of it's "address" location on all addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.

d. There shall be no limit to the number of stations, detectors, or zone adapter modules, which may be activated or in alarm simultaneously.

3. AUTOMATIC HEAT SENSOR

a. Device shall be combination rate-of-rise/fixed temperature sensor of which both operations are self-restoring. The temperature shall be field selectable. Auxiliary contacts shall be provided and wired to the elevator controller where shown as heat detectors with elevator shunt trip contacts.

4. HORNS

a. The horns shall be polarized and shall be operated by 24 VDC. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall not be accepted. The alarm horns shall be suitable for rear mounting behind audio-visual assemblies which shall be flush mounted with AV backboxes and flush trim ring. The white lexan lens shall have the words `FIRE' in red lettering on the sides and shall be pyramidal in shape to allow for side viewing. All outdoor alarm signals shall be horn only, mounted a minimum of 8' above grade in a weatherproof box.

b. Minimum dB: 87 dB at 10 feet not to exceed 120 dba.

5. VISUAL FLASHING LAMPS (XENON STROBE)

a. Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state. These devices shall be UL listed and be capable of either ceiling or wall mounting. The lexan lens shall be pyramidal in shape to allow better visibility. Separate alarm indicating circuits shall be provided for strobes. The maximum strobe pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent. The flash rate shall be at least 1 Hz but not to exceed 2 Hz. Strobes shall be provided in accordance with the latest applicable version of NFPA 72 and the candela rating of strobes provided shall be sized to meet the room requirements. All visual alarms shall be mounted 80 inches above the finished floor, or six inches below the ceiling, whichever is lower. All visual indicating appliance output levels will be sized per NFPA 72, Chapter 6. Submitted shop drawings shall show output levels per each strobe.

6. COMBINATION ALARM UNIT

a. Provide Manufacturer's heavy duty construction combination horn and strobe (white lens) unit. Horns shall be listed for fire alarm use by Underwriter's Laboratories, Inc. The alarm signals shall be semi-flush mounted at the locations indicated on the plans. All outdoor alarm signals shall be horn only, mounted in a weatherproof box. All alarms shall be intermittent.

b. All audible alarms must be 15 dba above ambient or exceed any maximum sound level for 60 seconds by 5 dba, whichever is louder. Sound levels not-to-exceed 120 dba.

7. DUCT DETECTOR

a. Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Detector shall include relays as required for fan shutdown.

b. The addressable duct smoke sensors shall operate on the light scattering, photo-diode principle, and shall communicate actual smoke chamber values to the system control. The sensors shall not have a self contained smoke sensitivity setting and shall automatically communicate actual smoke chamber values to the system control unit. The sensor's electronics shall be shielded to protect against nuisance alarms from EMI and RFI.

c. The duct housing shall provide an auxiliary alarm relay with two "Form C" contacts rated at 2A @ 28 VDC or 120 VAC resistive. This auxiliary relay operates when the sensor reaches its alarm threshold, or when the control unit via software control, manually or automatically operates the relay in response to inputs from other devices.

d. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.

e. Each duct detector shall have a Remote Test Station with an alarm LED and test switch. Locate all test stations in mechanical rooms serving same and label all stations with an affixed nameplate indicating AHU number and supply/return as applicable.

2.05 NETWORK

A. The system must provide communication with initiating and control devices individually, and other control panels. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

1. Alarm

2. Trouble

3. Open

4. Short

5. Device missing/failed

B. All addressable devices shall have the capability of being disabled or enabled individually.

C. Up to 127 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.

D. The communication format must be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.

E. Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping and the addition of an addressable device between existing devices required reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.

2.06 REMOTE ANNUNCIATOR PANEL (FARA)

A. Where shown on the plans, provide and install a serial LED annunciator. The annunciator(s) shall have a beige enamel finish and shall provide one alarm lamp and one trouble lamp per initiation device circuit. The annunciator shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24 VDC and be fused at the control panel and emulate all of the control/annunciation functions of the control panel.

B. The serial annunciator shall provide a common alarm and trouble circuit consisting of, but not limited to, the following:

1. Control pushbutton switches for: alarm silence, trouble silence, system reset, and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.

2. Tone Alert—Duplicates the control panel tone alert during alarm and trouble conditions.

3. System trouble LED.

4. Power ON LED.

2.07 BATTERY BACK-UP

A. The system shall be battery back-up for 24 hours with five minutes of alarm capabilities (per NFPA 72).

2.08 LIGHTNING PROTECTION

A. Provide Isolated Loop Circuit Protectors.

B. Provide lightning protection at all points entering and leaving each building and at the FACP and FATC locations shown on drawings. (EDCO)

C. Loop protection shall be manufactured and listed for use with the fire alarm system.

D. Provide AC surge protection on power feeding the panel.

PART 3 EXECUTION

3.01 INSTALLATION OF FIRE ALARM SYSTEM

A. Install fire alarm system as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECAs "Standard of Installation."

B. Wiring Systems and Materials

1. Wiring shall be in accordance with requirements of the National Electrical Code and NFPA Regulation 72. The fire alarm system, including components and wiring shall be completely installed and wiring shall be properly tagged and color coded. The Electrical Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions.

2. Use 14 AWG minimum size conductors for fire alarm detection/initiating and signal circuit conductors. Install wiring in conduit along with continuous ground wire. Provide wiring of adequate size to prevent voltage drop. Submit load calculations for each signal circuit and zone circuit indicating actual voltage drop and proper size conductors.

3. Color Code—the color codes of the fire alarm cabling shall conform with the following:

   a. Horn—Red (+) and Black (-).

   b. Pull Station/Heat/Smoke Detector—Blue and Yellow.

   c. Fan Shut-down/Door Release—White.

   d. Visual Flashing Lamps—Purple and Orange.

4. All junction box covers shall be painted red and all lengths of conduit shall have at least one red stripe.

5. Shutdown relays and control equipment shall be mounted within three feet of controlled device. Label all fan shutdown relay modules with an affixed nameplate. Relays to be located directly adjacent to motor starters.

6. Visual flashing lamps shall be wired on a separate circuit from horns and other indicating and initiating devices.

7. Horn and strobe appliance circuits shall be loaded a maximum of 70% of the circuit's operating capacity.

8. Power supplies to be provided with a minimum 30% spare capacity.

3.02 QUALITY ASSURANCE

A. NEC Compliance—Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.

B. UL Compliance and Labeling—Provide fire alarm and detection system components which are UL listed and labeled. Installation is to be by a UL listed installer.

C. Miscellaneous Compliance—The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and complying with all applicable portions of the NECAs "Standard of Installation" and all local codes and ordinances.

3.03 FIELD QUALITY CONTROL

A. Inspect relays and signals for malfunctioning, and where necessary adjust units for proper operation to fulfill project requirements. Any final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of fire alarm and detection system equipment. The Manufacturer's representative shall perform a quality inspection of the final installation and, in the presence of the Electrical Contractor, fire marshal and Owner's Representatives, shall perform a complete functional test of this system. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

B. Testing: The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's form and National Fire Protection Association Standard 72. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed and functions and conforms with these specifications.

3. Tests of individual zones, as applicable.

4. Serial numbers, locations by zone and model number for each installed detector.

5. Response time on thermostats and flame detectors (if used).

6. Technician's name, certificate number and date.

7. Voice Evacuation Speaker Audible Intelligence Testing: This test shall be accomplished with audible intelligence meter on a 10 foot by 10 foot grid over the entire floor space of the areas covered by voice evacuation. All readings shall exceed the equivalent of a Common Intelligibility Scale (CIS) score of 0.70. These grid locations and readings shall be recorded in a graphic document and shall be included in the overall fire alarm testing report package.

C. Documentation: After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the Owner.

1. A copy of the test report described in this specification and a Certificate of Compliance prepared as per National Fire Protection Association Standard 72 Chapter 2, Section 2-2.4, and State Fire Marshal's Rule 4A-48 to be complete at final test.

2. Affixed to FACP a standard service tag, as described in rule 4A-48 for fire alarm contractors by the Office of the State Fire Marshal.

3. Final tests and inspection shall be held in presence of the Owner and Engineers' representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.

4. To assure that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100% of devices being in alarm or operated simultaneously, this test shall include the following:

5. Place all sensors and monitor modules in alarm. Each shall display it's address or zone and alarm condition. At least the first five devices on each circuit shall also have their alarm LEDs lighted.

6. Operate all control modules for the alarm or operated condition. Each module shall display it's address and condition.

7. Reset all alarmed and operated devices. The panel shall display the address or zone of any off-normal devices.

8. Test a representative number of sensors for alarm verification by momentarily testing for alarm. The sensor shall not initiate an alarm. Then, test by placing the sensor in alarm such that it remains in alarm for the selected verification time. The sensor shall initiate an alarm.

9. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 day test period without any unwarranted alarms. Should unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another 90 day test period. As required by the Engineer, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the Owner has obtained beneficial use of the building under tests.

10. If the requirements provided in the paragraph above are not completed within 30 days after beginning the tests described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Owner.

11. The Contractor shall provide three sets of signed and sealed submittals to be accepted upon the Engineer's approval.

12. A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.

13. Individual factory issued manuals containing all technical information on each piece of equipment installed. In the event that such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

14. One copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins.

15. A training session, for personnel selected by the Owner, shall be presented by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

16. Provide a written description of standard control panel functions and user instructions at each FACP. These instructions shall be written in standard laymen's English so that an unfamiliar operator can accomplish basic functions such as reset.

3.04 LIGHTNING PROTECTION

A. Isolated Loop Circuit Protector (ILCP)

1. Furnish and install an isolated loop circuit protector device on all fire alarm (initiating device circuit), (signaling line circuit), (audio riser), (telephone riser or circuit) wiring, (including shields), which extends beyond the main methods (walkways, bridges, or other above ground connectors).

2. The ILCP shall be located as close as practical to the point at which the circuits leave or enter a building.

3. The ILCP grounding conductor shall be a No. 12 AWG wire having a maximum length of 28 feet to be run in as straight a line as practical and connected to a building ground electrode system (unified ground) per the (1987) National Electrical Code.

4. The ILCP furnished shall have a line to line response time of less than one nanosecond capable of accepting greater than 2,000 amps (35 joules each line) to earth. Shield to earth current shall be 5,000 amps maximum.

5. The ILCP shall be protected by a high dielectric insulating material and of small enough size to mount in a standard 4" square 2-1/8" deep electrical box.

6. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

B. Provide Ditek DTK Series or equivalent Isolated Loop Circuit Protectors.

3.05 SYSTEM GUARANTEE

A. All components, parts, and assembles supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months commencing the date of Final Acceptance by the Fire Department or Substantial Completion, whichever is later. Warranty service shall be provided by a qualified factory-trained representative of the equipment manufacturer during normal working hours. The representative must be able to respond to warranty calls within 12 hours, including weekends, of notice whether oral or written.

B. Provide, within one year after final acceptance, testing as per National Fire Protection Association 72, which shall consist of:

1. Regularly and systematically examine, adjust and clean all the electrical and mechanical components of waterflow switches, as required by code.

2. Test and Written report which certify that all initiating devices have been tested and which indicate the result of the inspection.

***** END OF SECTION *****

SECTION 16723

SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System Devices.

B. Cabling/Rack.

C. Equipment Mounting/Cross Connect.

D. System Testing.

1.02 RELATED SECTIONS

A. Section 16120 ..... Building Wire and Cable.

B. Section 16130 ..... Boxes.

C. Section 16195 ..... Electrical Identification.

1.03 SCOPE OF WORK

A. This project provides for a complete surveillance system.

B. Contractor shall be responsible for providing a complete, functional surveillance system (per this document's intent), whether ancillary devices/components are included in this specification or not.

C. Contractor shall provide labor and any incidental material required for installation. All new cable shall be terminated by this Contractor. Upon completion of installation, Contractor shall test the system and record the test results.

D. The work performed under this specification shall be of good quality and performed in a professional manner. In this context, "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner/Engineer reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

E. This Contractor shall provide all related surveillance system devices. Coordinate all requirements with other trades prior to submitting shop drawings.

F. This specification is specifically applicable to Division 16 Sections, in addition to Division 1—General Requirements, General Conditions, and Supplementary General Conditions.

1.04 APPLICABLE STANDARDS

A. NEC (NFPA) ..... National Electric Code (National Fire Protection Association)

B. ANSI/EIA/TIA ..... Electronic Industry Association

C. NEMA ..... National Electrical Manufacturers Association

D. UL ..... Underwriters' Laboratories UL 294, UL 639, and UL 1037, UL 1076

E. ASIS ..... American Society of Industrial Security

F. FCC ..... Federal Communications Commission 47 CRF Part 15 and 90

G. BICSI ..... TIA/EIA 568-C.0, C.1, C.3; TIA/EIA 569-B; TIA-EIA 606-B, as well as IEEE 802.3 FOIRL, IEEE 802.3 10BASE-F, IEEE 802.3 1000BASE-SX/LX, and IEEE 802.3z.

H. Applicable Federal, State, and Local Laws, Regulations, and Codes

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in this type of system, with five years documented experience. Installing and servicing office to be located within a 75 mile radius of the job site.

B. Installer: Company, specializing in this type of system, with five years experience, certified by Florida State Licensing Board as an installing contractor. The installer shall be factory authorized service representative (submit certification number) and show evidence of having successfully completed at least three similar projects in the local area, each having an installed service period of three years minimum of satisfactory performance.

C. The Contractor shall show evidence upon request that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system, including a stock or replacement parts. Replacement parts shall include at least one of every device used on the system to include control panels.

D. The Contractor shall be prepared to offer a service contract for the maintenance of the system after the warranty period.

1.06 DEFINITIONS

A. Building Distribution Frame (BDF), Main Distribution Frame (MDF), Communications Equipment Room (CER), Telecommunications Room (TR), or Main Cross-Connect (MXC or MCC).

B. Provide means to provide and install.

1.07 PRE-BID SUBSTITUTIONS

A. Under provisions of Division 1 and Section 16010.

B. Submit any requests for substitutions or deviations prior to bid opening. Only those requests that are complete and approved by the Engineer in written Addendum form shall be accepted.

1.08 SHOP DRAWING SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. The following items shall be submitted to the Engineer for review and approval. Submittals shall included, but not be limited to:

1. Spreadsheet with product numbers and quantities marked for all equipment.

2. Specifications and data sheets for each item.

3. Scaled layout of mounted equipment showing locations and relationship for equipment location.

PART 2 PRODUCTS

2.01 DIGITAL VIDEO RECORDER (MULTIPLEXER/RECORDER)

A. Provide rack mount, digital, 8 channel, color multiplexer/recorder with high density drive to comply with the following specifications in required quantities and include the following features:

1. Video compression: H.264.

2. Shall be able to set separate recording rates, mode, and image quality for each camera.

3. Watermarking.

4. Recording modes: Schedule, Motion, Alarm, continuous.

5. Pre-alarm (up to 30 seconds).

6. Daylight Saving Time.

7. One button Archive: Export video/audio built-in CD/DVD burner or USB devices (USB flash drive or HDD).

8. IR remote control.

9. Shall e-mail notification up to two users upon alarm, video loss, record status, etc.

10. Shall be duplex configuration (i.e., capable of simultaneous recording and playback).

11. Shall be provided with all required software installed (GE NAV 3.1 or most recent).

12. Shall have an offline player that runs on standard Windows PC with USB Drive; player page with 1, 2, 4, 8 camera viewing; and video for offline analysis.

13. Acceptable Manufacturers:

    a. UTC Fire & Security, GE Security (GES) TruVision, Model TVR-3108-2T.

    b. Pre-Approved Equal.

B. Provide laptop computer for programming and use by Owner. Laptop to be Panasonic CF31 i5 Model or pre-approved equal with the following: Operating System - Windows® 7 Professional 64-bit; Processor - Intel® Core™ i5-3360M vPro™ - 2.8GHz with Turbo Boost up to 3.5GHz – Intel Smart Cache 3MB; Memory - 4GB SDRAM (DDR3L-1333MHz); Internal Drive - 500GB, 7200 RPM; and 3/3/3 years Parts/Labor / On-Site Warranty. Install Owner provided software and necessary software for interface with equipment. Provide miscellaneous connection cabling in quantities, as necessary. Provide UNIT PRICE for the deletion of this laptop computer and programming from the GMP allowance at the Owner's discretion.

2.02 UPS—UNINTERRUPTIBLE POWER SUPPLY

A. Provide rack mounted UPS unit to allow for continued system function in the event of loss of facility power (APC Model SUA750RM2U). Battery shall be maintenance-free sealed, leak proof, Lead-Acid battery with suspended electrolyte.

B. UPS units shall be connected to:

1. Multiplexer/Recorder.

2. Video Switch.

3. Power supplies.

C. The number and size of UPS units shall be as verified to allow full function of the system for a minimum of 20 minutes after loss of power to switch over to emergency power or to shut down. Submit battery calculations with equipment data and shop drawings.

D. Provide two replacement batteries for storage at site and use by Owner.

2.03 MONITORS

A. Monitors: Provide two, wall mounted, flat screen, public display, color viewing LCD monitors, in locations noted on drawings. Monitors shall be full screen and full screen programmable sequencing of camera views. Number of cameras that can be viewed on the monitor shall be definable, options are all cameras or selected cameras. All the cameras shall be viewed by default. Provide signal splitter.

1. Acceptable Manufacturers:

a. Pelco PMCL524FL Flat Panel LCD Monitor. In Day Room, provide tilt wall mount (Pelco PMCL-WMF). In Office, countertop mount using included stand.

b. Pre-Approved Equal.

2.04 CAMERA/LENS

A. **Unit Price**: Provide Unit Price for the addition or deletion from the GMP allowance for each of the specified camera/lens/enclosure types to include cabling including space on multiplexer and patch panel allowance (i.e., power and coaxial and control if applicable).

B. All camera locations shown on the drawings are approximate locations. Cameras shall have approximately 20 feet of cable slack so that the camera location can be adjusted at time of installation. Final locations are to be verified prior to installation.

C. Exterior: Exterior Fixed Cameras/Lens and Enclosure shall be:

1. 1/3 HAD CCD Configuration.

2. Vandal/Weather Resistant with Polycarbonate Dome.

3. Minimum Color and True Day/Night 540 TVL, Wide Dynamic Range.

4. Powered by 24 VAC.

5. Provide NTSC camera with 0.5 Lux, F1.2, 2.8-10.5, Varifocal Autoiris lens.

6. Shall have BNC Video Output.

7. Shall have Autotracking White Balance.

8. Provide a high resolution, low voltage, fixed position, color camera with dome housing and Wall/Ceiling, Corner, Pendant, or Extended Pendant mount options. Coordinate with drawings and field conditions to determine exact mount type prior to submitting equipment data and shop drawings. Indicate mounting type on shop drawings for each camera.

9. Acceptable Manufacturer: Interlogix Ultraview Model UVD-XP4DNR-VA2.

D. Exterior PTZ: Exterior Camera/Lens and Enclosure shall be:

1. 1/4 HAD CCD Configuration.

2. Day/Night.

3. Minimum 540 TVL Resolution.

4. Powered by 24 VAC.

5. PTZ Cameras: Provide a low voltage, PTZ, day/night camera with weatherproof and tamperproof outdoor rated housing with opening cover for exterior application. See drawing for mounting configuration. Provide appropriate housings, adapters, and/or hardware.

6. Acceptable Manufacturer: Interlogix Ultraview UVP-x4-D27N.

7. PTZ Control System: - Provide multi-speed controller keypads (KTD-405, one in Office and one in Day Room), data signal distributor (KTD-83 with power transformer, as necessary, in BDF), and associated cabling for control of PTZ cameras, as needed to support installation.

E. Spares: Provide one, additional camera/lens/enclosure of the PTZ unit and one, additional camera/lens/enclosure of the fixed unit. All items are to be stored on the site in a secure location for use throughout the warranty period. Any time throughout the warranty period that one of the spares needs to be utilized to keep the system operating, this Contractor shall replace that item. At the end of the warranty, the spares shall be turned over to the Owner.

2.05 CCTV SURGE PROTECTION

A. Provide silicon surge protection for all exterior, building-mounted cameras. Ground wire shall be grounded directly to the metal chassis of equipment being protected. Equipment chassis shall be connected to the earth through a properly grounded AC power receptacle.

B. Exterior, fixed camera protectors shall have a response time of less than five nanoseconds with no more than a -0.5 insertion loss at 40 MHz (Transtector TCP Series for CCTV).

C. Exterior, PTZ camera protectors shall have a response time of less than five nanoseconds (Transtector CCTV PTZ for CCTV).

2.06 CAMERA POWER SUPPLY (LOCATED IN MDF)

A. Provide indoor power supply approved for use with CCTV camera systems (GES/Kalatel Model #KTP-24-8 and KTP-00-24 if rack mounted).

B. Provide in sufficient quantities, as depicted in drawings.

C. Provide mounting configuration hardware, as depicted in drawings.

D. Power supply shall have capacity to provide a minimum of 750 ma to each output.

2.07 SURVEILLANCE SYSTEM CABLING

A. This Contractor shall furnish and install the surveillance system (CCTV) cable. Route all surveillance cable in Category rated J-hooks. Route camera power so as not to interfere with the video or data signals.

B. This Contractor shall terminate cables at locations designated on drawings. Homerun cables from each camera to the BDF.

C. For each fixed cameras, provide the following wire types:

1. Power: 16 GA, 2 conductor stranded CPR (West Penn Model #225).

2. Signal: RG-6 CCTV coax cable (18 AWG, solid copper center conductor with foam polyethylene jacket, dielectric 75 ohm impedance, 95% bare copper braided shield) (West Penn Model #806).

D. For each PTZ cameras, provide the following wire types:

1. Power: 16 GA, 2 conductor stranded CPR (West Penn Model #225).

2. Signal: RG-6 CCTV coax cable (18 AWG, solid copper center conductor with foam polyethylene jacket, dielectric 75 ohm impedance, 95% bare copper braided shield) (West Penn Model #806)

3. Control: Category 6 cable (Mohawk: 6 LAN™ Category 6, #M58281)

2.08 SURVEILLANCE EQUIPMENT RACK

A. Wall-mount rack shall be height, as specified, and provided with EIA 19" mounting. In location indicated on drawings, securely mount designated wall-mount rack. Rack shall be constructed of extruded aluminum or cold rolled steel with standard EIA hole pattern on front and rear. Finish shall be anodized black. Provide rack with the following accessories/features:

1. Connect separate, solid, #4 AWG, insulated, grounding wire between the ground bus and the building's grounding system.

2. Provide rack with mounting hardware and all accessories required to complete installation of the rack. Provide support for each rack, as required, and factory finished backer board, as indicated on drawings and as manufactured by Pathway & Spaces, Inc. Backboard Kits or pre-approved equal.

3. Provide Velcro tie wraps for cable management within rack. Nylon tie wraps shall not be used within rack.

4. Provide rack-mounted, six position power strip with circuit breaker and surge suppression. Coordinate electrical service requirements with Division 16 Contractor.

5. Approved Manufacturers - Wall Mount Rack

a. Cooper B-Line #E2WM242424PB.

b. Pre-Approved Equal.

2.09 EQUIPMENT MOUNTING

A. Equipment shall be installed in designated rack or rack area identified on drawings. Provide layout prior to installation for coordination with existing equipment.

B. Any mounted equipment shall be organized and supported so that cable weight is not transferred to connectors and/or system devices.

C. Provide shelving to accommodate equipment that cannot be rack mounted.

D. Mount equipment with space to facilitate air circulation.

2.10 LABELING

A. Each cable shall be labeled with a unique, type written identifier. All system components shall be labeled, including cabinets, patch panels, individual ports in each patch panel, etc.) The system identification administration shall meet the requirements of EIA/TIA 606.

B. Label cameras on screen per Owner's requirements.

2.11 MISCELLANEOUS EQUIPMENT

A. As per the needs of the installation, miscellaneous equipment shall be provided at the Contractor's expense. It is the Contractor's responsibility to identify and bid all miscellaneous equipment necessary to provide a complete and properly functioning system.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall follow established guidelines for installation and termination of all cabling and equipment as established in Part 1 of this Specification.

B. Work shall be of professional quality and shall not detract from the aesthetic qualities of the facility. Contractor shall ensure that the site is clean of construction debris prior to leaving the site unsupervised at the end of every work day.

3.02 INSTALLATION OF SURVEILLANCE SYSTEM

A. Install surveillance systems as indicated, in accordance with equipment manufacturer's written instructions.

B. Contractor shall provide all equipment required for the installation of the surveillance system.

3.03 PENETRATIONS

A. Fire penetrations: Fire stop all fire penetrations I.A.W. published UL standards. It is this Contractor's responsibility to identify fire walls.

B. Masonry penetrations: Masonry penetrations to install materials shall be saw-cut for square or irregular penetrations, masonry drilled for round penetrations 1" diameter or less, or core drilled for round penetrations larger than 1" diameter. Under no circumstances shall masonry penetrations be chipped or hammered.

C. Provide necessary sleeves and chases where conduits pass through walls. Wall sleeves shall be installed above ceiling and be supported on both sides of the wall with strut and beam clamps. Ream and bush both sides of sleeves.

3.04 PAINTING OF DAMAGED AREAS

A. Raceways, conduit supports, hangers, and surface raceway, where exposed, shall be painted to match mounting surface or surrounding surfaces. Panels and equipment with damaged painted surfaces shall be refinished to previous conditions.

3.05 COMPLETION AND TESTING

A. Furnish to the Owner, a written report which certify that all devices have been tested and which indicates the result of the inspection. Additionally, furnish to the Owner, three sets of Operation and Maintenance manuals with parts list and other information necessary for the proper operation and maintenance on the system, as installed. Include three copies of complete troubleshooting and repair manuals. Provide Owner with a CD-ROM copy and two printed copies as-built drawings indicating location of conduit, junction boxes and equipment.

B. Upon completion of installation, system shall be completely checked-out and tested by a factory-authorized representative, to determine that the system was tested and installed in accordance with the manufacturer's instructions and all applicable codes. Results of the check out and testing shall be reported in writing to the Engineer. The written report shall precede or accompany the Contractor's request for acceptance inspection for work under this Section. This representative shall prepare an inspection report for the Owner and instruct the Owner's personnel in the operation of the system.

C. All initial software programming shall be provided.

D. The Contractor, at no cost to the Owner, shall immediately replace all equipment, devices, and/or work found to be defective.

E. Contractor shall turn over a turnkey security system programmed with Owner access codes, passwords, etc.

F. Site Test:

1. Check and test installation for shorts, ground, and circuit continuity.

2. Cables: Test free from opens, grounds, or crosses (shorts) between conductors.

3. Test cameras and recorder for proper function and operation.

4. Test all functions on system for proper functions and operations.

5. Verify signals are properly received.

G. Contractor shall finish, at completion of Contract, as-built drawings for complete system (electronic and three copies). Such drawings must include at a minimum:

1. Layout diagrams with appropriate interconnection information.

2. Complete cable routings and locations of all devices pertinent to the operation and maintenance of the system.

3.06 TRAINING

A. Provide eight hours total, broken up as designated by Owner, at the site with the Owner's maintenance staff and designated staff on the operation, maintenance, troubleshooting, and repair of the system. Training shall be certified by the manufacturer. Training shall take place at time of Substantial Completion. Obtain a signed roster of all personnel that attends the training sessions and submit a copy of the roster to the Engineer and the Owner.

3.07 WARRANTY

A. Provide warranty response information inside system panel.

B. Equipment, parts, and labor shall be warranted to be free from defects in material and workmanship for a period of one year from date of substantial completion and acceptance of system by Owner.

C. Warranty shall include damage from lightning and transients for a period of one year.

D. Contractor shall arrive on site within four normal business hours to repair system under warranty. All repairs shall be completed within 24 hours. Failure to respond in time specified shall result in the Owner making repairs and charging warrantor and shall not affect the warranty.

E. Equivalent loaner equipment with same functions and features will be accepted if system is completely inoperable.

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SECTION 16724

ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Software.

B. System Devices.

C. Cabling.

D. Equipment Mounting.

E. System Testing.

1.02 RELATED SECTIONS

A. Section 08710 ..... Door Hardware.

B. Section 16120 ..... Building Wire and Cable.

C. Section 16130 ..... Boxes.

D. Section 16195 ..... Electrical Identification.

1.03 SCOPE OF WORK

A. This project provides for a stand alone access control system. System shall have capability to be connected with other County systems if desired in the future. It is the intent for the central system at Hanna Road Facility to issue any cards to be used at this site.

B. Contractor shall be responsible for providing a complete, functional access system, whether ancillary devices/components are included in this specification or not.

C. Contractor shall provide labor and any incidental material required for installation. All new cable shall be terminated by this Contractor. Upon completion of installation, Contractor shall test the system and record the test results.

D. The work performed under this specification shall be of good quality and performed in a professional manner. In this context, "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner/Engineer reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

E. This Contractor shall provide all related access system devices. Coordinate all requirements with other trades prior to submitting shop drawings.

F. This specification is specifically applicable to Division 16 Sections, in addition to Division 1—General Requirements, General Conditions, and Supplementary General Conditions.

1.04 REFERENCES

A. ANSI A117.1 – Latest Edition - American National Standard for Building and Facilities Providing Accessibility and Usability for Physically Handicapped People.

B. NEC Article 760—Fire Protective Signaling Systems.

C. Americans with Disabilities Act.

D. Applicable Florida Building Code, FCC, NEC, IEEE, NEMA, and WZA codes.

E. UL 294, Standard for Access Control System Units.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in this type of system, with five years documented experience. Installing and servicing office to be located within a 75 mile radius of the job site.

B. Installer: Company specializing in this type of system, with five years experience, certified by Florida State Licensing Board as an installing contractor. The installer shall be factory authorized service representative (submit certification number) and show evidence of having successfully completed at least three similar projects in the local area, each having an installed service period of three years minimum of satisfactory performance.

C. The Contractor shall show evidence upon request that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system, including a stock or replacement parts. Replacement parts shall include at least one of every device used on the system to include control panels.

D. The Contractor shall be prepared to offer a service contract for the maintenance of the system after the warranty period.

1.06 DEFINITIONS

A. Building Distribution Frame (BDF), Main Distribution Frame (MDF), Communications Equipment Room (CER), Telecommunications Room (TR), or Main Cross-Connect (MXC or MCC).

B. Provide means to provide and install.

1.07 PRE-BID SUBSTITUTION REQUESTS

A. Under provisions of Division 1 and Section 16010.

B. Submit any requests for substitutions or deviations prior to bid opening. Only those requests that are complete and approved by the Engineer in written Addendum form shall be accepted.

1.08 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. The following items shall be submitted to the Engineer for review and approval. Submittals shall included, but not be limited to:

1. Spreadsheet with product numbers and quantities marked for all equipment.

2. Specifications and data sheets for each item.

3. Scaled layout of mounted equipment showing locations and relationship for equipment location.

PART 2 PRODUCTS

2.01 ACCESS MICRO-CONTROLLER PANEL

A. Provide user-configurable micro-controller for access control and alarm system. Controller shall serve as the interface between software and card readers/keypads, alarm inputs and outputs using 10/100 MB Ethernet. Provide distributed processing for independent operation of the host system computer. The microcontroller shall respond to door control and alarm inputs so that the host computer shall be free to perform functions such as alarm response, database updates, and reporting.

B. Provide enclosure with a hinged front door to house micro-controller panel to supports a fixed configuration of four card readers, 10 alarm inputs, and eight relay outputs. Enclosure shall include an internal power supply with battery backup. A green LED shall be provided on the exterior of the panel enclosure for visual verification of panel power.

C. All inputs shall have transient voltage protection for maximum reliability. Non-isolated inputs shall be unacceptable. Each connected reading device shall have its own buffered power source or shall be powered via the Panel. The shorting and/or manipulating of the reader wires shall not have an adverse effect on any other reader on the system. It shall not be possible to cause a controlled door to open by tampering with the reading device or its wires.

D. The panel shall have a dedicated input point for a panel tamper switch, which shall monitor whether the panel-enclosure door is open or closed. A "Tamper Switch Alarm" transaction shall be generated in the system when the panel-enclosure door is opened and a "Tamper Switch Normal" transaction shall occur when the door is reclosed. Systems requiring use of one of the available system alarm input points for monitoring the security of the panel enclosure door shall be unacceptable.

E. The badge capacity shall be 128,000, Offline Badge History Capacity shall be 8,192, and Offline Alarm History Capacity shall be 8,192. Capacities shall be able to be re-allocated between offline badge and offline alarm histories.

F. A reset switch/button, on the exterior of the enclosure, shall be provided to restart the program in the panel. Pressing the reset switch/button shall function like rebooting a computer and shall NOT erase any panel memory.

G. Cabling shall be per manufacturer's requirements. The communications line shall be supervised and shall alert the operator of any changes. Two LEDs shall indicate communications between the Remote Input/Output Boards and the Panel: a green LED shall indicate RS-485 transmissions from the panel to the Remote Input/Output Board and a red LED shall indicate RS-485 transmissions from the Remote Input/Output Board to the panel.

H. The panel shall incorporate a rechargeable battery to provide full functionality for the panel, readers and system communications for up to 12 hours in the event of a power failure. Provide a visual message on the system's PC monitor when the panel has lost AC power and is running on battery backup. When AC power is restored, provide a visual message. In normal operation, the battery shall be kept fully charged and its condition supervised and displayed by the system. Provide a visual warning on the system's transaction screen if the panel has lost AC power and has nearly exhausted its battery. Allow approximately 20 minutes of power before the panel will stop running after the "Battery Low" warning appears.

I. A lithium battery shall provide memory backup for at least 30 days in the event of a total power failure.

J. Contractor shall establish communication between Fire Station and the Owner's main facility in order to manage the database.

K. Equipment shall allow for upgrading.

L. Acceptable Manufacturers: GE Micro 3000 PXNplus, 110 VAC, 10/100 MB Ethernet) with Reader Board 8RP110100501.

M. Power Supply/Charger

1. The Panel shall be powered by 12 VDC power transformers plugged into 115 VAC filtered outlets.

2. Upon failure of normal power to the Panel, the Panel shall be temporarily powered from four to six hours by a backup 12 VDC gel-cell battery. The transition to the battery backup power shall be automatic to prevent the loss of transactions or notification of any alarm, trouble or operator acknowledgment signals during the transition. Readers shall be temporarily powered by the backup battery. Readers and other peripheral devices with separate power supplies shall not be provided backup power via the panel backup battery. The duration of operation shall be a function of the number of equipment connected to the panel and the individual power requirements of that equipment.

3. Panel backup batteries shall be continuously monitored by the system. The system shall notify system users of low-battery conditions via a transaction displayed on User Interfaces that identifies the panel with the failing battery. The backup batteries shall be on continuous charge while connected to their associated panels.

4. Panel memory shall be maintained for 30 days by a lithium battery installed on the panel, preserving stored transactions and database information.

5. Provide uninterruptable power sources (UPSs) with the server and client computers used in the system.

6. Acceptable Manufacturers: Altronix AL400ULACMCB Power Supply with Ultratec IM-1270 Batteries, quantities as required (no less than four).

2.02 SECURITY MANAGEMENT SOFTWARE

A. Provide Microsoft Windows based integrated security management software and associated licensing. Software shall provide access control and alarm management.

1. Acceptable Manufacturers:

a. UTC Fire & Security, Facility Commander for Windows WX70PRO-16CAPMIC.

B. User Interface

1. The User Interface shall incorporate a menu bar with drop-down menus and display icons for full system setup and operation. This menu and these icons shall offer, to system users, complete access on one screen to all system functions and system setup parameters to which the users have rights. Users shall be able to design, store and display multiple, individually created screens. The background and text colors for all transaction-display screens shall be customizable and it shall be possible to apply filters to display only selected transactions on a transaction-display screen.

2. The screen layouts shall provide for viewing system cardholder activity; monitoring and acknowledging alarms; and monitoring and controlling input points, relays and door configurations. Capability to include a site tree in any layout for displaying system setup and configuring system parameters shall be provided. It shall be possible to create tabbed windows in the screen layout to conserve desktop space in the viewing area without in any way restricting the availability of information that can be displayed for the user. Provide dynamic mapping for incorporation of any screen design viewers used.

3. Screen layouts shall be assignable to system users for automatic display when the user logs in. It shall be possible to define default screen layouts that always appear when a user logs onto the system or, if desired, whenever a user logs off the system. The system software shall allow an authorized user to select an appropriate screen layout from a menu on a per-client interface basis.

4. This Contractor shall install software on Owner provided equipment and ensure operability.

C. Panel List - A System Panel's list window shall be available to allow Panels to be edited, moved, or deleted within the system software. It shall also be possible to easily change the window's display to a table form that shows panel names, site panel IDs, computers, ports, panels, firmware versions, maximum card capacities, number of card records stored on the panels, whether panels are online or offline and whether they are actively polling.

D. Attendance Calculator - Provide software module to determine the dates and times that a specified cardholder entered at a Level 1 reader and later exited at a Level 1 reader over a user-selectable time period. This module then shall automatically calculate the amount of time that the specified cardholder remained in the Level 1 area of the facility.

E. User Journal - Provide system software for user journal feature that allows system administrators to track which system users made changes, additions, and deletions to system setup and cardholder records.

F. Reports

1. The software shall allow the user to print reports to the screen or to a local or network printer. When print to screen is selected, the generated report shall appear in a window with a toolbar that will allow the user to scroll to the next or a previous page, go directly to the first or last page, print the report, export the report in a selectable format and to a selectable destination, and zoom in or out on the report page. Systems unable to provide such print previewing capabilities shall be unacceptable.

2. Users shall be able to generate the following system reports:

   a. Alarm Setup Report: List all or selected alarm input points by computer, port, panel, and input point name and would report shunt time, any assigned time zone, and acknowledgement requirements and priorities.

   b. Alarm Group Report: List all alarm groups enabled on the system. The groups shall be sorted in alphabetical order by group name, listing the computer, port, panel, points, and any time zone assignment in each group.

   c. Reader Setup Report: List all or selected readers by computer, port, panel, and reader name and would report associated relays and input points, anti-passback information, time zone controls, keypad settings, valid site codes, and any necessary ABA settings.

   d. Reader Group Report: List all reader groups alphabetically by group name and show the computer, port, panel, and included readers for each group.

   e. Relay Setup Report: List all or selected relays alphabetically by computer, port, and panel and would report relay names, any associated time zones, pulse times, linked relays, link actions, and whether first card unlock is enabled.

   f. Relay Group Report: List all enabled relay groups alphabetically by group name and would report the computer, port, and panel, included relays and any time zone assignment for each group.

   g. Holiday Report: List the holiday number, date, and name for all holidays enabled on the system.

   h. Time Zone Report: List all time zones by time zone ID and would report the time zone name, start and stop times, days of operation, whether holiday operation applies, and any linked time zones.

   i. Door Setup Report: Llist all or selected doors by computer, port, panel, and door name and report associated readers, relays, and input points.

   j. Door Group Report: List all door groups alphabetically by group name and would show the computer, port, panel, and included doors for each group.

k. Cardholder Report: List cardholders as a result of users building report filter criteria by selecting fields in the cardholder record, an operator and the desired field value for which to search. It shall be possible to create multiple search statements and combine them to provide flexible report filtering capabilities, or to choose no filters. The report shall show the card and cardholder records meeting the selected filter criteria and detail various access-control data, including antipassback status, access group assignments and data in any custom fields which the user may select for inclusion in the report. The user shall be able to sort the report in either ascending or descending order by card number, name, active/inactive status and/or expiration date. The software shall allow users to save complete Cardholder report filter criteria for easy reuse later.

l. History Report: Provide history of all events or events selected by user-designed filters. These user-designed filters shall enable customized reports by permitting selection of the following parameters: a) Start and end time and date, with the option of choosing a start time on one day and an end time one or more days later, a start and end time on one single day, or a start and end time "slice" to be viewed over a succession of days; b) Filter parameters set by selecting the report field, an operator and the desired field value to search for. The user shall be able to select transactions, readers, alarms, and relay points to incorporate into the search.

m. Journal Report: List any changes, additions, or deletions made to the system software setup or cardholder information by users, who shall be able to customize the report if desired by creating filters. The filters provided shall be: a) Start and end time and date, with the option of choosing a start time on one day and an end time one or more days later, a start and end time on one single day, or a start and end time "slice" to be viewed over a succession of days; b) Filter parameters set by selecting an action type, logon name, object name and/or object type; an operator; and a corresponding field value to search for. It shall be possible to create unlimited multiple search statements and combine them to provide flexible report filtering capabilities. The software shall allow users to save complete Journal report filter criteria for easy reuse later.

n. It shall be possible to create unlimited multiple search statements and combine them to provide flexible report filtering capabilities. The user shall be able to sort the report in either ascending or descending order by card number, name, date, and/or time. The software shall allow users to save complete History report filter criteria for easy reuse later.

G. Archiving

1. The system software shall allow the archiving of system events or transactions. The History Management module shall automatically display the date and time of the most recent and oldest transactions in the History table of the database. Users shall be able to select which transaction is to be the first and which transaction is to be the last to be archived. Users shall enter a path and filename for the archive database file (data source) they create. The progress of archiving shall be visually displayed in detail. It shall be possible to delete the transactions from the History table after the archive is created to free up server drive space for storage of new system activity.

2. Archive Reports - Provide an Archive Reports module to allow administrators and users to select the desired data source of archived history from which the archive reports is to be generated. The archive report shall provide a printout of the archived transaction database, as selected by user-designed filters. The user-designed filters shall enable customized reports by permitting selection of the following parameters:

a. Start and end time and date, with the option of choosing a start time on one day and an end time one or more days later, a start and end time on one single day, or a start and end time "slice" to be viewed over a succession of days.

b. Filter parameters set by selecting the report field, an operator, and the desired field value for which to search. The user shall be able to select transactions, readers, alarms, and relay points to incorporate into the search. It shall be possible to create unlimited multiple search statements and combine them to provide flexible report filtering capabilities. The user shall be able to sort the report in either ascending or descending order by card number, name, date and/or time. The software shall allow users to save complete History report filter criteria for easy reuse later.

H. Online Manual

1. The system software shall provide a printable online setup and operations manual selectable from the main menu of the software.

2.03 DEVICES AND ACCESSORIES

A. Systems that require factory reprogramming to add or delete devices shall be unacceptable.

B. Should a device fail, it shall not hinder the operation of other system devices.

C. A supervised wiring system shall be provided. A supervised system shall detect troubles in panel or wiring; removal or tampering of point devices; monitor either open or closed circuits; and verify system integrity.

D. Provide Request-to-Exit Motion Sensor (BOSCH DS150ITP160) to allow a person to exit an access controlled door, consistent with manufacturer's recommendations. Quantity and location shall be as indicated on drawings.

E. Electric Door Strikes – Coordinate with Architect's Hardware Schedule for door strikes. Reference drawings for locations.

F. Provide Door Contacts (GE Security 1078CWM). Quantity and location shall be as indicated on drawings.

G. Provide black, Keypad/Readers with Wiegand interface technology (GE Security T-525SW, single gang with keypad, 521211003). Quantity and location shall be as indicated on drawings.

2.04 SURGE/LIGHTNING PROTECTION

A. Furnish and install an isolated circuit protector device on all security (initiating device circuit), (signaling line circuit), (audio riser), (telephone riser or circuit) wiring, (including shields), which extends beyond the main methods (walkways, bridges, or other above ground connectors). Provide Isolated Loop Circuit Protectors: Ditec Model DTK-RJ31XSCP on telephone dialer line and DTK-4LVPSCP on initiation zones. Provide lightning protection as close as practical to the point at which the circuits leave or enter a building.

B. The CP grounding conductor shall be a No. 6 AWG wire having a maximum length of 28 feet to be run in as straight a line as practical and connected to a building ground electrode system (unified ground).

C. The CP furnished shall have a line-to-line response time of less than one nanosecond capable of accepting greater than 2,000 amps (35 joules each line) to earth. Shield to earth current shall be 5,000 amps maximum.

D. The CP shall be protected by a high dielectric insulating material and of a small enough size to mount in a standard 4" square 2-1/8" deep electrical box.

E. Spark gap devices or devices incorporated in or installed within the security control panel, in lieu of the specified CP are not acceptable.

2.05 WIRING

A. The security system, including components and wiring, shall be completely installed and wiring shall be properly tagged and color coded. The Electrical Contractor shall make final connections, as shown and required by the equipment manufacturer's wiring instructions.

B. Each device shall be homerun to the local termination cabinet per manufacturer's requirements. Multi-pair trunk cables shall be homerun from remote termination cabinets per manufacturer's requirements. Provide and label termination strips. Provide wiring of adequate size to prevent voltage drop.

C. Cables free-run in joist space shall be supported at 6'-0" intervals with bridle rings, neatly tie-wrapped and run in straight and 90 degree orientations. Cables shall not be combined with other signal system cables.

D. In other open ceiling areas, such as mechanical, electrical, or storage rooms, exposed cable runs shall be in metal raceway. At terminal boxes provide conduit sleeves down from ceiling.

E. Label all junction box covers containing security system cables. Provide service loops above all drops.

F. Provide conduit raceways to carry cables through inaccessible ceilings and above covered walkway canopies. Provide #6 ground wire in all terminal cabinets containing surge suppression.

G. Provide metal conduit sleeves properly fire stopped in fire or smoke rated walls that are penetrated by security cable runs. Provide metal conduits to stub-up from panels and terminal cabinets into ceiling spaces. All fire stopping materials shall be part of a UL Listed assembly.

H. Provide tile bridge supports for all ceiling mounted detectors.

I. Partitions and zone assignments shall be determined by the Owner and implemented by installing contractor.

J. All work shall be coordinated with other trades and the project schedule.

K. Conduits between buildings shall carry a #8 grounding conductor.

L. All cables connected to the Panels shall be 18-22 AWG, multi-conductor, jacketed, twisted cable or twisted shielded or as per manufacturer's requirements.

2.06 EXTRA MATERIALS (TO BE KEPT AT JOBSIT THROUGHOUT WARRANTY PERIOD UNDER LOCK AND KEY)

A. Provide one, extra expansion board.

B. Provide one, extra reader.

C. Spares are considered to be the property of the Owner and are to be replaced in working order by the Contractor if used throughout the warranty period. Spares are to be available on site and shall be turned over to the Owner prior to the Final Substantial Completion Inspection for Owner use.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall follow established guidelines for installation and termination of all cabling and equipment as established in Part 1 of this Specification.

B. Work shall be of professional quality and shall not detract from the aesthetic qualities of the facility. Contractor shall ensure that the site is clean of construction debris prior to leaving the site unsupervised at the end of every work day.

3.02 INSTALLATION OF ACCESS CONTROL SYSTEM

A. Install access control systems as indicated, in accordance with equipment manufacturer's written instructions.

B. Contractor shall provide all equipment required for the installation of the access control system.

C. Contractor shall install all equipment, conduit, wire, terminations, and related equipment. All wiring shall be closed to verify continuity. The Main Control Panel shall have an electrical system grounding connection and telephone line.

D. Provide concealed conduit from door jambs to above finished ceilings. Wiring to terminal cabinets and other device locations shall be run, without conduit, in ceiling spaces. All wiring shall be in accordance with N.E.C.

3.03 PENETRATIONS

A. Fire penetrations: Fire stop all fire penetrations I.A.W. published UL standards. It is this Contractor's responsibility to identify fire walls.

B. Masonry penetrations: Masonry penetrations to install materials shall be saw-cut for square or irregular penetrations, masonry drilled for round penetrations 1" diameter or less, or core drilled for round penetrations larger than 1" diameter. Under no circumstances shall masonry penetrations be chipped or hammered.

C. Provide necessary sleeves and chases where conduits pass through walls. Wall sleeves shall be installed above ceiling and be supported on both sides of the wall with strut and beam clamps. Ream and bush both sides of sleeves.

3.04 PAINTING OF DAMAGED AREAS

A. Raceways, conduit supports, hangers, and surface raceway, where exposed, shall be painted to match mounting surface or surrounding surfaces. Panels and equipment with damaged painted surfaces shall be refinished to previous conditions.

3.05 COMPLETION AND TESTING

A. Furnish to the Owner, a written report which certify that all initiating devices have been tested and which indicates the result of the inspection. Additionally, furnish to the Owner, three sets of Operation and Maintenance manuals with parts list and other information necessary for the proper operation and maintenance on the system, as installed. Include three copies of complete troubleshooting and repair manuals. Provide Owner with a CD-ROM copy and two printed copies as-built drawings indicating location of conduit, junction boxes and equipment. Provide control diagram on 8½" x 11" document, frame/mounted, and installed next to main control panel.

B. Upon completion of installation, system shall be completely checked-out and tested by a factory-authorized representative, to determine that the system was tested and installed in accordance with the manufacturer's instructions and all applicable codes. Results of the check out and testing shall be reported in writing to the Engineer. The written report shall precede or accompany the Contractor's request for acceptance inspection for work under this Section. This representative shall prepare an inspection report for the Owner and instruct the Owner's personnel in the operation of the system.

C. All initial software programming shall be provided.

D. The Contractor, at no cost to the Owner, shall immediately replace all equipment, devices, and/or work found to be defective.

E. Contractor shall turn over a turnkey security system programmed with Owner access codes, passwords, etc.

F. Site Test:

1. Check and test installation for shorts, ground, and circuit continuity.

2. Cables: Test free from opens, grounds, or crosses (shorts) between conductors.

3. Walk-test doors and motion detectors for proper function and operation.

4. Test all functions on access control panels for proper functions and operations.

5. Verify signals are properly received.

6. Check for proper standby battery backup in access control panels and remote power supplies.

G. Contractor shall finish, at completion of Contract, as-built drawings for complete system (electronic and three copies). Such drawings must include at a minimum:

1. Layout diagrams with appropriate interconnection information.

2. Complete cable routings and locations of all devices pertinent to the operation and maintenance of the system.

3.06 TRAINING

A. Provide eight hours total, broken up as designated by Owner, at the site with the Owner's maintenance staff and designated staff on the operation, maintenance, troubleshooting, and repair of the system. Training shall be certified by the manufacturer. Training shall take place at time of Substantial Completion. Obtain a signed roster of all personnel that attends the training sessions and submit a copy of the roster to the Engineer and the Owner.

3.07 WARRANTY

A. Provide warranty response information inside system panel. Contractor shall provide any software upgrades during the warranty period including parts and labor at no cost to the Owner.

B. Equipment, parts, and labor shall be warranted to be free from defects in material and workmanship for a period of one year from date of substantial completion and acceptance of system by Owner.

C. Warranty shall include damage from lightning and transients for a period of one year.

D. Contractor shall arrive on site within four normal business hours to repair system under warranty. All repairs shall be completed within 24 hours. Failure to respond in time specified shall result in the Owner making repairs and charging warrantor and shall not affect the warranty.

E. Equivalent loaner equipment with same functions and features will be accepted if system is completely inoperable.

***** END OF SECTION *****

SECTION 16741

TELEPHONE SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Telephone Service Entrance Raceway.

B. Equipment and Terminal Backboards.

1.02 RELATED SECTIONS

A. Section 16111 ..... Conduit.

B. Section 16190 ..... Supporting Devices.

C. Section 16195 ..... Electrical Identification.

1.03 QUALITY ASSURANCE

A. Telephone Utility Company: Verizon.

B. Install work in accordance with Telephone Utility Company's rules and regulations.

1.04 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1.

B. Accurately record location of service entrance conduit and termination backboards.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Verify that field measurements are as shown on drawings.

3.02 INSTALLATION

A. Support raceways under the provisions of Section 16190.

B. Install pullwire in each empty telephone conduit.

***** END OF SECTION *****

SECTION 16742

STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal Copper Cabling (CAT 5E).

B. Cabling Connectors.

C. Data Jack System.

D. Equipment Mounting and Interconnecting Devices.

E. System Testing.

1.02 RELATED SECTIONS

A. Section 16010 ..... Basic Electrical Requirements.

B. Section 16111 ..... Conduit.

C. Section 16190 ..... Support Devices.

1.03 SCOPE OF WORK

A. Contractor shall be responsible for providing a complete, functional data communications system, whether ancillary devices/components are included in this specification or not. The Contractor shall provide equipment for 20% growth on patch panels and punchdown locations. This does not include tear and go system.

B. The installation shall include cable (twisted-pair copper), connectors (twisted-pair copper), jumpers (twisted-pair copper), patch panels (twisted-pair copper), wire management, telecommunications outlets, and cabinet, as required.

C. In addition to material and equipment, Contractor shall provide labor and any incidental material required for installation. All copper station cables shall be terminated on patch panels (BDF end) and data communications outlets (work station end). Upon completion of installation, Contractor shall test all horizontal cabling and record the test results, as specified herein.

D. The work performed under this specification shall be of good quality and performed in a professional manner. In this context, "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner/Engineer reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

E. Conduit for telecommunications use to be provided by this subcontractor. Coordinate all requirements with other trades prior to submitting shop drawings.

F. This Contractor shall coordinate with utility providers. This shall include setting meeting dates with the providers and resolving the scope and timing of work to be done by each party. Telephone utility demarcation points shall be established and clear prior to submittal of shop drawings.

1.04 GENERAL

A. It is the responsibility of the Contractor to verify ALL aspects of the installation. The guidelines used shall include the TIA/EIA 568C, TIA/EIA 569-B, TIA/EIA 606B, TIA 41.8 for Category 5 Enhanced cabling. As well as, IEEE 802.3 specification for Ethernet over UTP (10/100 Base-T).

B. It is the intent that all TIA/EIA and IEEE standards adopted at the time of bid opening shall be met.

C. Contractor shall provide Category 5 Enhanced cabling system.

D. The structured cabling infrastructure is to include all equipment, materials, and labor required to provide, install, and test a complete system, as described herein.

1.05 APPLICABLE STANDARDS

A. TIA/EIA-568-C.0 .....Generic Telecommunications Cabling for Customer Premises.

B. TIA/EIA-568-C.1 .....Commercial Building Telecommunications Cabling Systems Standard.

C. TIA/EIA-568-C.2 .....Balanced Twisted Pair Telecommunications Cabling Systems Standard.

D. TIA/EIA-569-B (-C)....Telecommunications Pathways and Spaces.

E. IEEE 802.3ab.....Specification for Gigabit Ethernet over UTP cable.

F. ANSI/TIA-1152.....Requirements for Field Test Instruments.

G. EIA/TIA-606-B .....Administration Standard for Commercial Telecommunications Infrastructure.

H. ANSI J-STD-607-A.....Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (2002).

I. ASTM D 4566-08.....Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable.

J. IEC 60603-7-5.....Connectors for frequencies below 3 MHz for use with printed boards – Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality.

K. NEC.....National Electric Code.

1.06 CONTRACTOR QUALIFICATIONS

A. The installing communications contractor shall be able to submit proof that they meet the following qualifications upon request from the Engineer.

1. PERFORMANCE HISTORY: Contractor must have successfully performed at least three projects of similar scope and size, within two years of the date of this bid in the local area. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman or superintendent's name, and the name, address, and telephone number of a project contact. The Superintendent proposed for the project shall have been responsible for at least two of these projects under the employment of this Contractor.

2. TIME IN BUSINESS: Contractor must have been in business, under the current name, and in the business of installing similar type systems, continuously, for a period of at least three years, prior to the date of this bid. Essential installation personnel shall include at least one foreman and two journey level installers or technicians. By submitting the names of these personnel, Contractor is committing them to the execution of the project outlined in this specification.

3. REQUIRED LICENSE: The Contractor shall possess at least a State of Florida Low Voltage License.

4. RCDD ON STAFF: The Contractor shall have a (BICSI) Registered Communication Distribution Designer on staff. Contract RCDD's shall not be acceptable.

5. OFFICE LOCATION: The Contractor shall maintain a permanent office within 50 miles of the project site.

1.07 DEFINITIONS

A. For purposes of this specification, Category 5 shall mean Category 5E. This systems is intended to be based on the enhanced cabling.

B. BDF is defined as Building Distribution Frame or Telecom Room.

C. Provide means to provide and install.

1.08 OWNER PROVIDED LAN ELECTRONICS

A. Electronics will be provided by the Owner. It is necessary for this Contractor to become familiar with the location, space requirements, and specific mounting requirements of the electronics. All requirements and information shall be known before building out the BDF. 50% (i.e., the lower half) of the rack shall be reserved for Owner provided electronics.

1.09 PRE-BID SUBSTITUTIONS AND RECORD DOCUMENTS

A. Under provisions of Division 1 and Section 16010.

B. Submit any requests for substitutions or deviations prior to bid opening. Only those requests that are complete and approved by the Engineer in written Addendum form shall be accepted.

1.10 SHOP DRAWING SUBMITTALS

A. The Contractor shall submit per Division 1. The submission shall consist of five major sections with each section separated with insertable index tabs.

1. The first section shall be the "Index" which shall include the project title and address, and name of the firm. The contents of each section shall be listed on the index.

2. The second section shall include a copy of the Contractor's valid State Low Voltage license, and a list of instrumentation to be used for system testing.

3. The third section shall contain the product specification listing, including a complete list of the characteristics and specifications. This section shall be organized by product classes as specified herein with dividers separating each class.

    a. Class One: Category 5 patch panels, patch cords, workstation outlets.

    b. Class Two: Equipment Racks and Cable Management.

    c. Class Three: Equipment Cabinets.

    d. Class Four: Category 5 Enhanced Cable.

e. Class Five: Wire ties labels, "D" rings, nuts, bolts, screws, and other miscellaneous hardware.

4. The fourth section shall contain samples of proposed cable markers and labeling.

5. The fifth section shall contain a scaled, complete, detailed BDF layout with rack elevation, scaled floor plans with equipment locations shown, and a layout of any wall mounted backloads.

B. The Contractor shall provide the shop drawing submittals within 60 days of receipt of contract. No work shall begin nor equipment be ordered without an Engineer accepted shop drawing submittal.

1.11 FUNCTION AND OPERATION

A. The intended function of the data communications cable system is to transmit data signals from a central location to individual data outlet locations. Upon completion of the work outlined in this specification, the system shall be capable of supporting data signals per IEEE 802.3.

B. Performance verification and documentation shall be as specified herein.

C. Use TIA/EIA 568A wiring configuration. Verify with Owner prior to ordering.

PART 2 PRODUCTS

2.01 EQUIPMENT RACKS

A. All racks shall be properly grounded. Connect separate, solid, #4 AWG, insulated, grounding wire between the ground bus and the building's grounding system.

B. Refer to drawings for manufacturer, part numbers, and quantities.

C. Prior to installation, obtain approval from Owner for rack space allocation (i.e., what equipment goes in what cabinet).

2.02 UTP HORIZONTAL CABLING

A. Provide plenum rated, Category 5 Enhanced compliant, unshielded twisted pair (UTP) copper cable. Cable shall contain insulated primaries enclosed in a thermoplastic outer jacket. Coordinate final color of cable with Owner prior to installation.

B. The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing the correct number of pairs, etc. Damaged cable, or any other components failing to meet specifications shall not be used in the installation.

C. Provide 3 feet of "s" coiled cable above ceiling at each outlet location.

D. Provide Velcro tie wraps for cable management throughout. Nylon tie wraps shall not be used.

E. Acceptable Manufacturers.

1. Mohawk: MegaLAN M56168.

2. Berk-Tek: LANmark-350 10032064.

2.03 DATA JACK SYSTEM

A. Data Jack System

1. Recessed Mount—Provide faceplate and specified number of angled RJ-45 connectors. Jacks shall meet Category 5E specifications. The jacks shall individually snap-in to faceplate from the back of the faceplate. There shall be no front access to the jack termination once faceplate is secured to back box. Data outlet shall provide compliance with TIA-568-A and TIA-606 specifications. Color-coded icons shall be provided on the front of jack (coordinate color with Owner prior to purchase/installation). Termination of all jacks shall be 110-type insulation displacement connectors (IDC) and shall utilize printed circuit board technology.

B. For wall mount telephone locations, provide stainless steel wall plate with lugs for flush mounting of modular jack or with jack installed.

1. Acceptable Manufacturers:

a. Hubbell: #P630S1G.

b. Ortronics: GigaMo Series #OR-854045212.

C. Category 5 Enhanced Plus compliant

1. Jacks shall meet Category 5E component specifications per TIA 568C.2 as verified by ETL.

a. Acceptable Manufacturers:

(1) Hubbell: XCELERATOR HXJ5EOW with IFP14OW (faceplate)–Office White.

(2) Ortronics: Clarity 5E TracJack OR-TJ5E00 with OR-40300546 (faceplate)–Fog White.

2.04 LABELING

A. Each cable shall be labeled with a unique identifier. All network system components shall be labeled, including rooms, racks, cabinets, patch panels, individual ports in each patch panel, communications outlets, etc. The system identification administration shall meet the requirements of EIA/TIA 606. All color coding shall meet the TIA-606 standard.

B Each box shall have a recessed designation strip with clear plastic cover for jack identification. The associated termination shall be permanently labeled according to the following scheme:

Room Number-Position in Room Clockwise from Main Door

For example, the third jack from the door in Room J101 would be labeled:

J101-C

The jack number shall be marked on the designation strip of the interface box. Lettering shall be printed in block letters and numerals and applied by the same individual for consistency.

C. Each patch panel shall be labeled sequentially left to right, top to bottom with the room number and port letter, such that the ports can be located easily on the panel.

D. Labeling Notes

1. Labels shall be made using a device which produces typewritten print.

2. Allow more characters if needed (i.e., BBB-RRRR).

3. X's in the following examples indicate jacks.

E. Labeling Copper

1. Communications Outlet Labeling

Each jack on the Communications Outlet shall be labeled at the faceplate using the following format:

Format:

BB-RRR
X X
X X
P##-P##-P##-P##

Top Label

BB ..... Building number where the communications closet servicing that jack is located.

RRR..... Room number where the communications closet servicing that jack is located.

Bottom Label

P ..... Patch Panel ID (A, B, C, D, etc.)

##..... Patch Panel port number (01-96, etc.)

Label indicates jacks left to right, top to bottom, separated by a dash.

Example

12-103 ..... Building number of the communications closet.....12

X X ..... Room number of the communications closet.....103

X X ..... Jacks on this communications outlet.....A47, A48, B01, B02

2. Patch Panel Labeling

Each patch panel shall be labeled using the following format:

Format:

X	X	X	X
BB-RRR	BB-RRR	BB-RRR	BB-RRR

BB ..... Building number the jack is serving.

RRR..... Room number the jack is serving.

Label shall be placed just below the jack.

Example

X	X	X	X
12-103	12-103	12-103	12-103

Building number the jacks are serving.....12

Room number the jacks are serving.....103

3. Cable Labeling

Each cable shall be labeled at both ends—at the patch panel and at the communications outlet.

a. Format at the patch panel end:

BB-RRR

BB..... Building number the jack is serving.

RRR ..... Room number the jack is serving.

Label shall be attached to the cable within six inches of the cable's termination point.

Example

12-103

Building number the jack is serving 12

Room number the jack is serving 103

b. Format at the communications outlet end:

BB-RRR

BB.....Building number where the communications closet servicing that jack is located.

RRR .....Room number of communications closet.

Label shall be attached to the cable within six inches of the cable's termination point.

Example

12-103

Building number where the CC servicing that the jack is located.....12

Room number of the communications closet.....103

2.05 BUILDING CABLE ROUTING SYSTEM

A. J-Hooks:

1. From cable tray to stubbed up outlet conduits, building shall be supplied cables through Category 5 compliant J-hook system located in the ceiling space. The J-hooks shall be of adequate size to accommodate all cable specified herein plus 50%.

2. J-hook system shall be no closer than 18 inches from sources of electromagnetic interference such as fluorescent light fixtures or shall be shielded from such interference by tray sections designed for that purpose.

3. All efforts shall be made to keep transitions smooth and continuous to prevent excessive bending and turning of cables.

4. Cabling shall be supported to the building structure at a maximum of 4-foot intervals with J-hooks. Cabling shall not be supported from the ceiling, ductwork, conduits, piping, or any other non-structural building member.

2.06 CATEGORY 5E—110 PATCH PANELS

A. Provide Category 5E rated UTP modular patch panels (rack mount). Panels shall be 110 IDC type connectors to RJ-45 type jacks with no exposed PC boards. Jacks shall be manufactured with printed circuit board (PCB) or lead frame technology. Patch panels shall be provided with individual port and patch panel labeling identification areas and shall be labeled consistent with the data jack system labeling outlined in this specification.

B. Provide quantity to accommodate number of outlets indicated on drawings.

C. Provide rear cable management and horizontal cable management guide either as an integral part of the patch panel or provide as a separate piece and station support bars. Each 24 port patch panel is to have a dedicated horizontal cable guide located adjacent to the patch panel in the rack, or as indicated on drawings.

D. Each patch panel shall be labeled (see this section for details).

E. The building and room number in which the patch panel resides shall be prominently displayed.

F. Patch panels shall be alphabetically labeled from top to bottom, left to right, beginning with the letter A and proceeding through the alphabet. Each port of each patch panel must be numbered and labeled with the originating jack identification using building, room, and jack designation.

G. Acceptable Manufacturers:

1. Hubbell: SpeedGain P5E48UE.

2. Ortronics: Clarity 5E OR-PHD5E6U48.

2.07 JUMPERS AND PATCH CORDS

A. Category 5E Patch Cords

1. Provide bootless Enhanced Category 5E compliant patch cords (with an RJ-45 8P8C jack on each end), one for each outlet shown on the drawings plus 20% spares. Coordinate final color with Owner and provide custom length prior to installation.

2. Acceptable Manufacturer

a. Hubbel PC5E6 Series.

b. Or Pre-Approved Equal.

2.08 MISCELLANEOUS EQUIPMENT

A. As per the needs of the installation, miscellaneous equipment shall be required at the Contractor's expense. It is the Contractor's responsibility to identify and bid all miscellaneous equipment necessary to provide a complete and properly functioning system.

B. Backboards shall be factory-finished with manufacturer's label, fire-retardant treated plywood, 3/4 by 48 by 96 inches, as manufactured by Pathway Spaces, Inc. Backboard Kits or pre-approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall follow established guidelines for installation and termination of all cabling and equipment as established in EIA/TIA-568-C, EIA/TIA-569-B (C), BISCI Telecommunications Distribution Methods Manual, and the National Electrical Code (NEC).

B. Work shall be of professional quality and shall not detract from the aesthetic qualities of the facility. Contractor shall ensure that the site is clean of construction debris prior to leaving the site unsupervised at the end of every work day.

3.02 CABLING

A. All cabling shall be installed in conduit as shown on the drawings and per the industry standards as outlined in the BISCI Telecommunications Distribution Methods Manual, EIA/TIA 568-C, EIA/TIA-569-B (C), and the following:

1. Care should be taken to insure the integrity of the installed cable. Use wide sweep elbows at all right angles.

2. Fire Penetrations: Fire stop penetrations through fire rated walls I.A.W., UL Standards, and EIA/TIA 569-B.

3. Tension: Cable shall be free from tension at both ends, as well as over the length of each run. Pulling tensions shall not exceed manufacturer's published data.

4. Grounding: Ground shields I.A.W. applicable standards.

5. One pull string shall be left in the ceiling, secured in the same manner as the station cabling, subsequent to installation running from the CER to each classroom.

6. Cables shall be terminated in order, lowest room number first, station A first, and ports I-4 in order.

7. Three feet of slack, when within operating limits, shall be neatly "s" coiled in the ceiling directly above the drop for each communication outlet.

8. All cables shall be dressed and permanently labeled at each end using approved labels to ensure a neat and organized appearance.

3.03 EXCAVATION

A. Provide excavation, backfill, and compaction in conformance with industry standards.

B. Provide dewatering as required to insure proper installation of duct bank or underground pathways.

C. Jack and bore under existing concrete slab, sidewalks, etc. shall be preferred for underground routing of pathways. Ensure safe re-routing of facility occupants during procedures or perform procedure after occupancy hours of the facility. However, if cutting of existing concrete slab, sidewalks, etc. is deemed to be required, the cutting shall be from joint to joint (control or expansion). Final surface finish shall match surrounding conditions.

D. Do not cut roots larger than ½" in diameter.

E. Hand trenching is required. Contractor to ensure that there are no open trenches prior to leaving the site unsupervised at the end of every work day

F. Perform required trenching and backfilling associated with the Work under this Division.

G. Provide all materials necessary and as required by OSHA to protect personnel working in trenches.

3.04 PENETRATIONS

A. Fire penetrations: Fire stop all fire penetrations I.A.W. published UL standards. It is this Contractor's responsibility to identify fire walls.

B. Masonry penetrations: Masonry penetrations to install materials shall be saw-cut for square or irregular penetrations, masonry drilled for round penetrations 1" diameter or less, or core drilled for round penetrations larger than 1" diameter. Under no circumstances shall masonry penetrations be chipped or hammered.

C. Provide necessary sleeves and chases where conduits pass through walls. Wall sleeves shall be installed above ceiling and be supported on both sides of the wall with strut and beam clamps. Ream and bush both sides of sleeves.

D. Conduit penetrations entering a building from the exterior, perpendicular to the wall, shall be sealed with UV resistant silicone and shall be water tight.

E. Conduit entering the building shall be sealed with approved duct seal to prevent intrusion of gas, water, or pests from outside the building.

3.05 CONCRETE WORK

A. This Contractor shall be responsible to replace concrete pads, supports, piers, bases, foundations, and encasements damaged from the installation of the Work under this Division.

3.06 PAINTING OF DAMAGED AREAS

A. Raceways, conduit supports, hangers, and surface raceway, where exposed, shall be painted to match mounting surface or surrounding surfaces. Panels and equipment with damaged painted surfaces shall be refinished to previous conditions.

3.07 TESTING (TO BE SUBMITTED AT SUBSTANTIAL COMPLETION)

A. TESTING: Contractor shall test each twisted-pair copper cable. The Owner/Engineer reserves the right to have a representative present during all or a portion of the testing. A testing schedule shall be planned and agreed upon beforehand.

B. HORIZONTAL UTP CABLE: Each horizontal cable run shall be tested twice up to 350 MHz. First test shall be a basic link test configuration which includes patch panel, UTP cable, and work station jack. The cable tester shall be set for basic link test parameters before testing. The second test shall be a channel link configuration which includes the patch cord, patch panel, UTP cable, workstation jack, and workstation cord. The cable tester shall be set for channel link parameters before testing. Each Category 5E cable shall be tested using a TSB-95 Level IIe tester compliant with TIA specifications for testing of Category 5E cabling. Tester shall be as manufactured by Scope Communications, approval of other testers shall be based on compliance with TIA requirements. No tester will be approved without meeting these requirements. Prior to testing UTP runs, the tester shall be calibrated per manufacturer's guidelines. The correct cable NVP shall be entered into tester to assure proper length and attenuation readings. During channel link testing the patch cords and workstation cords shall be the same as those provided by the Contractor per this specification. Each channel link test shall include one yellow patch cord and one blue workstation cord, with no cord used twice. Category 5E test results shall be in the form of tester software print outs. Photocopies will not be accepted, only original signed reports shall be accepted. Test results shall be furnished to the Engineer.

1. Category 5E UTP cable testing shall include:

    a. Cable Length

    b. Wire Map

    c. Attenuation

d. Power Sum Near End Cross Talk

e. Pair to Pair Near End Cross Talk

f. Power Sum ELFEXT

g. Return Loss

h. ELFEXT – Equal level far end cross talk

i. Delay skew

j. SNR

C. DOCUMENTATION: Contractor shall provide documentation to include test results and as-built drawings.

1. Drawings shall be developed in CAD (i.e., AutoCAD 2009 or higher). The following documents shall be provided to the Engineer:

a. BDF shall contain a copy of the building's as-built drawing affixed to an adjacent wall or located in an interior pouch for quick reference. Revised equipment cabinet elevations shall be provided including serial numbers of all installed equipment.

b. Three sets of black line, as-built drawing sets.

c. Number, as necessary, CD-ROM reflecting all the work with actual device and equipment locations. Drawings to be submitted in .dwg or .dxf format.

d. One copy of UTP cabling results. These results shall be submitted to the Engineer prior to the Contractor calling for substantial completion inspection.

3.08 ACCEPTANCE

A. Acceptance of the Data Communications System, by the Owner, shall be based on:

1. Copy of all test results (one copy).

a. All workstation data cables must meet the criteria established above.

2. Copy of as-built drawings (three hard copies and one disc copy) shall contain the following.

a. Changes and/or deviations from the construction (bid) prints (AutoCAD 2012 or higher).

b. All communication outlet addresses and locations.

c. Cable routing.

3. Visual inspection (aesthetics)

3.09 PROJECT COMPLETION

A. Upon completion of the work of this Section, thoroughly clean all exposed portions of the installation, removing all traces of soil, labels, grease, oil, or other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned. Cover all exposed cabling and termination devices.

3.10 TRAINING

A. Provide a minimum of two, Owner personnel with training on the network cabling system for up to two hours on site. Training shall cover the location labeling scheme, documentation structure and contents, documentation orientation, and system reconfiguration (i.e., reassignment of Communication Outlet function via patching).

3.11 WARRANTY

A. The Contractor shall and does hereby warrant all materials and equipment furnished under this scope of work to be free from defects and function or operate satisfactorily for a period of one year from Substantial Completion of this project.

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SECTION 16760

INTERCOMMUNICATION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System Devices.

B. Cabling.

C. Equipment Mounting.

D. System Testing.

1.02 RELATED SECTIONS

A. Section 16120 ..... Building Wire and Cable.

B. Section 16130 ..... Boxes.

C. Section 16195 ..... Electrical Identification.

1.03 SCOPE OF WORK

A. Installer shall provide all necessary tools, equipment, material and labor required to install complete intercom system, as described in this specification.

B. This specification is specifically applicable to Division 16 Sections, in addition to Division 1—General Requirements, General Conditions, and Supplementary General Conditions.

1.04 CODES AND STANDARDS

A. National Electric Code (N.E.C.).

B. Florida Building Code.

C. State Requirements for Educational Facilities (S.R.E.F.).

D. Manufacturer installation instructions.

E. Execution portion of this guideline.

F. In the event the execution portion of the guideline exceeds the above codes and standards, the execution section shall be followed.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in this type of system, with five years documented experience. Installing and servicing office to be located within a 75 mile radius of the job site.

B. Installer: Company specializing in this type of system, with five years experience, certified by Florida State Licensing Board as an installing contractor. The installer shall be factory authorized service representative (submit certification number) and show evidence of having successfully completed at least three similar projects in the local area, each having an installed service period of three years minimum of satisfactory performance.

C. The Contractor shall show evidence upon request that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system, including a stock or replacement parts. Replacement parts shall include at least one of every device used on the system to include control panels.

D. The Contractor shall be prepared to offer a service contract for the maintenance of the system after the warranty period.

1.06 PRE-BID SUBSTITUTION REQUESTS

A. Under provisions of Division 1 and Section 16010.

B. Submit any requests for substitutions or deviations prior to bid opening. Only those requests that are complete and approved by the Engineer in written Addendum form shall be accepted.

1.07 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. The following items shall be submitted to the Engineer for review and approval. Submittals shall included, but not be limited to, the following:

1. Spreadsheet with product numbers and quantities marked for all equipment.

2. Specifications and data sheets for each item.

3. Scaled layout of mounted equipment showing locations and relationship for equipment location.

PART 2 PRODUCTS

2.01 GENERAL

A. Intercom shall function as follows: A call signal from a remote station shall activate a call tone on the Master Stations. The call tone shall last as long as the call button is being pressed on the remote. Any Master shall be able to answer by pressing the "TALK" button, holding the "TALK" button to transmit, and releasing to listen. The person at the remote station shall be able to speak hands free. Masters shall be able to push a button to remotely release door via connection to Access System's REX motion detector.

B. Cabling and distance from the door to the Master Stations shall be per manufacturer's recommendations.

2.02 INTERCOM MASTER STATIONS

A. Provide an open voice, selective calling type intercom with one channel for communication to a remote station. Provide two master stations, each answering the remote, each releasing the door, and each with their own power source.

B. No master-to-master communication is required.

C. Master Station shall be equipped with a door release button, providing a normally open contact. Other controls shall include TALK and OFF buttons, voice and call tone volume controls. An "Occupied" LED shall indicate if the system is in use.

D. Acceptable Manufacturers:

1. Aiphone LEM-1DLC (one to be provided in the Day Room and one to be provided in the Office), with Aiphone PT-1210N (power supply).

2.03 SUB-STATION

A. Provide vandal proof and weather resistant sub station constructed of 11 gauge carbon steel with a white powder-coated finish. Flush mount using a standard, three gang, electrical box. Provide with tamper proof screws and tool for installation.

B. Acceptable Manufacturers:

1. Aiphone LS-NVP/B.

2.04 SURGE SUPPRESSION

As required, intercom installation shall include appropriate lightning and transient voltage surge suppression/protection.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall follow established guidelines for installation and termination of all cabling and equipment as established in Part 1 of this Specification.

B. Work shall be of professional quality and shall not detract from the aesthetic qualities of the facility. Contractor shall ensure that the site is clean of construction debris prior to leaving the site unsupervised at the end of every work day.

3.02 INSTALLATION OF INTERCOM SYSTEM

A. Install intercom systems as indicated, in accordance with equipment manufacturer's written instructions.

B. Contractor shall provide all equipment required for the installation of the intercom system.

3.03 PENETRATIONS

A. Fire penetrations: Fire stop all fire penetrations I.A.W. published UL standards. It is this Contractor's responsibility to identify fire walls.

B. Masonry penetrations: Masonry penetrations to install materials shall be saw-cut for square or irregular penetrations, masonry drilled for round penetrations 1" diameter or less, or core drilled for round penetrations larger than 1" diameter. Under no circumstances shall masonry penetrations be chipped or hammered.

C. Provide necessary sleeves and chases where conduits pass through walls. Wall sleeves shall be installed above ceiling and be supported on both sides of the wall with strut and beam clamps. Ream and bush both sides of sleeves.

3.04 PAINTING OF DAMAGED AREAS

A. Raceways, conduit supports, hangers, and surface raceway, where exposed, shall be painted to match mounting surface or surrounding surfaces. Panels and equipment with damaged painted surfaces shall be refinished to previous conditions.

3.05 COMPLETION AND TESTING

A. Furnish to the Owner, a written report which certify that the devices have been tested and which indicates the result of the inspection. Additionally, furnish to the Owner, three sets of Operation and Maintenance manuals with parts list and other information necessary for the proper operation and maintenance on the system, as installed. Include three copies of complete troubleshooting and repair manuals. Provide Owner with a CD-ROM copy and two printed copies as-built drawings indicating location of conduit, junction boxes and equipment.

B. Upon completion of installation, system shall be completely checked-out and tested by a factory-authorized representative, to determine that the system was tested and installed in accordance with the manufacturer's instructions and all applicable codes. Results of the check out and testing shall be reported in writing to the Engineer. The written report shall precede or accompany the Contractor's request for acceptance inspection for work under this Section. This representative shall prepare an inspection report for the Owner and instruct the Owner's personnel in the operation of the system.

C. All initial software programming shall be provided.

D. The Contractor, at no cost to the Owner, shall immediately replace all equipment, devices, and/or work found to be defective.

E. Contractor shall turn over a turnkey intercom system.

F. Site Test:

1. Check and test installation for shorts, ground, and circuit continuity.

2. Cables: Test free from opens, grounds, or crosses (shorts) between conductors.

3. Walk-test doors and keypads/readers for proper function and operation.

4. Test all functions on intercom system for proper functions and operations.

5. Verify signals are properly received.

G. Contractor shall finish, at completion of Contract, as-built drawings for complete system (electronic and three copies). Such drawings must include at a minimum:

1. Layout diagrams with appropriate interconnection information.

2. Complete cable routings and locations of all devices pertinent to the operation and maintenance of the system.

3.06 TRAINING

A. Provide eight hours total, broken up as designated by Owner, at the site with the Owner’s maintenance staff and designated staff on the operation, maintenance, troubleshooting, and repair of the system. Training shall be certified by the manufacturer. Training shall take place at time of Substantial Completion. Obtain a signed roster of all personnel that attends the training sessions and submit a copy of the roster to the Engineer and the Owner.

3.07 WARRANTY

A. Provide warranty response information inside system panel.

B. Equipment, parts, and labor shall be warranted to be free from defects in material and workmanship for a period of one year from date of substantial completion and acceptance of system by Owner.

C. Warranty shall include damage from lightning and transients for a period of one year.

D. Contractor shall arrive on site within four normal business hours to repair system under warranty. All repairs shall be completed within 24 hours. Failure to respond in time specified shall result in the Owner making repairs and charging warrantor and shall not affect the warranty.

E. Equivalent loaner equipment with same functions and features will be accepted if system is completely inoperable.

***** END OF SECTION *****

SECTION 16781

TELEVISION DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cable and Accessories.

B. Television Distribution Equipment. The CATV headend equipment is not in this contract. The equipment is to be provided under separate contract. This scope is included to set standard of operation for the system.

1.02 SCOPE

A. Furnish and install, complete with all accessories, a complete building Television Distribution System as shown on the contract drawings and described herein.

B. Furnish and install all miscellaneous equipment required to provide a complete Television Distribution System as required by the system configuration.

C. It is the intent that the same subcontractor complete work performed under this Section and Section 16742.

1.03 RELATED SECTIONS

A. Section 16111 ..... Conduit.

B. Section 16120 ..... Building Wire and Cable.

C. Section 16130 ..... Boxes.

1.04 GENERAL

A. All general and special conditions outlined in this specification shall apply to this work.

B. The system shall provide for reception of monochrome (black and white), color TV, and FM transmissions at every outlet, located as shown in the design drawings, equal or superior to that obtainable on a single television receiver connected directly to the cable TV drop at the head end.

C. The Contractor shall be qualified as a Television Distribution System installer by demonstrating successful installation for at least three years and, upon request, shall provide three recent local project references. Data network, telephone, fire and alarm systems are not to be considered as a part of the Contractor's Television Distribution experience.

D. The Television Distribution System shall be a separate entity from all other networks and backbone wiring. The system shall have its own backbone wiring and may take different physical paths than other networks.

E. Any devices used in the CATV system after the head-end shall be capable of passing sub-band frequencies in either direction.

1.05 SYSTEM DESCRIPTION

A. The system shall consist of a balanced circulating RG-11 coaxial trunkline with multiple trunklines home-run to the headend. Each leg of the trunkline shall be balanced in its loading in both the number of outlets, including dummy loads and termination, and decibels mv. Interior feeder lines shall be RG-6 coaxial cable with drop taps.

B. Video sources include, but are not limited to, local community access television (CATV), video cassette recorders, DVD players, live studio broadcasts, satellite, antenna, and others.

C. The distribution system consists of the cabling, equipment, and connectors to provide the delivery and reception of video channels in each outlet location.

D. The system shall provide for the distribution of cable TV channels 2 through 117 and Sub-Band T-7 through T-12. All TV outlets shall be capable of receiving a color TV signal that is equal to that obtainable by a single receiver connected directly to the CATV feed.

E. The system shall meet or exceed all standards set forth in the FCC Rules, Part 76.

F. All passive devices shall have a bandwidth of 5 to 1,000 MHz with a flatness response of ±2 dB.

G. Provide 2-way amplifiers as required to maintain dB levels.

1.06 SUBMITTALS

A. Comply with pertinent provisions of the Specifications.

B. Requirements of submittal for this section are supplementary to the requirements of Specification Section 16742.

C. Product Data: At time of submittal, submit the following:

1. Splitters
2. Cable
3. Cable Fittings
4. Outlets and Accessories
5. Products listed in Part 2—Products, herein.

D. Provide the following shop drawings prior to start of installation.

1. Riser diagram with calculated signal levels.
2. System performance calculations.
3. Drawings as listed on contract drawings.

1.07 REGULATOR REQUIREMENTS

A. Conform to requirements of cable utility company. All modulators and filters shall be tuned to either FCC channels, non-shifted, or HRC shifted channels in accordance to the local CATV provider's frequency allocations. All active components shall be mounted in the headend.

1.08 BANDWIDTH

A. All passive devices shall have a bandwidth of 54 MHz to 400 MHz with a flatness response of +/- 2 dB. The reverse bandwidth shall be 5 MHz to 30 MHz.

1.09 CROSS MODULATION AND NOISE

A. The system shall have a carrier-to-noise ratio of better than 36 dB and cross modulation shall be less than -57 dB.

1.10 RADIATION

A. System radiation shall not be in excess of the values listed below:

- 5 MHz to 54 MHz.....15 microvolts/meter @ 100 feet.
- 54 MHz to 216 MHz.....20 microvolts/meter @ 100 feet.
- 216 MHz to 400 MHz.....15 microvolts/meter @ 100 feet.

1.11 ISOLATION

A. Isolation between any two outlets shall be better than 28 dB for the Sub-band through the Super-band (7 MHz - 300 MHz). Isolation in the Hyper-Band (300 MHz - 400 MHz) shall be better than 20 dB.

1.12 SIGNAL STRENGTH

A. The internal CATV distribution system shall provide to each television receiver outlet a signal level, on each channel, not less than +2 dBmv and not greater than +6 dBmv. The RF level difference between any two adjacent channels shall not be greater than 2 dB.

1.13 PROOF OF PERFORMANCE

A. After the Contractor has submitted a Certificate of Performance and test data, the Contractor shall demonstrate system performance. The test shall be performed in the presence of the Engineer. The Contractor shall furnish all instrumentation and personnel for the demonstration.

B. The system will be physically inspected to assure that all equipment is in compliance with the specifications. Workmanship will be verified for conformance with acceptable installation standards and practices.

C. Prior to the system's performance test, the system shall be aligned and balanced. This shall be accomplished by adjusting the gain and slope of amplifiers at the head end and, if necessary, the addition of tilt compensation devices and/or changing tap values in the system.

1.14 PICTURE QUALITY

A. Connect a TV receiver to several outlets (at least one per feedline) and verify an acceptable TV image and noise free audio.

PART 2 PRODUCTS

2.01 CATV SYSTEMS CABLING

A. Provide and install television distribution cable. Cable shall be coaxial copper-clad center conductor, foam polyethylene dielectric, aluminum-mylar-aluminum foil tape, aluminum braid shield and non-contaminating polyvinyl chloride jacket. Cable shall be 75 ohm impedance with 80 dB shielding. Submit sweep test certification before installation. Cable shall be used as follows:

1. Outdoor Trunkline (RG-11/U) ..... Commscope #F1160BEF or Pre-Approved Equal (if not Service Provider provided)

2. Indoor Drops (RG-6/U) ..... Commscope #F660BV or Pre-Approved Equal.

B. Indoor cables shall be plenum rated as required by the National Electrical Code, NEC, Article 820.

C. Coaxial Cable Connectors: UHF and VHF.

1. Provide radio frequency, Type F, male, one piece cable connectors for RG-6/U and RG-11/U Flexible Coaxial. The "F" connector shall be housed in a snap-in module located in the top slot of the communications outlet. "F" connectors shall be Hubbell #SFFGOW, Ortronics #OR-60900017, or pre-approved equal; coordinate color prior to ordering. Tap-offs shall be contained in 8" x 8" x 4" junction boxes located in the ceiling space directly above the communications outlet.

2. Provide all TV outlets in quantities as indicated on the contract drawings. Specific outlet connectors shall be served with extruded and flat isolation washers to provide complete electrical isolation from the building grounding system.

2.02 AMPLIFIER (if not Service Provider provided)

A. Signal strength calculations shall be based on a 50 dB source.

B. Amplifiers shall have a frequency bandwidth of 5 to 1,000 MHz.

C. Output Level: +40 dBmV.

D. Slope and level controls.

E. Amplifiers shall be Blonder-Tongue, BIDA 750A-30, (gain to be calculated on need).

F. Provide two-way amplifiers if the outlet signal strength is less than required at any tested outlet.

2.03 PASSIVE DEVICES

A. Provide all required passive devices as indicated on the drawings and as required for a complete system operation.

B. Provide devices as required to include, but not limited to:

Hybrid Splitters ..... Blonder-Tongue MS 2 & 4 U/V or equal

In Line Pads ..... Blonder-Tongue FAM *** configured, as required

Line Equalizers ..... Blonder-Tongue LE550 EQ value, as required

Tap-offs/Couplers ..... Blonder-Tongue SRT-XX

Television Terminal Cabinet .... Television cabinets shall be constructed of galvanized, code gauge sheet steel, of minimum dimensions 18" x 24" x 8" deep. Surface mounted cabinets shall have manufacturer's standard lacquer or enamel finish. Mount in Telecommunications Closet. Provide each television cabinet with a ¾" plywood backing for mounting of equipment.

2-Way Splitters ..... Blonder-Tongue, CRS-2 or equal

4-Way Splitters ..... Blonder-Tongue, CRS-4 or equal

End of Line Terminators ..... 75 Ohms

RG-11/U Splitters ..... 1 x 6 or 1 x 8

2.04 TRANSIENT VOLTAGE SURGE SUPPRESSION

A. Provide surge suppression on all coaxial cables entering or leaving a building. Surge suppression shall be EDCO, CATV-145 Series, or approved equal. Provide ground block with kit as required. Mount in cabinet at an accessible location, to be field coordinated with Engineer.

2.05 ACCESSORY ITEMS

A. As per the needs of the installation, miscellaneous materials and equipment required will be provided at the Contractor's expense. It is the Contractor's responsibility to identify and bid all miscellaneous equipment necessary to provide a complete and properly functioning system.

B. Provide tie wraps, wire minders, and cable clamps for management of wire and cable.

C. Provide termination caps on end of line taps.

D. Where possible, mount all devices to plywood backboards provided under Division 16742.

PART 3 EXECUTION

3.01 SYSTEM GROUNDING

A. Provide separate #6 gauge (minimum) ground between the cabinet and building earth ground.

B. All cabinet mounted components, such as amplifiers, taps, splitters, etc., shall be grounded by a separate ground wire or mounted directly to the cabinet in such a manner to assure an electrical ground.

3.02 WORKMANSHIP

A. Components of the system shall be installed in a neat, workmanlike manner consistent with industry standards.

B. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the building.

C. Identification markings and systems shall be uniform and complete.

D. Wiring and cabinet layouts shall be neat and organized affording easy access to all components of the system.

3.03 ISOLATION OF CABLE SHIELDS

A. Cable shields shall be suitably protected at each outlet to avoid incidental contact with grounded elements of the building structure. Shield continuity shall be maintained through the entire system, referenced building ground only at the Production Room via the single point grounding system.

B. Isolation of shield shall be individually verified by resistance measurement as connections are made

3.04 TESTING OF WIRING INTEGRITY

A. Each television outlet shall be tested using an appropriate instrument to verify both the integrity of all conductors and correctness of the termination sequence.

B. System shall be fully tested prior to any Division 17 equipment being installed.

3.05 INSTALLATION OF CONNECTORS

A. All connectors shall be installed in strict accordance with the manufacturer's instructions.

B. All dielectric residue shall be removed from surfaces of center conductors to insure proper electrical contact.

C. All connections, including terminations and connections on flexible cables, shall be to insure RFI integrity.

D. Cables shall be prepared to accept connectors using the manufacturer's recommended tooling.

E. Crimp type connections on flexible cables in manholes shall be made with a Hex crimp tool and encapsulated with flooded heat shrink tubing.

F. All cables containing flooding compound shall be provided with a heat shrink boot at all termination points which covers the housing connector boss, body of the connector and extends not less than 12 inches along the cable jacket. Heat shrink boot shall be of the filled type.

3.06 EQUIPMENT MOUNTING

A. All equipment shall be mounted within the equipment enclosure in a neat and orderly manner. All operating controls shall be accessible without removal of equipment.

B. All remote terminal equipment (amplifiers, taps, couplers, etc.) shall be neatly arranged and securely mounted.

C. All equipment housing hardware, including amplifiers, shall be wrench tightened to insure full RFI integrity.

D. All equipment shall confirm to system grounding requirements per Section 3.1.

3.07 SYSTEM ADJUSTMENTS

A. System incoming signal levels shall be padded and/or preamplified to produce the specified input at each amplifier.

B. The Contractor shall adjust all controls to provide a system operating within the parameters set forth herein.

3.08 TESTING AND PROOF OF PERFORMANCE

A. The Contractor shall provide all instruments and personnel to perform required testing and field demonstrations. Instruments required shall include, but are not limited to:

1. Field Strength Meter (FSM): Jerrold 727 or approved equal.

2. 17 inch diagonal screen color television in good working order.

3. 75 ohm EOL resistor.

4. Video camera with microphone.

B. System testing shall consist of the following:

1. Measure the signal strength at all video outlets, new and existing. Record the results in chart form.

2. Measure and record signal strength at the input and output of each amplifier.

3. Measure and record signal strength of all incoming signals including antenna, satellite dish, and utility cable services.

4. Perform cross modulation testing. Select a channel in the low-band and replace its source with an unmodulated CW carrier. Connect a TV receiver to the most remote outlet in the system. Tune the TV to the CW carrier. Observe that there are no visible components of cross modulation. The source of CW carrier shall be an existing modulator, which is driven by a video camera with either its lens capped or its aperture set closed. The audio shall be the camera microphone in a silent environment.

5. Perform carrier-to-noise testing. Connect the FSM to the most remote outlet in the system. Measure and record the signal strength of at least two channels. Remove the normal source of video at the headend and terminate it with 75 ohms. Measure and record the signal level on the previously measured channels. The difference between the readings will be the carrier-to-noise ratio. It shall not exceed 46 dB after the appropriate meter correction factor has been applied.

C. The Contractor shall demonstrate system performance in the presence of the Engineer. System demonstrations shall be scheduled at the convenience of the above listed personnel and after the Contractor has submitted all test results. System demonstrations shall consist of the following:

1. Perform random signal strength tests as directed by the Engineer. A random sampling shall be 10% to 20% of the installed television outlets. Test results shall be documented and compared to submitted test results.

2. Perform cross modulation testing.

3. Perform carrier-to-noise testing.

4. Demonstrate proper video and audio performance on a random sampling of installed outlets as directed by the Engineer. Television reception shall be clear ad free of ghosting, distortion, or snow. Audio shall be clear and free of static, hum, or distortion. Acceptable reception shall be in the opinion of the Television Engineer.

3.09 SYSTEM DOCUMENTATION

A. Provide three (3) hard copies of systems as-built drawings to include the following information:

1. Block diagram and riser diagram of the entire system.

2. Exact routing of installed cabling.

3. Building floor plans (1/16 inch minimum) with exact locations of all video outlets, new and existing, terminal cabinets, and headend.

4. Addresses of all television outlets, new and existing.

5. Site plan with routing of interbuilding cabling.

B. Provide five (5) copies of the Certificate of Performance. Contractor shall supply the Owner with signed Certificates of Performance stating that the installed system meets or exceeds all criteria set forth herein.

C. Provide three (3) copies of recorded test results.

D. Provide two (2) sets of operating instructions and maintenance manuals with circuit diagrams and measured test results (include troubleshooting procedures).

3.10 TRAINING

A. Provide training from qualified personnel to instruct the Owner's Representative(s) in the proper operation and maintenance of the installed system. A minimum of two hours of on-site training time shall be provided for each school.

3.11 WARRANTY

A. All equipment and materials furnished and installed under this contract shall be guaranteed for a period of one (1) year from the date of Substantial Completion. Guarantee shall cover the system against electrical and mechanical defects except where such defects are the result of misuse by the Owner.

***** END OF SECTION *****