EXHIBIT "A"

FLORIDA DEPARTMENT
OF TRANSPORTATION
District One

TECHNICAL SPECIAL PROVISIONS

For

LABELLE MAINTENANCE YARD INMATES TOILETS/STORAGE FACILITY

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September 2015

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THE FOLLOWING SPECIFICATIONS WERE PREPARED UNDER THE DIRECT SUPERVISION OF THE PERSON SIGNING AND SEALING THE SIGNATURE SHEET OF THESE TECHNICAL SPECIAL PROVISIONS FOR THEIR RESPECTIVE DISCIPLINES INDICATED.

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DIVISION 01

GENERAL REQUIREMENTS

SECTION 011100
SUMMARY OF WORK

PART 1 - GENERAL

1.01 PROJECT DESCRIPTION

A. The general overall description of the work of the contract for the:

FDOT District One
Labelle Maintenance Yard
Inmates Restroom and Storage

Summarized as follows:

1. The general scope of work consists of consists of the furnishing of all labor, materials, and equipment necessary to construct an Inmate Restroom and Storage building at the Labelle Maintenance Yard as shown on the drawings, summarized in this Technical Special Provision, and in adherence with the Florida Department of Transportation (the Department) Fixed Capital Outlay (FCO) Non-Technical Specifications for Building Construction. This work shall constitute the "Lump Sum" building construction work, unless otherwise specified or indicated on the drawings.

B. Contract Documents:

1. Requirements of the work are contained in the Contract Documents, and include cross-references herein to published information, which is not necessarily bound therewith.

2. Specifications are included on the drawings and/or as these Technical Special Provisions.

C. Intent:

1. The intent of the Contract is to provide for construction and completion in a workmanlike manner, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in a workmanlike manner in accordance with the Contract Documents.

1.02 SAFETY AND PROTECTION

A. This facility will remain occupied during construction. Environment control, health and safety of the occupants including visitors are a primary concern in and around the construction site as well as the ability for the office to remain in operation.

B. In as much as each work area will be accessible to and used by the Department's personnel during the construction period, it is the Contractor's responsibility to maintain the work area in a safe, hazard free condition at all times. This will include barricades,

fencing, taping up sharp corners, or any other precautions necessary to protect the Department's personnel or any authorized visitors. Should the Department and/or Architect find the area unsafe at any time, Department and/or Architect will notify the Contractor, and the Contractor shall take whatever steps necessary to remedy the unsafe condition. Should the Contractor not be immediately available for corrective action, the Department may remedy the problem and the Contractor shall reimburse the Department for the expense of such correction.

C. Fixed structures, equipment, paving, and vehicles (automobiles, trucks, etc.) shall be protected with appropriate measures to assure maximum protection of all property and vehicles. All damages resulting from this work shall be reimbursed to the Department at cost of replacement and/or repair

D. Fire exits located in any adjacent facility shall not be obstructed in any way during construction. Exterior walkways and entrances/exits shall be protected as required to provide a safe passageway for building occupants and visitors.

1.03 SCHEDULING

A. The Contractor shall be responsible for the planning and scheduling, and the coordination of all work performed under the Contract Documents and the entire project as a whole so that materials will arrive on schedule and work will proceed without delay.

1.04 PRESERVATION AND RESTORATION OF PROPERTY

A. General:

1. Preserve from damage all property which is in the vicinity of or is in any way affected by the work, where the removal or destruction of which is not specified in the plans. This applies to public and private property, public and private utilities, trees, shrubs, crops, signs, monuments, fences, pipe and underground structures, etc.

2. Whenever the Contractor's activities damage or injure such property, immediately restore it to a condition similar or equal to that existing before such damage occurred, at no expense to the Department. Protect property during the entire construction period from damage caused by the construction operations or equipment. The Department will not require the Contractor to provide routine repairs or maintenance for structures. However, immediately repair, at no expense to the Department, all damage occasioned by the construction operations.

3. In the event that the Contractor's construction operations result in damage to existing buildings requiring repairs, the Contractor shall make such repairs with any equipment, materials, or labor at the Contractor's disposal prior to continuing contract work.

B. Failure to Restore Damaged Property:

1. In case of failure on the part of the Contractor to restore such property, building, facility or vehicle, or to make good such damage or injury, the Department may, upon 48-hour notice, proceed to repair, rebuild, or otherwise restore such

property, building, facility or vehicle as may be deemed necessary, and the Department will deduct the cost thereof from any monies due or which may become due the Contractor under the Contract.

2. Nothing in this clause prevents the Contractor from receiving proper compensation for the removal, damage, or replacement of any public or private property, not shown on the plans, that is made necessary by alteration of the contract work. The Architect and/or Department will authorize such work, provided that the Contractor, or his employees or agents, have not, through their own fault, damaged such property.

C. Final Cleaning Up of Property:

1. Upon completion of the work, and before the Department accepts the work and makes Final Payment, remove from the right-of-way and adjacent property all falsework, equipment, surplus and discarded materials, rubbish and temporary structures; restore in an acceptable manner all property, both public and private, that has been damaged during the prosecution of the work; and leave sidewalks unobstructed and the property in a neat and presentable condition throughout the entire length of the work under Contract. Do not dispose of materials of any character, rubbish, or equipment, on abutting property, with or without the consent of the property owners. The Department will allow the Contractor to temporarily store equipment, surplus materials, usable forms, etc., on a well-kept site owned or leased by the Contractor, adjacent to the project. However, do not place or store discarded equipment, materials, or rubbish on such a site.

2. Shape and dress areas adjacent to the project property that were used as staging areas, materials storage areas or equipment yards when they are no longer needed for such purposes.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 011100

SECTION 017329
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall be responsible for all cutting, fitting and patching existing construction affected by and required to complete this work to include, but not be limited to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of the Contract Documents.

5. Provide penetrations of non-structural surfaces for installation of connections and electrical conduit.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product(s) involved.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of the project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions to the Department and/or Architect. Do not proceed with work until the Department and/or Architect has provided further instructions.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value to integrity of affected portion of the work.

B. Provide devices and methods to protect other portions of project from damage.

C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Fit and adjust products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

C. Restore work which has been cut or removed; install new products to provide completed work in accordance with the requirements of the Contract Documents.

D. Replace surfaces airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

E. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

END OF SECTION 017329

DIVISION 02

SITE CONSTRUCTION

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Earthwork includes, but is not limited to, excavation, backfill, compaction, and preparation of subgrade for the restroom facilities complete as indicated on the drawings.

1.02 RELATED WORK

A. SOIL TREATMENT: Section 02280.

B. DEWATERING: Section 02401.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: All work shall conform to sections/indexes of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, as amended.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EARTHWORK AND COMPACTION

A. All earthwork and compaction under the restroom facilities shall be in accordance with the specified Florida Department of Transportation sections/indexes.

END OF SECTION 02200

SECTION 02280
SOIL TREATMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide soil treatment for termite control at all restroom concrete slabs and foundations as indicated on the drawings and specified herein.

1.02 RELATED WORK

A. SUBMITTALS: Section 01340.

B. PRODUCT SUBSTITUTIONS: Section 01630.

C. EARTHWORK: Section 02200.

D. CONCRETE WORK: Section 03310.

E. UNIT MASONRY: Section 04220.

F. UNDER-SLAB VAPOR BARRIER: Section 07111.

1.03 QUALITY ASSURANCE

A. Applicator's Qualifications:

1. Engage a professional pest control operator, licensed in the State of Florida, in accordance with regulations of governing authorities for application of soil treatment solution.

B. Requirements of Regulatory Agencies:

1. All work shall comply with the Florida Building Code, latest adopted edition, as amended.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's technical data, complete with written substrate preparation and soil treatment application instructions. Include EPA-Registered Label.

2. Submit Material Safety Data Sheets.

B. Applicator's Qualifications:

1. Submit documented evidence of applicator's qualifications.

2. Submit a copy of the applicator's current state license.

C. Certificate of Compliance:

1. Submit a copy of the applicator's Certificate of Compliance required by the Florida Building Code.

1.05 PROJECT CONDITIONS

A. Restrictions:

1. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

2. To ensure penetration, do not apply soil treatment to excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil treatment solution manufacturer and EPA-Registered Label requirements.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. General: Provide an EPA-Registered emulsifiable, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Termiticide shall be clearly labeled for use as a preventative treatment to new construction. Fuel oil will not be permitted as a diluent.

1. Dilute with water to concentration level compliant with manufacturer's written instructions.

2. Use only soil treatment solutions that are not injurious to plants.

B. Products: Provide one of the following products:

1. "Dragnet FT" permethrine; FMC Corp.

2. "Prevail FT" cypermethrine; FMC Corp.

3. "Demon TC" cypermethrine; Zeneca Professional Products.

4. "Prelude" permethrine; Zeneca Professional Products.

PART 3 - EXECUTION

3.01 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Soil treatment solutions may be applied before placement of compacted fill under slabs, if recommended by soil treatment solution manufacturer.

B. Application Rates: Apply soil treatment solution in accordance with EPA-Registered Label directions. Distribute the treatment evenly.

C. Allow not less than twelve (12) hours for drying after application, before beginning concrete placement or other construction activities.

D. Post signs in areas of application warning workers that soil treatment solutions have been applied. Remove signs when areas are covered by other construction.

E. Re-apply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

F. Protect treated areas from rainfall if left exposed for extended period.

END OF SECTION 02280

SECTION 02401
DEWATERING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide dewatering for construction of restroom facilities below grade level.

B. Obtain all permits required for dewatering operations.

1.02 RELATED WORK

A. SUBMITTALS: Section 01340.

B. EARTHWORK: Section 02200.

C. CONCRETE WORK: Section 03310.

1.03 SUBMITTALS

A. Dewatering Programs:

1. Prior to Start of All Work: Prior to beginning all work, the Contractor shall submit for review a detailed plan of his dewatering system, including standby equipment, showing the arrangement and location of wells or wellpoints, methods of installation, location of headers and discharge line and points of discharge disposal.

a. Prior to beginning all work, the Contractor shall submit all applicable permits together with documentation of compliance of the Contractor's dewatering system, equipment, and disposal with permit provisions and requirements.

2. After Installation of System and Prior to Excavation: After completion of the dewatering installation and prior to commencement of excavation, the Contractor shall submit for review a detailed plan of the dewatering system as constructed, together with test data and computations demonstrating that the system is capable of achieving the specified result.

3. Deactivation Plan: The Contractor shall submit for review a plan for deactivation of the system at least one (1) week prior to deactivation. The deactivation plan shall include calculations of the adequacy of the structure to resist uplift and procedures for abandoning wells and other items left in place.

4. Review by the Engineer shall not relieve the Contractor of responsibility for the adequacy of the dewatering system to achieve the required results.

B. Stormwater Plan: The Contractor shall submit for review a plan to handle stormwater during heavy rain events so as to prevent soil erosion and temporary flooding of the excavation and partially completed works.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Equipment shall be subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 DEWATERING SYSTEM

A. The Contractor shall supply a dewatering system capable of allowing the construction of the restroom facilities in the dry.

B. The dewatering system shall control the ground water in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes and will not result in damage to existing structures (if occurring), and utility lines.

C. The water level shall be lowered in advance of excavation utilizing wells, wellpoints or similar methods.

D. The water level as measured in piezometers installed in the water table aquifer shall be maintained to allow the construction of the restroom facilities in the dry.

E. Open pumping with sumps and ditches will be permitted only if it does not result in boils, loss of fines, softening of the ground or instability of slopes.

F. Wells and well points shall be installed with suitable screens and filters so that continuous pumping of fines does not occur.

3.02 STANDBY EQUIPMENT

A. The Contractor shall provide standby equipment installed and ready to operate to assure continuous pumping throughout the construction.

3.03 DISPOSAL OF WATER

A. The Contractor shall be responsible for the disposal of water generated by his operations.

B. The Contractor shall devise a plan that will be acceptable to all agencies having jurisdiction.

C. The Contractor shall remove all temporary facilities constructed for the Contractor's use, remove all soil deposits occurring as a result of an operation, clean any existing drainage facilities used, and restore to original condition all temporary site alterations.

3.04 FIELD QUALITY CONTROL

A. The Engineer reserves the right to reject any stormwater plan proposal that features the use of design data considered by the Engineer to be inadequate, insufficient, or undesirable.

B. The Engineer reserves the right to reject any dewatering system proposal that features the use of design data considered by the Engineer to be inadequate, insufficient, or undesirable.

END OF SECTION 02401

SECTION 02660
WATER MAINS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install water mains and appurtenances required for potable water system complete as indicated on the drawings.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. 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 five (5) years.

B. Installer's Qualifications:

1. Firm with at least three (3) years of successful installation experience on projects with potable water piping work similar to that require for this project. Firm shall have a valid certified underground utility contractor's license.

C. Requirements of Regulatory Agencies:

1. All work is subject to requirements of the following:

a. Florida Department of Transportation Standards.

b. Florida Department of Environmental Protection Regulations.

c. Florida Building Code, Latest Adopted Edition, as amended.

D. Reference Standards:

1. American Society for Testing and Materials (ASTM):

a. D 1784 Specification for Rigid Poly Vinyl Chloride (PVC) Compounds

b. D 1785 Specification for PVC Plastic Pipe, Schedules 40, 80, and 120

2. American Water Works Association (AWWA):

a. C 508 Standard for Swing-Check Valves for Waterworks Service, 2 inches through 24 inches NPS

b.	C 509	Standard for Resilient-Seated Gate Valves for Water and Sewerage Systems
c.	C 605	Standard for Underground Installation of PVC Pressure Pipe and Fittings for Water
d.	C 651	Standard for Disinfecting Water Mains
e.	M 23	PVC Pipe - Design and Installation

1.03 SUBMITTALS

A. Product Data:

1. Submit manufacturer's technical product data and installation instructions for water system materials and products.

B. Shop Drawings:

1. Submit shop drawings for water systems, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, thrust blocks, and anchors. Show interface and spatial relationship between piping and proximate structures.

C. Maintenance Data:

1. Submit maintenance data and parts lists for water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Markings:

1. All water mains shall have a blue marker tape buried 24 inches above the top of the pipe for its full length with the following wording: "CAUTION - WATER MAIN BURIED BELOW."

2. A blue coated #14 gauge UF (Underground Feeder per National Electric Code Article 339) solid tracer wire and joint seal shall be installed along all pipe and service and must be taped below the spring line of the pipe and stubbed up at valves.

B. Pipe and Pipe Fittings:

1. 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.

2. All 2-inch water service lines shall be PVC Schedule 40 pressure pipe complying with ASTM D 1784 and ASTM D 1785.

3. PVC Pipe Products: Provide products by one of the following manufacturers:

   a. Certainteed.

   b. Charlotte Pipe.

C. Steel Casing:

1. All construction projects requiring steel sleeves shall conform to ASTM A 53 for roadway crossings. Railroad crossings shall conform to railroad requirements. Casing pipe shall be steel and shall meet the following wall thicknesses:

STEEL CASING (Diameter)	RAILROAD (Min. Thick.)	FDOT (Min. Thick.)
1"	0.251"	0.133"
1-1/2"	0.251"	0.145"
2"	0.251"	0.154"
2-1/2"	0.251"	0.203"
3"	0.251"	0.216"
4"	0.251"	0.237"
6"	0.251"	0.188"
8"	0.251"	0.188"
10"	0.251"	0.188"
12"	0.251"	0.250"
14"	0.281"	0.250"
16"	0.281"	0.250"
18"	0.312"	0.250"

2. When the plans specify carrier pipe size for installation in casing pipe, said casing pipe shall be sized as follows:

CARRIER PIPE (Normal O.D.)	STEEL CASING (Required Dia.)
2"	8"
4"	12"
6"	12"
8"	18"

3. All steel sleeve installations shall require casing spacers.

   a. Products: Provide casing spacers by one of the following manufacturers:

      (1) Cascade.

      (2) PSI.

4. Any variations to the above schedule must be approved by the Department prior to construction.

D. Valves:

1. Gate Valves: 2 inches through 12 inches in size shall be resilient seated, NRS, with 2-inch-square operating nut and shall conform to AWWA C-509.

2. Products: Provide gate valves by one of the following manufacturers:

a. Clow.

b. Mueller.

c. U.S. Pipe.

d. American Flow Control.

e. ITT Kennedy.

E. Valve Boxes:

1. Boxes shall be cast iron of standard design with adjustable screw type box. Interior diameter shall not be less than 5 inches with cast iron cover marked "WATER." Any deviations from this, i.e., PVC valve boxes, shall be approved by the Department prior to installation.

2. Products: Provide valve boxes by one of the following manufacturers:

a. Tyler.

b. Clow.

c. U.S. Foundry.

F. Backflow Assembly:

1. Backflow assembly shall be the sizes as detailed on the plans.

2. Backflow prevention device - reduced pressure principle shall be installed per AWWA C506-78 Standard.

3. Products: Provide backflow assemblies by one of the following manufacturers:

a. Hersey.

b. Febco.

c. Watts.

d. Zurn.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pipe Installation:

1. Installation shall be performed in accordance with the applicable provisions of AWWA.

2. Thrust blocks shall be required at all bends and tees except for glued PVC connections where thrust are not required.

3. Install underground marker at all locations where piping is installed.

4. All pipes shall be installed 36 inches (minimum) below unpaved ground and 48 inches (minimum) below pavement surfaces within limited access right-of-way as shown on the drawings.

B. Backfilling:

1. The Contractor shall obtain a well compacted bed and shall carefully fill and compact along the sides of the pipe in 6-inch layers to a point at least one foot above the top of the pipe. Where no pavement is to be constructed and vehicular traffic is to pass over the pipe, such as road shoulder and grass median strip areas, backfill material above one foot over the top of the pipe shall be compacted to a firmness approximately equal to that of the soil adjacent to the pipe trench excavation.

2. When pavement is to be constructed over the pipe, backfill material above one foot over the top of the pipe shall be placed in a manner and compacted to a degree required to meet the minimum requirements for compaction as specified by the Department.

3. Backfill compaction shall be minimum of 90 percent of modified proctor in grassed areas and 95 percent of modified proctor under roadways.

4. The Department reserves the right to reject any portion of backfill material that is not deemed appropriate or improperly placed. The Contractor will be required to reopen the trench at those locations and replace backfill in a proper manner.

3.02 PRESSURE TESTS

A. General:

1. After installation is completed, the system shall be filled with water and flushed at 2-1/2 feet per second or the highest obtainable velocity at the farthest points. If sufficient velocities cannot be obtained, poly pigs may be required to properly clean the system of construction sand and debris. All air must be expelled. Should the system appear to be tight, the leakage test may begin.

2. Flushing of the system and control of the tie valve is under the direct control of the Department's inspector. No flushing is to take place through the backflow preventer.

3. Water main shall be tested in accordance with AWWA C605, latest edition, under minimum hydrostatic pressure of not less than 150 psi for a minimum of two (2) hours.

B. Leaks:

1. All leaks shall be uncovered and repaired regardless of the total leakage as indicated by the test, and all pipes, valves, and fittings and other materials found defective under the test shall be removed and replaced at the Contractor's expense. Tests shall be repeated until leakage has been eliminated and the system passes a pressure test.

3.03 STERILIZATION TEST

A. General:

1. Sterilization of all equipment, pipelines, and other parts of the project with which water comes into contact and which have been contaminated by the Contractor's operations shall be accomplished after completion of construction and immediately before the system or unit is placed into operation. The Contractor shall pay for all water used for construction and sterilization of the system.

2. Sterilization tests shall be conducted in accordance with current Health Department standard specifications prevalent at the time of testing.

B. Sterilizing Agent:

1. The sterilizing agent shall be liquid chloride or sodium hypochlorite solution conforming to Federal Specification 0-S-602b Sodium Hypochlorite, Grade D. Dry Hypochlorite similar to "HTH" may also be used as the sterilizing agent, upon approval by the Department.

C. Sterilization Method:

1. The piping shall be sterilized by introducing the sterilizing agent into the water which is being pumped into the system in such a manner that the entire system will be filled with water containing a minimum chlorine concentration of 50 ppm at any point. This water shall be allowed to remain in the system for a contact period of time of at least 24 hours.

D. Residual Chlorine Tests:

1. After sterilizing agents have been permitted to remain for the specified contact periods, the pipeline and valves shall be thoroughly flushed with water until the residual chlorine tests are not less than 0.2 ppm or greater than 3.0 ppm in each instance. The determination of the amount of residual chlorine in the system shall be made at such points and in accordance with the required tests by means of a standard chlorine test kit for monitoring free chlorine.

E. Bacterial Tests:

1. After the water system or any other units or portions of the project have been sterilized and thoroughly flushed, samples of water shall be taken from several points as directed by the Health Department. If repeated tests of such samples show the presence of coliform organisms, their sterilization shall be repeated and continued until tests indicate absence of pollution. On two (2) consecutive days, 24 hours apart, bacteriological samples shall be satisfactorily completed and written notice is given before the system is placed into operation. At no point is water to be used from this system (except for flushing and chlorination) prior to satisfactory bacteriological results and approval for public use notification from the Health Department.

F. Approval of Sterilization:

1. The complete sterilization program and methods followed, especially if materially different from those specified, shall be in accordance with directives of the State of Florida Department of Health and Rehabilitative Services, Division of Health - County Health Department, and all methods employed shall meet with their approval.

3.04 FIELD QUALITY CONTROL

A. Testing:

1. Hydrostatic and Leakage Test:

a. After completion of all work and before Final Acceptance, hydrostatic and leakage test shall be conducted. The Contractor shall furnish and install the taps into the pipeline, pipe connections, and the measuring device. Water shall be furnished by the Contractor for the test. The duration of this test shall be no less than two (2) hours at a minimum test pressure of 150 psi.

b. The maximum allowable leakage shall be determined by the formula:

$$L = \frac{ND\ \theta\ PP}{7{,}400}$$

In which,

L = Allowable leakage, in gallons per hour

N = Number of joints in the length of pipe line tested

D = Pipe diameter, in inches

P = Average test pressure during the test, in PSI gauge

All defects discovered during this test shall be remedied and the test repeated before Final Acceptance.

The Contractor shall pay all costs in connection with the pressure testing.

B. Notice of Test:

1. The Contractor shall give the Department forty-eight (48) hours advance notice of the time when the installation is ready for hydrostatic and leakage test.

END OF SECTION 02660

SECTION 02700
SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install sanitary sewer piping and appurtenances required for sanitary sewer system complete as indicated on the drawings.

1.02 RELATED WORK

A. WATER MAINS: Section 02660.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of sanitary sewer systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications:

1. Firm with at least three (3) years of successful installation experience on projects with sanitary sewer piping work similar to that require for this Project. Firm shall have a valid State of Florida underground utility contractor's license.

C. Requirements of Regulatory Agencies: Comply with provisions of the following:

1. Referenced Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, Latest Adopted Edition, as amended.

2. Florida Department of Environmental Protection (FDEP) Regulations

3. Florida Department of Health and Rehabilitative Services (HRS) Regulations

4. Florida Building Code

D. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American National Standards Institute (ANSI).

a. Referenced Standards

2. American Society for Testing and Materials (ASTM):

a.	A 48	Specification for Gray Iron Castings
b.	C 150	Specification for Portland Cement
c.	C 478	Specification for Precast Reinforced Concrete Manhole Sections
d.	C 928	Specification for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes
e.	D 1248	Specification for Polyethylene Plastics Molding and Extrusion Materials
f.	D 2321	Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
g.	D 3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
h.	D 3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
i.	F 477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

3. Uni-Bell PVC Pipe Association (UNI):

a. Referenced Standards.

E. Marking: Each length of pipe shall bear the name or trademark of the manufacturer, the location of the plant, and the date of manufacture. Each length shall likewise be marked to designate the class or strength of the pipe. The marking shall be made on the exterior of the pipe barrel near the bell end and shall be plainly visible. Pipe with special outlets or connections shall be marked to designate the specific installation location.

1.04 SUBMITTALS

A. Product Data: Submit product data and installation instructions.

B. Shop Drawings: Submit shop drawings showing piping materials, size, locations, and elevations. Include details of underground structures, connections, and anchors. Show interface and spatial relationship between piping and proximate structures.

C. Maintenance Data: Submit maintenance data and parts lists for sanitary sewer system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products.

B. Load and unload all pipe, fittings, and appurtenances by hoists or other mechanical devices. DO NOT skid or roll products on or against other products. Use slings, hooks, and pipe tongs in such a manner that will prevent damage to products. Use of pipe tongs shall be prohibited if pipe linings are damaged by their use.

C. Keep stored products safe from damage or deterioration. Keep the interior of pipe, fittings, and appurtenances free from dirt or foreign matter. Store gaskets and other products which may be deteriorated by sunlight, in a cool location out of direct sunlight. Keep gaskets out of contact with petroleum products.

D. Promptly remove damaged products from the job site and replace with undamaged products.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. All pipe, fittings, and appurtenances shall be as indicated on the drawings and specified in this section, and shall be new and unused.

B. All pipe shall be green in color.

2.02 GRAVITY SEWER PIPE AND FITTINGS

A. Polyvinyl Chloride Pipe (PVC):

1. PVC pipe and fittings, 4 inch through 15 inch diameter, shall conform to ASTM D 3034 with a standard dimension ratio (SDR) of 26. Joints shall be push-on joints conforming to ASTM D 3212. Solvent cement joints are NOT permitted.

2. All gaskets shall be molded into a circular form or extruded to the proper section and then spliced into circular form and shall consist of a properly cured high-grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer, or a blend of both, conforming to ASTM F 477. The gasket shall provide as adequate compressive force so as to affect a positive seal under all combinations of joint tolerances. The gasket shall be the only element depended upon to make the joint watertight. Gaskets shall comply with the Low-Head Application requirements of ASTM F 477.

3. Adaptors (if required) for joining ductile iron pipe to PVC and vitrified clay pipe to PVC shall be submitted to the Department for review and approval before being installed on the Project.

4. PVC sewer pipe shall be field cut using hand or power saws in accordance with the manufacturer's recommendations. The raw spigot end thus formed shall be filed to remove gasket damaging burrs and form a standard bevel.

5. Products: Provide PVC gravity pipe by one of the following manufacturers:

a. J-M Manufacturing Co., Inc.

b. CertainTeed Corporation.

c. North American Pipe Corporation.

2.02 PRECAST CONCRETE MANHOLE FABRICATION

A. General:

1. Manholes shall be constructed of precast reinforced concrete sections. Each manhole shall have a base section or tee section, barrel section, and an eccentric or concentric cone top, all as required. Manholes shall be built without steps. Except as otherwise specified or shown, precast concrete manholes shall comply with ASTM C 478. Only sulfate resistant cement (ASTM C 150, Type II) shall be used in the concrete mix.

2. Manhole barrel sections shall be constructed with preformed openings properly located for making sewer line connections. The diameter of such openings shall not be more than 4-inches larger than the outside diameter of the pipe or pipe bell to be connected. The distance between the nearest edge of such openings and the shoulder of the barrel joint shall be 6-inches minimum.

B. Manholes on Sewers 24 Inches or Less in Diameter:

1. Base sections for Standard Deep Type and Shallow Type Manholes shall consist of a circular slab base with a minimum thickness of 8 inches and shall be reinforced as shown on the plans. The base slab can extend beyond the outside diameter of the barrel section, providing the extension is equal at all points on the circumference of the slab.

2. Barrel sections for Standard Deep Type shall have an inside diameter of 48 inches and a minimum wall thickness of 5 inches. A single line of circumferential reinforcement shall be placed inside the face of the wall. The bottom section of the manhole barrel shall be either integrally precast with the base section or cast separately with an approved 6-inch PVC waterstop installed in the joint between the base slab and barrel section.

3. Top sections for Standard Deep Type Manholes shall be eccentric cones 3 feet in height as shown on the plans. The cones shall have walls a minimum of 5 inches thick.

4. Barrel sections for Standard Shallow Type Manholes on 8-inch diameter sewers shall have an inside diameter of 48 inches and a minimum wall thickness of 8 inches. The bottom section of manhole barrel shall be either integrally precast with the base section or cast separately with an approved 6-inch PVC waterstop installed in the joint between the base slab and barrel section.

5. Top sections for Standard Shallow Type Manholes shall be 2-foot-high concentric pre-cast concrete cones with 24-inch openings and walls a minimum of 8 inches thick.

6. Ends of each length of manhole riser pipe and bottom end of manhole tops of the cone type shall be formed as detailed on the drawings. All joints shall be watertight under all conditions of service.

C. Curing:

1. All precast concrete manhole sections shall be cured in accordance with any one of the methods specified in ASTM C 478. The facilities for curing shall, however, be subject to review and prior approval.

2. No precast concrete manhole sections shall be delivered to the job site until the specified minimum compressive strength of 4,000 psi, as determined by crushing tests on cured concrete cylinders, has been obtained.

D. Manhole Frames and Covers:

1. Manhole frames and covers shall be of grey iron and shall meet the requirements of ASTM A 48, Class 30 B. Castings shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Standard frames and covers shall be of the traffic type. The cover shall seat firmly into the frame without rocking.

2. Grind or otherwise finish each cover so that it will fit in its frame without rocking. Frame and cover shall be made watertight by means of dovetail groove and gasket in the cover. Frames and covers shall be matchmarked in sets before shipping to the site.

3. Covers shall have the words "SANITARY SEWER" cast thereon in 3/4-inch-high letters raised flush with the top of the cover.

4. Before leaving the foundry, clean castings and subject them to a hammer inspection. Then dip castings twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 190 degrees F, nor more than 310 degrees F, and in such manner as to form a firm tenacious coating.

5. Frames and Covers Product: U.S. Foundry & Mfg. Corp. No. 420, or approved equal Type "C" Cover with "O" Ring.

PART 3 - EXECUTION

3.01 EXCAVATING, TRENCHING, BACKFILLING, AND COMPACTION

A. Perform in accordance with requirements of FDOT Section 120 - EXCAVATION AND EMBANKMENT.

3.02 PIPE INSTALLATION

A. PVC Pipe Installation:

1. Installation of PVC sewer pipe shall be in accordance with the recommended practices contained in ASTM D 2321 and UNI-B-5.

2. Unsupported trench width shall be limited to the minimum practicable width allowing working space to place and compact the haunching material. The maximum width shall be the pipe diameter plus 305 mm on each side of the pipe at springline for pipe in unsupported trenches. In sheeted trenches the width of trench between faces of the sheeting shall be adequate to allow the pipe bedding and haunching to be placed and completed and the sheeting removed without disturbing the bedding and haunching material within two (2) pipe diameters on each side of the pipe. Trench boxes and moveable sheeting shall be wide enough to allow moving without disturbing the bedding and haunching within two (2) pipe diameters on each side of the pipe. Trench boxes and moveable sheeting shall be constructed and used in the trench to avoid disturbing the piping, bedding, and haunching when being moved forward in the trench.

3. Dewatering of the trench bottom shall be accomplished using adequate means to allow preparation of bedding, placement of haunching and pipe in a trench environment without standing water. Dewatering shall continue until sufficient backfill is placed above the pipe to prevent flotation.

4. Preparation of trench bottom shall provide firm, stable and uniform support for the full length of the pipe. Haunching of native material shall be placed to the spring line and compacted to a minimum 95% of the AASHTO T-180 proctor density. If ground water or trench bottom conditions are such as to require use of Class I material, either to aid in dewatering or to provide foundation and bedding for the pipe, the haunching shall also be of Class I material. Class I material contains angular, 1/4 inch to 1-1/2 inch graded stone, coral, crushed stone and crushed shells. Care shall be taken to place the haunching material, without voids, completely filling the trench from pipe wall to trench wall.

B. Sanitary Sewer Line and Other Utilities:

1. Sanitary sewers must be a minimum of 6 feet clear (10 feet preferred) from parallel water line and 5 feet from any other parallel utility. It is especially important to provide additional clearance for gravity sewers, and depending on the relative size and depth of the utilities involved, we specify a minimum of more than 5 feet.

3.03 MANHOLE INSTALLATION

A. Set each precast manhole unit plumb on a bed of sealant to make a watertight joint at least 2 inch thick with the concrete base or with the preceding unit. Point the inside joint and wipe off the excess sealant. Secure the manhole frame to the grade ring with grout and cement mortar fillet. Backfill, compact, and replace pavement or other surface as applicable.

B. Assemble units so that the top of the cover shall be flush with the adjoining pavement surface and/or ground surface. Install precast grade rings to provide for adjustment of the final elevation of the cover. Provide grade rings totaling not less than 6 inches nor more than 12 inches in height between the manhole frame and the top of the concentric cone or flat slab top.

C. Manhole bases shall be cast-in-place concrete, reinforced as indicated on the drawings, or monolithic base and first section combination. Manhole bases shall be cast or placed on a minimum of 12 inches of compacted crushed stone. Pre-cast concrete bases will be considered for use on a case by case basis.

D. Manhole channels or inverts shall be preformed and poured with 2,000 psi Class I concrete to the spring line of the connecting pipe. The finished invert shall be semicircular shaped smooth channel directing the flow to the downstream pipe.

E. Connecting pipe shall be connected into manholes by means of a resilient connector between reinforced concrete manhole structures and pipe in accordance with ASTM C 923. A waterstop gasket embedded in the manhole barrel similar or equal to Press Wedge II shall be acceptable.

F. All manhole frames shall be securely anchored to the cone section or flat slab top, as applicable, with frames bedded in mortar. The joint between the casting frame and the grade rings, and between the grade rings and the cone section or flat slab top, shall be fully mortared or gasketed and coated with a coal tar epoxy type coating upon reaching its final set. The joints shall be watertight.

G. Seal all joints between precast sections with both inner and outer rings of plastic sealing compound. Seal exterior of joints with Type II Portland cement mortar.

3.03 FIELD QUALITY CONTROL

A. Sanitary Sewer System Testing: Prior to Final Acceptance of the Work:

1. After completion of backfilling, all sewers shall be tested for alignment, deflection, and integrity.

2. After completion of backfilling, all sewers shall be tested and inspected for infiltration or leakage by the Contractor with Department observation. All wyes, house connections, and stubs shall be suitably plugged or bulkheaded to the satisfaction of the Department prior to testing. All sewers shall be cleaned and pumped out as necessary prior to testing.

B. Light Test:

1. After backfilling over any section of sewer which should have a uniform grade and straight alignment, the Contractor shall flash a light from manhole to manhole. The view through the line shall show a vertical and horizontal axis in full pipe diameter. The Contractor shall be responsible for the removal and relaying of pipe as necessary to meet these requirements.

C. Leakage Tests: All pipe sewers and appurtenant structures connected thereto shall be made as nearly watertight as practicable. Leakage tests shall be performed by the Contractor who shall be responsible for furnishing all necessary labor and equipment to conduct such testing.

1. Type of Test: Gravity sewers shall be required to pass a leakage test before Final Acceptance. Leakage tests shall be by the low-pressure air test as described below.

2. Selection of Test Sections: Each test section shall not exceed 400 feet in length and shall be tested between adjacent manholes.

3. Preparation and Coordination for Testing:

   a. The Contractor shall flush all sewers with water sufficient in volume to obtain free flow through each line. Water shall be pumped from the sewer system during flushing to an acceptable discharge location. A visual inspection shall be made and all obstructions removed.

   b. The Contractor shall notify the Department 48 hours prior to performing any leakage testing.

   c. The results of all leakage tests shall be presented in neat, legible writing by the Contractor to the Engineer for distribution to the Department. These written results shall be formatted and adequately labeled so that they are easily understandable.

4. Leakage Test: Leakage testing shall be conducted in accordance with the procedure for "Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe" in UNI's UNI B-6. Passing this test shall be presumed to establish leakage test limits of 50-gallons per day per inch diameter per mile of sewer.

D. Precast Concrete Manhole Testing:

1. All Precast concrete manholes are to be inspected by a certified laboratory, approved by the Department, to establish the strength of the concrete, the adequacy of curing, the certification of the date that the manholes were cast and the confirmation that the steel is properly placed, all according to the standard details and specifications.

2. Three (3) cylinders shall be taken each day that manholes are cast, with batch samples to be designated by the laboratory representative. At least one (1) set of cylinders shall be taken for each nine (9) cubic yards of concrete used in the construction of the manhole sections. These samples shall be tested for strength. If the samples fail to meet minimum concrete strength requirements set forth in the specifications, then all manhole sections will be considered rejected.

3. In addition, the Department reserves the right to core manholes either at the site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength, then all sections not previously tested will be considered rejected until sufficient additional cores are tested to substantiate strength requirements, all at the Contractor's expense

END OF SECTION 02700

DIVISION 03

CONCRETE

SECTION 03310
CONCRETE WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The extent of concrete work is shown on the Drawings.

1.02 RELATED WORK

A. SOIL TREATMENT: Section 02280.

B. DEWATERING: Section 02401.

C. UNIT MASONRY: Section 04220.

D. STRUCTURAL STEEL: Section 05120.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with provisions of the following, except as otherwise indicated or specified:

1. American Association of State Highway and Transportation Officials (AASHTO):

a.	AASHTO M 182	Burlap Cloth Made From Jute or Kenaf.

2. American Concrete Institute (ACI):

a.	ACI 301	Specifications for Structural Concrete for Buildings.
b.	ACI 304	Guide for Measuring, Mixing, Transporting, and Placing Concrete.
c.	ACI 305	Hot Weather Concreting.
d.	ACI 306	Standard Specification for Cold Weather Concreting.
e.	ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
f.	ACI 318	Building Code Requirements for Reinforced Concrete.
g.	ACI 347	Recommended Practice for Concrete Formwork.
h.	ACI 504R	Guide to Sealing Joints in Concrete Structures.

3. American Society for Testing and Materials (ASTM):

   a. Referenced Standards.

4. Concrete Reinforcing Steel Institute (CRSI):

   a. Manual of Standard Practice.

5. U.S. Army Corps of Engineers (CE):

   a. CE CRD-C 513 Specification for Rubber Waterstop.

   b. CE CRD-C 572 Specification for Polyvinyl-Chloride Waterstops.

6. United States Department of Commerce, National Institute of Standards and Technology; Product Standards (PS):

   a. PS-1 U.S. Product Standard for Construction and Industrial Plywood.

B. Concrete Testing Service: The Contractor shall retain an independent testing laboratory, hereinafter referred to as the "Lab."

1. Materials and installed work may require testing and retesting, as directed by the Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, excluding retesting of rejected materials and installed work, shall be performed at Department's expense. Retests shall be performed at the Contractor's expense.

1.04 SUBMITTALS

A. Product Data: Submit product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by the Engineer.

B. Shop Drawings, Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Conform to ACI 315, showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and formed openings through concrete structures.

C. Laboratory Test Reports: Submit copies of laboratory test reports for concrete materials and mix design test as specified.

D. Material Certificates: It is preferable to provide copies of materials certificates in lieu of materials laboratory test reports when permitted by the Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. The design and removal of all formwork is solely the responsibility of the Contractor.

B. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork, for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Cardboard tube forms are not acceptable. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use medium density overlay (MDO) plywood conforming to PS-1 M.D. Overlay, Group 1, Exterior Grade.

C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

D. 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.

E. Form Ties: Use factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated and except as noted, provide ties so portion remaining within concrete after removal is 1-1/2 inches inside concrete and will not leave holes larger than 1 inch diameter in concrete surface.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports conforming to CRSI Specifications, unless otherwise acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

3. Where underside of lintels are exposed, bars shall be suspended such that chairs which cause spalling are not used.

2.03 CONCRETE MATERIALS

A. General: The materials used in concrete must be certified from the source and shall conform to the requirements of Division III of 2004 FLORIDA DEPARTMENT OF TRANSPORTATION Standard Specifications:

1. Portland Cement: Section 921.

2. Fine Aggregate: Section 902. Only silica sand will be permitted except as provided in 902-5.2.3.

a. For exterior exposed surfaces, do not use fine aggregates containing spalling-causing deleterious substances.

3. Coarse Aggregate: Section 901.

a. For exterior exposed surfaces, do not use coarse aggregates containing spalling-causing deleterious substances.

4. Water: Section 923.

5. Admixtures: Section 924.

6. Slag, Fly Ash, and Other Pozzolanic Materials: Section 929.

7. The materials used in concrete shall contain no hardened lumps, crusts, or frozen matter and shall not be contaminated with dissimilar material.

B. Types of Cement: Unless a specific type of cement is designated elsewhere, cement used in concrete shall be Type I or Type II.

C. Fly Ash, Slag, and Other Pozzolanic Materials: Fly ash, slag, or other pozzolanic materials may be used as a cement replacement or as an admixture in concrete when Type I or Type II cement is used.

D. Mixing Different Coarse Aggregates: Substitution of aggregate of the same type and grade from a different source than in an approved concrete mix may be permitted at the discretion of the Engineer.

E. Admixtures:

1. Air Entraining Admixture: ASTM C 260.

2. Water Reducing Admixture: ASTM C 494, Type A, and contain not more than 0.1 percent chloride ions.

3. High Range Water Reducing Admixture (Superplasticizer): ASTM D 495, Type D, and contain no more than 0.1 percent chloride ions.

4. Water Reducing Non-Chloride Accelerator Admixture: ASTM C 494, Type D, and contain no more than 0.1 percent chloride ions.

5. Water Reducing Retarding Admixture: ASTM C 494, Type D, and contain no more than 0.1 percent chloride ions.

6. Chemical admixtures or additives containing calcium chloride ions shall not be permitted. Provide admixture manufacturer's written certification that chloride ion content is negligible.

F. Material Storage:

1. Cementitious Materials Storage: As a minimum, each plant shall comply with material specifications and provide a separate and clearly labeled weatherproof facility to store each brand and/or cementitious material available during the Work. Each storage facility shall provide a suitable, safe, and convenient means of collecting cementitious materials samples.

2. Aggregate Storage: As a minimum, each plant shall provide suitable bins, stockpiles, or silos to store and identify aggregates without mixing, segregating, or contaminating the different sources or grades. Identification shall include FLORIDA DEPARTMENT OF TRANSPORTATION-approved pit number and aggregate type/gradation.

3. Stockpiles - General Requirements: Whichever of the allowable methods of stockpiling aggregates, as specified below, is used by the concrete producer, it shall be his responsibility to handle the aggregates in such a manner as to minimize segregation and to recover materials from the stockpile for use in the mix in a manner that it will fall within the limits of the Specifications. Stockpiles shall be maintained in a well drained condition to minimize free water content. The Producer shall make available to the Lab, for sampling, the necessary quantities of aggregate on the recovery side of the stockpile where feasible, for their testing at a frequency necessary to ensure compliance with the Specifications.

4. Forming Stockpiles by Clamshell: Stockpiles of either coarse or fine aggregates shall be built-up in layers not to exceed 3 feet in height. Each layer shall be completely in place before the next layer is started.

5. Forming of Ramped Stockpiles: When truck and bulldozers are used to form a ramp-type stockpile, such stockpiles shall be constructed in lifts not exceeding 3 feet in height and a slope that will prevent segregation. Generally, only rubber-tired equipment will be permitted on the stockpile. Equipment other than rubber-tired equipment may be permitted by the Engineer when the Producer can show that the equipment produces no detrimental effect.

6. Forming Stockpiles by Belt Conveyor: When the stockpile is formed by a belt conveyor system, the discharge end of the conveyor shall be adjustable in height and capable of moving circularly, or the Producer shall provide means of keeping coning of stockpiles to a minimum to reduce segregation. Questions of segregation shall be resolved by sampling the aggregate from the last conveyor belt before entering overhead storage.

7. Storage of Aggregates in Silos: When aggregates are stored in silos the overhead charge shall be so arranged that segregation of the aggregates does not occur. The silos shall be maintained in reasonably full condition, as full as practicable.

8. Wetting Coarse Aggregate Stockpiles, Storage Bins, and Silos: The entire surface of the coarse aggregate shall be continuously and uniformly sprinkled with fresh water for a period of 24 hours preceding their introduction into the concrete mix to assure uniformity of concrete consistency. Any request for deviations from the 24-hour sprinkling requirements shall be addressed for consideration by the Engineer.

2.04 RELATED MATERIALS

A. Waterstops: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as indicated. Size to suit joints. Provide either rubber or PVC waterstops as follows:

1. Rubber Waterstops: CE CRD-C 513.

a. Products: Provide rubber waterstops by one of the following manufacturers:

(1) The Burke Co.

(2) Progress Unlimited.

(3) Williams Products, Inc.

2. Polyvinyl Chloride Waterstops: CE CRD-C 572.

a. Products: Provide polyvinyl chloride waterstops by one of the following manufacturers:

(1) Afco Products.

(2) The Burke Co.

(3) W.R. Meadows, Inc.

(4) Progress Unlimited.

(5) Vinylex Corp.

B. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials specified in Section 07111 - UNDER-SLAB VAPOR BARRIER.

C. Non-Shrink, Non-Metallic Grout: Factory packaged nonstaining grout. Provide grout specifically recommended by manufacturer for interior and exterior applications.

1. Products: Provide one of the following nonshrink, nonmetallic grouts (conforming to ASTM C 1107):

a. "Euco-NS" Euclid Chemical Co.

b. "Vibropruf #11" Lambert Corp.

c. "Masterflow 928" Master Builders Technologies, Inc.

d. "Sonogrout 14" Sonneborn Building Products-Chemrex, Inc.

D. Hardener/Sealer/Dustproofer:

1. Products: Provide one of the following hardener/sealer/dustproofers:

a. "Burk-O-Lith" the Burke Co.

b. "Surfhard" Euclid Chemical Co.

c. "Saniseal" Master Builders Technologies, Inc.

d. "Lapidolith" Sonneborn Building Products-Chemrex, Inc.

E. Sealer for Form-Lined Concrete and Adjacent Vertical Concrete: Colorless, proprietary solution for sealing concrete surfaces.

1. Product: "Clear Pruf" the Burke Co.

F. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd., conforming to AASHTO M 182, Class 2.

G. Moisture-Retaining Cover: One (1) of the following, complying with ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

H. Liquid Membrane Forming Curing Compound: Liquid type membrane-forming curing compound conforming to ASTM C 309, Type 1-D. Moisture loss not more than 0.55 gr./sq. cm. when applied at 200 sq. ft./gal. Compound to be clear and colorless at time of application and not change to a yellow or amber color over time and exposure.

1. Products: Provide one (1) of the following liquid membrane forming curing compounds:

a. "Clear Seal" Tamms Div., LaPorte Construction Chemicals.

b. "Masterkure 200W" Master Builders Technologies, Inc.

c. "Klearseal" Setcon Industries.

d. "Kure-N-Seal" Sonneborn Building Products-Chemrex, Inc.

I. Bonding Compound: ASTM C 1059. Where concrete placement will be protected (interior) or delayed, use rewettable Type 1 bonding agent. Where concrete will be placed immediately after application of bonding agent, use non-rewettable acrylic Type II.

1. Products, Rewettable Type Bonding Compounds: Provide one (1) of the following products:

a. "Euco Weld" Euclid Chemical Co.

b. "Hibond" Lambert Corp.

c. "Everweld" L&M Construction Chemicals, Inc.

2. Products, Non-Rewettable Type Bonding Compounds: Provide one (1) of the following products:

a. "Acrylic Bondcrete" the Burke Co.

b. "SBR Latex" Euclid Chemical Co.

c. "Acrylbond" Lambert Corp.

d. "Sonocrete" Sonneborn Building Products-Chemrex, Inc.

J. Epoxy Adhesive: ASTM C 881, two-component 100% solids material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit project requirements.

1. Products: Provide one of the following epoxy adhesives:

a. "Burke Epoxy M.V." the Burke Co.

b. "Euco Epoxy System #452 or #620" Euclid Chemical Co.

c. "Sikadur 32 Hi-Mod" Sika Chemical Corp.

K. Joint Filler Material: Preformed strips of asphalt saturated fiberboard, conforming to ASTM D 1751.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.

B. Submit written reports to the Engineer of each proposed mix for each class of concrete at least fifteen (15) days prior to start of work. Do not begin concrete production until mixes have been reviewed and approved by Engineer of Record.

C. Design mixes to provide normal weight concrete as indicated on Drawings. Maximum w/c ratio shall be as specified in ACI 301.

D. Admixtures: Conform to the following requirements:

1. Use water reducing admixture of high range water reducing admixture (super plasticizer) in concrete as required for placement and workability.

2. Use air entraining admixture in all normal weight concrete, unless otherwise indicated. Add air-entraining admixture in manufacturer's prescribed rate to result in concrete at point of placement having total air content of 4 percent with a tolerance of $\pm$ 1-1/2 percent.

3. Use admixtures for water reducing and set control in strict compliance with manufacturer's written directions.

E. Slump Limits: Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 4 inches or less if consolidation is to be by vibration, and 5 inches or less if consolidation is to be by methods other than vibration.

1. Concrete Containing High-Range Water-Reducing Admixture (Superplasticizer): Not more than 8 inches after adding admixture to the concrete.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Department and as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in work.

G. The maximum concrete temperature at the time of placement shall not exceed 90 deg F unless hot weather provisions are provided.

H. Hot Weather Concreting: Hot weather concreting is defined as the production, placing, and curing of concrete when the concrete temperature at placing exceeds 90 deg F, but is less than 100 deg F. Concrete mix designs that will be used under hot weather concreting conditions shall be developed in accordance with this additional procedure.

1. A trial mix shall be prepared with a minimum temperature of 94 deg F and shall be held in the mixer for 90 minutes after completion of initial mixing.

a. On completion of the extended mixing period, the trial mix concrete shall have a slump within $\pm$ 1 inch of the target slump ($\pm$ 1 inch for mixes utilizing HRWR) and an air content within $\pm$ 1.0 percent of the target air.

b. The mix temperature at the end of the extended mixing period shall not be less than 94 deg F.

c. During the extended mixing period, the drum shall be turned intermittently for 30 seconds every five minutes. The drum shall be covered with wet burlap or an impermeable cover material during the rest periods.

d. At the end of the 90-minute period the trial mix shall be remixed for a minimum of one minute and a slump test made to verify that the concrete is within the specified range for slump. If below the target range, the slump may be adjusted by a water addition. After the water addition, the concrete shall be remixed for a minimum of two (2) minutes.

e. The total water used in initial mixing and the final slump adjustment, if applicable, constitutes the design mix water content. It shall not exceed the maximum water cement ratio of the respective mix design.

f. The production and testing of the trial mix concrete shall be demonstrated in the presence of the Lab or its designated representative.

2. The heat of hydration of the cement shall not exceed 80 cal/g at seven (7) days measured as the average of three samples, and no individual measurement shall exceed 90 cal/g.

a. Where fly ash is 18 to 22 percent of the total cementitious material, the heat of hydration of the cement shall not exceed 88 cal/g at seven (7) days measured as the average of three samples and no individual measurement shall exceed 96 cal/g.

b. These requirements do not apply to Type III cement, nor do they apply to cements used for steam cured concrete, unless specified in the Special Provisions.

c. The Contractor shall supplement standard curing practices with additional methods, supplies, and/or equipment for the full curing period. These methods may include but are not limited to:

(1) Water fogging.

(2) Insulated blankets.

(3) Apply curing compound at a rate of 1-1/4 times the manufacturer's recommended application rate.

d. Unless the specified hot weather concreting special measures (3.06 F Item 4) are in effect, concrete exceeding 90 deg F at the time of placement shall be rejected. Regardless of special measures taken, concrete exceeding 100 deg F will be rejected. It is the Contractor's responsibility to implement hot weather measures in a timely manner to avoid production shutdown.

2.06 CONCRETE MIXES

A. Ready-Mix Concrete: Conform to requirements of FLORIDA DEPARTMENT OF TRANSPORTATION Specification Section 346-7, Concrete Plant Requirements, and as specified.

B. Provide batch ticket for each load of concrete delivered to the site. The information to be included on the ticket shall be in accordance with Attachment "A" to this Specification.

C. Transit Time: When nonagitator trucks are used, the elapsed time between the addition of water to the mix and depositing the concrete in place shall not exceed 45 minutes, except that when a water reducing and retarding admixture is used, such elapsed time shall not exceed 75 minutes. When the hauling is done in agitator trucks, such elapsed time shall not exceed 60 minutes, except that when a water reducing and retarding admixture is used, a maximum elapsed time of 90 minutes will be permitted. Extended transit time may be authorized by the Engineer. All such time limits are subject to the ability of the Contractor to properly place and consolidate the concrete.

2.07 CONCRETE PLANT REQUIREMENTS

A. General: All concrete produced for incorporation into the Work shall be produced by a concrete plant approved by the Engineer for such production. If plant approval is withdrawn by the Engineer during production for a construction project, it is the Contractor's sole responsibility to (a) obtain another approved concrete plant to produce the concrete, or (b) await re-approval of the concrete plant. Such actions shall occur prior to any further production and placement of concrete on the construction project. No changes in contract time or completion dates will be allowed. Delay costs or other costs associated with plant approval or disapproval shall be borne by the Contractor.

1. Equipment used for handling elements of concrete, mixing concrete, handling the mixed concrete, transporting and depositing the mixed concrete shall have no detrimental effect on the hardened concrete. Equipment surfaces which are in physical contact with the elements of concrete or the mixed product shall not be made of aluminum.

2. Concrete producers will be evaluated for compliance with the specifications. Plant re-inspection will be performed on a periodic basis when the producer is actively supplying concrete for the Work. When discrepancies are found, the plant may be removed from the fully approved plant status and placed on either a conditional status or a non-approved status depending on the nature of the discrepancy and the corrective action required. When a plant is placed on non-approved status, the producer shall notify the Engineer, in writing, of the proposed corrective action. The Lab will schedule a plant re-inspection within three (3) working days of receipt of the written acceptable corrective action.

B. Measuring Materials: Water may be measured by volume or weight. Whichever method is used, the equipment shall be constructed so that the accuracy of measurements will not be affected by variations in pressure in the water supply line. The meter or weighing device shall be capable of being set to deliver the required quantity and to automatically cut off the flow when the required quantity has been discharged. The measuring equipment shall have an accuracy, under all operating conditions, within one percent of

the quantity of water required for the batch. The accuracy of measuring devices shall be verified at the request of the Engineer or at least quarterly as per the attached "Calibration of Water Measuring Devices" requirements.

1. Adjustment to mix consistency, within the allowable limit for the addition of water, is the Contractor's responsibility at the job site, and shall be made upon initial arrival and not thereafter.

C. Admixtures: Admixtures shall be measured by weight or volume. The measuring equipment shall have an accuracy, under all operating conditions, within 3 percent of the quantity of admixture required for the batch. The accuracy of measuring devices shall be certified by the admixture supplier annually. Each admixture shall be measured separately and added to the mixing water in a separate sequence as the mixing water is introduced into the mix.

1. Exceptions to the above method of admixture addition may be permitted by the Engineer provided accuracy of measurement is not sacrificed and the desired goals of each admixture are achieved.

D. Cement, Fly Ash, and Slag: Cement, fly ash, and slag shall be measured by weight within an accuracy of 1 percent of the required amount, except that for concrete batches of 3 cubic yards or less, a required accuracy of 2 percent will be permitted. Cement, fly ash, and slag shall be weighed separately from other materials. When cement, fly ash, and slag are weighed in a cumulative weight hopper, the cement shall be weighed first.

1. If bag cementitious material is permitted, the batch shall be so proportioned that only whole bags are used.

E. Fine and Coarse Aggregates: Aggregates shall be measured by weight or volume within an accuracy of 1 percent of the required amount. Proper aggregate surface moisture corrections shall be applied.

1. Within two (2) hours prior to each day's batching, free moisture shall be determined for the coarse and fine aggregates. When concrete production is expected to exceed three (3) hours, an additional moisture test shall be required at approximately halfway through the batching operations. The concrete producer shall use these values for adjustment of batch proportions.

2. Batch adjustments made necessary by aggregate free moisture may be made by one or more of the following methods:

a. By using moisture probe readings, speedy moisture tester or Chapman flask for fine aggregate moisture. The accuracy of the moisture probe will be verified at least weekly by the manufacturer's recommended method. The Chapman flask and speedy moisture tester will be verified at least weekly by the method outlined in Paragraph E.2.b.

b. By calculating both coarse and fine aggregate free moisture based upon dry sample weights and adjusting for absorption.

c. By towel drying coarse aggregate to calculate free moisture on S.S.D. aggregate. The accuracy of towel drying shall be verified weekly by the method outlined in Paragraph E.2.b.

F. Batching Accuracy: Failure to maintain batching operations of the plastic concrete with the tolerance for each component material requires immediate investigation and corrective action by the concrete producer and automatically places the plant on conditional status. Failure to implement corrective measures will be cause for placing the plant on a non-approved status.

G. Bins: All bins shall be of adequate capacity for the concrete production required. They shall be supported upon a rigid framework founded upon a stable foundation capable of holding them in a safe and secure position. Each compartment shall be designed to discharge efficiently and freely into the weigh hopper. Positive means of control shall be provided so that as the quantity desired in the weight hopper is approached, the material can be added slowly and shut off precisely. The discharging mechanism shall not permit loss of material when it is closed. Aggregate storage bins shall be constructed sufficiently tight to prevent leakage of material and they shall be divided into at least one compartment for the fine aggregate and one compartment for each size of coarse aggregate to be used. The compartment partitions shall be sufficiently tight and high enough to prevent the intermingling of the several materials. Cement bins shall be constructed leak-proof and moisture-proof, and shall be provided with vibrators or other means to aid the flow of cement from the bin.

H. Weigh Hoppers: Weigh hoppers shall consist of suitable containers freely suspended from scales and protected from the elements so that accuracy is not adversely affected. The hoppers shall be equipped with a discharge mechanism which prevents leakage or loss of material when closed. Hoppers shall be vented to permit air to escape and be equipped with vibrators or other equipment that ensures complete and efficient discharge of materials.

I. Scales: Scales shall be either beam type, or springless dial type, or electronic devices such as load cells, and the product of a recognized scale manufacturer. Where beam type scales are used, suitable means shall be provided to hold poises securely in position after they are set. Scales shall be kept clean and in good operating condition. Where necessary, the scale operator shall have an unobstructed view of all indicating devices and convenient access to all controls. The weigh beam, or dials, shall be graduated to permit reading to one-tenth of one percent of the capacity of the scales.

1. Prior to beginning any work, all scales and other weighing devices used in batching shall be checked for accuracy by a qualified representative of a scale company registered with the Bureau of Weights and Measures of the Florida Department of Agriculture.

2. Scales shall be rechecked once every three months or more often if deemed necessary. Scales shall be checked up to at least the maximum load normally handled on each respective scale.

3. Cement scales, fly ash scales, and coarse and fine aggregate scales shall be maintained to an accuracy of one-half of one percent of the maximum load normally handled.

4. A certificate of inspection bearing the date of the certification and signed by the scale company representative shall be affixed to each weighing device. A copy of the scale company's report corresponding with the current certificate of inspection showing the date of inspection, signature of the scale company representative, the observed scale deviations for the loads checked, and a statement that the scale conforms to the requirements of Chapter 531 Florida Statutes pertaining to specifications, tolerances, and regulations, as administered by the Bureau of Weights and Measures of the Florida Department of Agriculture, shall be available at the plant.

J. Mixers, General Requirements:

1. All mixers shall be of an approved type and shall be capable of combining the components of the concrete into a thoroughly mixed and uniform mass, and shall be capable of discharging the concrete with a satisfactory degree of uniformity.

2. Design: Mixers may be truck mixers of the inclined axis revolving drum type, or concrete plant central mixers of the non-tilting, vertical shaft or horizontal shaft types.

3. A copy of the manufacturer's design, showing dimensions and arrangement of blades, shall be available at the batching plant at all times. The use of mixers that have been altered from such design in respect to blade design and arrangement, or to drum volume, may be permitted when recommended by the manufacturer and approved by the Engineer.

4. Metal rating plates shall be attached to each mixer specifying its mixing speed, agitating speed, rated capacity, and unit serial number.

K. Truck Mixers: The drums of truck mixers may be actuated by power sources independent of the truck engines or by suitable power take-offs. Either system used shall provide control of the rotation of the drum within the limits specified on the manufacturer's rating plate, regardless of the speed of the truck. A truck mixer of the revolving drum type shall be equipped with a hatch in the periphery of the drum shell which permits access to the inside of the drum for inspection, cleaning, and repair of the blades.

1. Truck mixers shall be equipped with operable revolution counters of Department-approved type and mounting, by which the number of revolutions of the drum may be readily verified.

2. The water supply system mounted on truck mixers shall be equipped with a volumetric water gauge or Department-approved water meter in operating condition. Each mixer shall display an identification card obtained from the Department prior to delivery of concrete to the Work. Failure to display an identification in the mixer truck shall be cause for rejection of the delivered concrete. The identification card may be removed by the Lab when a truck mixer is discovered to be in non-compliance.

3. As an exception to the above, when the deficiency involves only an inoperable revolution counter, the truck mixer identification and approval card will not be removed. However, the deficiency will be noted on the card by the Lab. The producer will be allowed to deposit concrete present in the mixer and then the truck mixer will be removed from use until the revolution counter is repaired or replaced. On the initial delivery to the Work, after repair or replacement, the truck mixer operator will be expected to have the Lab note that the revolution counter is operable and initial the truck mixer approval card. Without such inspection and documentation of corrective action, the Lab may reject the truck mixer at any time it is again found to have an inoperable revolution counter. The revolution counter will be set to zero prior to mixing.

4. All truck mixers shall be inspected by the producer at least once each week for changes due to accumulation of hardened concrete or wear of blades. Any appreciable accumulation of hardened concrete shall be removed before any mixer may be used under these procedures.

5. Maintenance of Mixers: Blades of revolving drum type mixers shall be repaired or replaced when the radial height is less than 90 percent of the design radial height. Mixers of other designs shall be repaired or adjusted per instructions of the manufacturer. Questions of performance shall be resolved through mixer uniformity tests as described in ASTM C 94.

L. Timers: Stationary type mixers shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum is charged and release it at the end of the mixing period. In the event of failure of the timing device, the Lab may allow operations to continue as may be necessary to avoid critical or uneconomical conditions. Such operations, however, shall not extend beyond the end of that working day.

1. If necessary, and in order to produce a homogeneous mixture, the minimum allowable mixing time specified may be increased or decreased if uniformity of mix is verified. The mixer shall be operated at the drum speed stipulated on the manufacturer's name plate on the mixer.

M. Trucks for Transporting Wet Batches: Wet batches of concrete may be transported in either agitating or non-agitating trucks. Bodies of non-agitating trucks shall be smooth, mortar tight containers with round internal corners, and shall be capable of discharging the concrete at a satisfactorily controlled rate without segregation. Covers shall be provided for non-agitating trucks for protection from the elements.

N. Records: All records must be made available at each plant, upon request by the Lab personnel. Records which shall be available at each plant are as follows:

1. Approved concrete design mixes.

2. Materials source/specification compliance (delivery tickets, certifications, certified mill test reports, miscellaneous test reports).

3. Plant and mixer design data as may be required by Specifications.

4. Federal Poster.

5. Specifications and approved drawings, if applicable.

6. A copy of the scale company or testing agency report showing the observed deviations from quantities checked during calibration of scales and/or meters. Certification document for the admixture weighting/measuring device.

7. Truck mixer inspection (a copy shall be located in the cab of the truck).

8. Moisture control records.

PART 3 - EXECUTION

3.01 FORMS

A. The Contractor shall be solely responsible to design, erect, support, shore, reshore, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct form-work so concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances conforming to ACI 347.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. 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 work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

D. 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, rustications, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar matrix. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges 3/4 inch unless otherwise indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

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 concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

A. Comply with CRSI's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement as called for on Drawings. 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.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints, as indicated, or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to the Engineer.

B. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops pursuant to manufacturer's published instructions.

1. Waterstops shall be securely held in position using split form dimensional lumber to hold waterstop rigidly within the casting to a true linear profile. Concrete shall be properly consolidated around the waterstop so that no voids or honeycombing occurs adjacent to the waterstop, thus maintaining sealing integrity. The Contractor shall remove all concrete spillage from the waterstop upon completion of the day's concrete pour.

C. Isolation Joints in Slabs-On-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated. Construct isolation joints using joint filler material herein specified and sealant materials specified in Section 07900 - JOINT SEALANTS. Maintain top of strips of filler material at 1/4-inch + (maximum) below top of finish slab.

3.04 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.05 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before concrete is placed.

C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions pursuant to form-coating compound manufacturer's published instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply pursuant to manufacturer's published instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades sufficiently in advance, to permit installation of their work; cooperate with other trades in setting such work. All aforementioned work must be completed and the Engineer or its designated representative notified at least 24 hours prior to concrete placement to allow time for adequate inspection. Moisten wood forms immediately before placing concrete where form coating is not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

B. General: Conform to ACI 304 and as specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not 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. Cold joints will not be allowed except as approved by the Engineer.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete pursuant to ACI recommended practices.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of 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 segregation of mix.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with 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 during concrete placement operations.

E. 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.

1. When air temperature has fallen to or is expected to fall below 40 degrees F., uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs. Do not use calcium chloride.

F. Hot Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 or as specified in Paragraph 2.05 H., Hot Weather Concreting.

1. 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.

2. Fog spray forms, reinforcing steel, and subgrade just before placing concrete.

3. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.

3.07 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Formed Finish: All work shall conform to the following Paragraphs under Article 400-15 “Finishing Concrete” of Section 400 - CONCRETE STRUCTURES of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2004 Edition as amended:

1. 400-15.1 - General Surface Finish (Required for All Surfaces).

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring 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.

3.08 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating 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. Check and level surface plane so that depressions between high spots do not exceed 1/4 inch under a 10-foot straight edge. 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 trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, paint, tile, or other 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.

2. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance and with a level surface plane so that depressions between high spots do not exceed 1/8 inch under a 10-foot straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish:

1. Where ceramic tile is to be installed with a thin-set mortar, apply trowel finish as specified, then immediately follow with fine brooming to create a slightly scarified surface.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete flatwork, steps and ramps, and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with the Engineer before application.

3.09 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven (7) days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days pursuant to ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete, surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

1. Final cure concrete surfaces to receive liquid floor sealer/dustproofer/hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

2. Provide curing compound to exposed interior slabs and to exterior slabs, walks, and curbs; as follows:

a. Apply specified curing compound to concrete slabs as soon as final finishing operations are complete (within two [2] hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.

b. Do not use membrane curing compounds or a sealer on surfaces which are to be covered with coating material applied directly to concrete such as liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer.

3.10 SHORES AND SUPPORTS

A. Conform to ACI 347 for shoring and reshoring.

B. Extend shoring from ground to roof.

C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

D. Keep reshores in place a minimum of 15 days after concrete placement, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.11 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, wall, columns, and similar parts of the work, may be removed 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, joints, slabs and other structural elements, may not be removed in less than fourteen (14) days and until concrete has attained design minimum compressive strength at twenty-eight (28) days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

3.12 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in 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 the Engineer.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling-in: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

1. Grout base plates and foundations, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

C. Cementitious Waterproofing: Prepare concrete pit wall and floor substrates, and apply waterproofing material pursuant to manufacturer's published instructions. Apply two (2) coats of material to prepared surfaces at the rate of 20 sq. ft. per gallon.

3.14 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Engineer.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, down to solid concrete but, in no case to a depth of 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 specified bonding agent. Place patching mortar after bonding compound has dried.

2. Patch holes left by tie rods and bolts with a mixture of sand and cement which, after curing, closely matches the appearance of the surrounding wall surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or pre-cast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify the surface plane to tolerance specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch-wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen (14) days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.

D. Repair defective areas, except random cracks and single holes not exceeding 1 inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete 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 compound. Mix patching concrete of same materials to provide concrete of same type of class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, 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. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

F. Perform structural repairs with prior approval by the Engineer for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of the Engineer.

3.15 ACCEPTANCE TESTING DURING CONSTRUCTION

A. General: The Lab will perform acceptance concrete testing and submit test reports.

B. Initial verification tests will be made by the Lab on a sample from the initial delivery of each class of concrete to the jobsite each day for compliance with requirements for air content, temperature, and slump. The placement operation shall not proceed until the delivered concrete complies with specification tolerances for the plastic concrete.

C. Sampling and testing for quality control during concrete placement shall include the following as directed by the Engineer:

1. Sampling Fresh Concrete: FM1-T141 for acceptance sampling and FM 5-501 for initial verification (If the concrete is placed utilizing a pump, the concrete shall be sampled at the end of the hose).

a. Slump: FM1-T119; one test for each 50 cubic yards placed of each type of concrete for each day's pour. Additional tests shall be made when the consistency changes.

b. Air Content: FM 1-T 196, volumetric method for lightweight or normal weight concrete; FM 1-T 152, pressure method for normal weight concrete; one for each 50 cubic yards placed of each type of concrete for each day's pour. Additional tests shall be made as deemed necessary.

c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below, when 90 degrees F and above, and one test for each set of compressive-strength specimens.

d. Making and Curing Test Specimens: FM 1-T 023 and as specified herein; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cure test specimens are required.

e. Compressive Strength Tests: FM 1-T 022 and as specified herein; one (1) set for each day's placement plus additional sets for each 50 cu. yds. of each concrete class placed in any one day; one specimen tested at seven (7) days, two (2) specimens tested at twenty-eight (28) days, and one (1) specimen retained in reserve for later testing if required.

2. When strength of field-cured cylinders is less than 95 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

3. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

D. Test results will be reported to the Engineer. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, concrete type, and class, location of concrete batch in structure, design compressive strength at twenty-eight (28) days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

E. 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.

F. Additional Tests: The Lab shall, at the Contractor's expense, conduct additional testing as directed by the Engineer when test results indicate specified concrete strengths and other characteristics have not been attained in the structure. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with FM 1-T 024, or by other methods as directed by the Engineer.

ATTACHMENT "A"

DELIVERY TICKET/CERTIFICATION

1. Serial number of delivery ticket.
2. Plant number assigned by the Florida Department of Transportation.
3. Date of batching.
4. Contractor's name.
5. Project number.
6. Truck number making the concrete delivery.
7. Class of concrete.
8. Design mix number.
9. Cubic yards in this load.
10. Time all materials are introduced to mixer.
11. Arrival time at job site.*
12. Time that concrete mix has been completely discharged.*
13. Total cubic yards batched for job on date of delivery (cumulative total).
14. Maximum allowable water addition at the job site.
15. Number of revolutions at mixing speed before leaving for job site.
16. Number of additional mixing revolutions upon arrival and prior to water additions.*
17. Amount of mixing time for central mixer.
18. Total number of revolutions at mixing and agitating speed.*
19. Brand (name) of cement producer and cement type.
20. Actual weight of cement batched in pounds.
21. Producer and actual amount of air entraining agent.
22. Percent of free moisture in coarse aggregate.
23. Coarse aggregate source (assigned pit no.).

24. Actual amount of coarse aggregate in pounds.

25. Producer and actual amount of retardant used.

26. Percent free moisture in fine aggregate.

27. Fine aggregate source (assigned pit no.).

28. Actual amount of fine aggregate in pounds.

29. Brand name and class of fly ash.

30. Actual amount of fly ash in pounds.

31. Actual amount of water used in gallons or pounds.

32. Statement of compliance to Specifications and original signature of approved plant operatory.

33. Total gallons of water added at the job site.*

34. Additional mixing revolutions when water is added.*

35. Signature of Contractor's representative who received the concrete and requested or permitted water to be added at the job site.

* This information to be verified and completed by the Lab.

END OF SECTION 03310

DIVISION 04

MASONRY

SECTION 04220
UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install all concrete masonry units, pre-cast lintels, and miscellaneous masonry items necessary as indicated on the Drawings and specified herein.

1.02 RELATED WORK

A. CONCRETE WORK: Section 03310.

B. STRUCTURAL STEEL: Section 05120.

C. LIGHT GAUGE STEEL ROOF TRUSSES: Section 05425.

D. ROUGH CARPENTRY: Section 06100.

E. JOINT SEALANTS: Section 07900.

F. STEEL DOORS AND FRAMES: Section 08110-7.

G. PAINTING: Section 09960.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American Concrete Institute (ACI):

a. ACI 315 Details and Detailing Concrete Reinforcement.

b. ACI 530 Building Code Requirements for Masonry Structures.

c. ACI 530.1 Specification for Masonry Structures.

2. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

3. National Concrete Masonry Association (NCMA):

a. Referenced Standards.

B. Erector's Qualifications: Installation shall be performed only by a qualified mason with at least five (5) years documented experience in installations of a similar nature, and as approved by the Engineer.

C. The concrete masonry units shall be obtained from one manufacturer, and cured by one process. All units shall be sound and free of cracks or other defects that could interfere with the proper laying of the unit or would impair the strength or permanence of construction. Minor cracks incidental to the usual method of manufacture, or minor chipping resulting from customary methods of handling in shipment and delivery are acceptable.

1. Concrete masonry units for exposed to view conditions shall be free of surface defects which are noticeable and objectionable from a distance of 10'-0".

2. Color and Texture: The units shall be of uniform color and texture for each continuous area and visually related area.

D. Neither the source nor the brands of mortar materials shall be changed during construction of this Project.

E. The independent testing laboratory shall not be changed during the construction of the project, unless otherwise approved by the Department.

F. Comply with recommendations of the National Lime Association and Portland Cement Association for mortar requirements.

G. Cold Weather Requirements: Masonry shall be protected from freezing when the temperature of the surrounding air is 40 degrees F. and falling, with materials heated and temporary protection of completed portions of masonry work provided. Comply with all applicable governing codes and the "Construction and Protection Recommendations for Cold Weather Masonry Construction" of the BIA Technical Notes on Brick and Tile Construction.

H. 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.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

I. Techniques of laying, finishing, and grouting of masonry shall conform to the requirements of ACI 530 and ACI 530.1.

1.04 CONSTRUCTION TOLERANCES

A. Variation From Plumb:

1. Vertical Lines and Surfaces of Walls: Do not exceed the following tolerances, except walls around elevator shall be within tolerances required by elevator manufacturer:

a. 1/4 inch in 10 feet.

b. 3/8 inch in a story height, maximum 20 feet.

2. External Corners, Expansion joints, Control Joints, and Other Conspicuous Lines: Do not exceed the following tolerances:

a. 1/4 inch, maximum 20 feet.

3. Vertical Alignment of Head Joints: Do not exceed the following tolerances:

a. 3/8 inch in 10 feet.

B. Variations from Level:

1. Bed Joints and Lines of Exposed Lintels, Parapets, and Other Conspicuous Lines: Do not exceed the following tolerances:

a. 1/4 inch in any bay, maximum 20 feet.

2. Top Surface of Bearing Walls: Do not exceed the following tolerances:

a. 1/16 inch within width of a single unit.

C. Variation of Linear Building Line:

1. Position Shown in Plan and Related Portion of Walls: Do not exceed the following tolerances:

a. 1/2 inch in any bay, maximum 20 feet.

D. Variation in Cross-Sectional Dimensions:

1. Columns and Thickness of Walls, from Dimensions Shown: Do not exceed the following tolerances:

a. Minus 1/4 inch nor plus 1/2 inch.

E. Variation in Mortar Joint Thickness:

1. Do not exceed bed joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.

2. Do not exceed head joint thickness indicated by more than plus or minus 1/8 inch.

1.05 SUBMITTALS

A. Product Data:

1. The Contractor shall submit manufacturer's product data for each different masonry unit, accessory, and other manufacturer product specified.

B. Shop Drawings, Reinforcement:

1. The Contractor shall submit shop drawings for fabrication, bending, and placement of wall reinforcement. Comply with ACI 315.

C. Samples: Submit the following samples:

1. Unit masonry samples for each type of exposed masonry unit required.

2. Precast Concrete Formed Units: One (1) sample approximately 6 inches x 6 inches x 2 inches thick to illustrate quality, color, and texture of surface finish.

3. Anchors, Ties, Joint Reinforcement: Two (2) of each type proposed for use.

D. Certifications:

1. Mortar and Masonry Units: The Contractor shall submit manufacturer's written certification that the concrete masonry units and all components of the masonry mortar meet or exceed all the requirements set forth in this Section.

2. Reinforcing Steel: The Contractor shall provide mill certificates for all concrete reinforcing steel.

E. Design Mixes:

1. Type "S" Mortar: Prior to construction, the Contractor shall submit independent laboratory test results confirming the proposed mix design meets the requirements of ASTM C 270, Type "S" mortar. Average test results of a minimum of three samples shall have a compressive strength of 1,900 psi for a two-inch cube at 28 days.

2. Grout Design Mix: The Contractor shall submit the grout mix design. The grout for reinforced masonry walls shall be a pumpable, pearock concrete mix with a minimum compressive strength of 2,500 psi at 28 days.

1.06 PRODUCT DELIVERY AND STORAGE

A. The concrete masonry units, pre-cast concrete formed units, and mortar materials shall be delivered to the site undamaged, on pallets, stacked to allow air circulation and shall be covered and protected from rain, ground water, soiling, staining, or intermixture with earth or other materials.

B. Mortar materials shall be stored off the ground, under cover using tarpaulins, felt paper, or polyethylene sheets, and in a dry location. Damaged materials shall be removed from the Site and replaced at no additional cost to the Department.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. The concrete masonry units shall have nominal face dimensions of 16 inches long by 8 inches high by 8 inches wide (15-5/8 inches by 7-5/8 inches by 7-5/8 inches actual), unless otherwise indicated. The Contractor shall provide special shapes for lintels and other special conditions.

1. Minimum Thickness of Face Shells and Webs: Face shell thicknesses (FST) and web thicknesses (WT) shall conform with the following requirements, and in accordance with ASTM C 140:

a. Nominal 8 Inch Wide Units:

(1) FST: 1-1/4 inches.
(2) WT: 1 inch.
(3) Equivalent WT: 2-1/4 inches.

B. Hollow load-bearing concrete masonry units shall conform to ASTM C 90, Type II, pursuant to modifications in "Architectural Concrete Masonry Units in Florida" published by the Florida Concrete and Products Association.

1. Weight Classification: Normal weight.

C. Hollow non-load-bearing concrete masonry units shall conform to ASTM C 129.

D. Concrete masonry units for exposed conditions shall have length and height tolerances which do not exceed 1/16 inch +/- (a total not to exceed 1/8 inch). In locations where both sides are exposed, the width tolerances shall be 1/32 inch +/- in thickness (a total not to exceed 1/16 inch).

E. Performance Requirements: General: After 28 days from the time of manufacture, concrete masonry units shall conform to the strength and absorption requirements specified herein. The 28 day time period shall include a minimum of 7 days prior to delivery to the project site.

1. Compressive Strength: Concrete masonry units shall have the following minimum compressive strengths for the average net area:

a. Average of 3 Units: 1900 psi.

b. Individual Unit: 1500 psi.

2. Water Absorption: The maximum water absorption (average of 3 units) shall be 10 lb/cf for normal weight units with an oven dry weight of concrete of more than 128 lb/cf.

2.02 PRECAST CONCRETE LINTELS

A. Provide precast units of manufacturer's standard type with standard fine and coarse concrete aggregates and mixes to provide engineered units having a minimum 28-day compressive strength of 3,400 psi.

2.03 ANCHOR DEVICES

A. Joint Reinforcement:

1. Material:

a. Exterior Block Reinforcement: 0.188 inch for side rods and 0.148 inch for cross rods, unless otherwise recommended in the manufacturer's published technical data.

b. Interior Block Reinforcement: 9 gauge edge rods.

2. Size: 2 inches less than width of wall.

3. Finish: Hot dip galvanized (1.5 oz. coating) after fabrication. ASTM A 153, Class B-2.

4. Products, Single Wythe Walls: Provide one of the following joint reinforcement products:

a. "Dur-O-Wal Truss"; Dur-O-Wal, Inc.

b. "Lox All Truss-Mesh #120"; Hohmann & Barnard, Inc.

c. "Truss"; National Wire Products Industries.

5. For Corners and Intersections: Use prefabricated corners and tees.

2.04 MORTAR MATERIALS

A. Portland cement shall conform to ASTM C 150, Type I, non-staining, without air entrainment and of natural color.

B. Hydrated lime shall conform to ASTM C 207, Type S.

C. Sand shall conform to ASTM C 144, hard, free of clay, loam, dust or organic matter.

D. Water shall conform to ASTM C 270 and be clean and free of deleterious materials which would impair the strength or bond. Sea water or water containing salts shall not be used.

E. Masonry Cement: Comply with ASTM C 91.

2.05 GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, unless otherwise acceptable to the Department. Use one brand of cement throughout the project, unless otherwise approved by the Department.

B. Aggregate: Aggregates for grout shall conform to ASTM C 404.

1. Size No. 89 aggregate for coarse grout.

C. Fly Ash: ASTM C 618, Type "F."

D. Air Entraining Admixtures: The use of air-entraining admixtures is not permitted for grout.

E. Water Reducing Admixture: ASTM C 494, Type "A," containing not more than 0.1% chloride ions.

F. High Range Water Reducing Admixture (Super Plasticizer): ASTM D 495, Type "D," containing not more than 0.1% chloride ions.

G. Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted. Provide admixtures manufacturer's written certification that the chloride ion complies with specified requirements.

H. Water: Potable.

2.06 MISCELLANEOUS MATERIALS

A. Reinforcing Bars:

1. Deformed steel, ASTM A 615, Grade 60.

B. Flood Relief Vents:

1. Basis of Design: Type/LV Foundation Vent with Type/CD Nesting Foundation Duct as manufactured by McKinney Iron Works, or approved equal. Modular vents and accompanying ducts shall be fabricated from heavy-duty aluminum castings for full wall load bearing. Vents shall be furnished with galvanized metal insect screen.

a. Size: 7-5/8-inch high x 15-5/8-inch wide x 4-inch deep vent with nesting duct of depth required to provide full wall bearing construction.

2.07 MORTAR MIXES

A. Mortar shall meet requirements of ASTM C 270 Type S mortar.

B. Mortar mixes with proportions, measured by volume, for unit masonry work shall be one of the following, at the Contractor's option:

1. 1 part masonry cement, 4-1/2 parts sand (maximum), and 2 part Portland cement.

2. 1 part Portland cement, 1/4 to 2 part hydrated lime, and 4-1/2 parts sand (maximum).

C. The freezing point of the mortar shall not be lowered by use of admixtures or anti-freeze agents.

D. The mortar mix shall comply with ASTM C 270, except materials shall be limited to those specified herein, and cement/lime ratio shall be not more than 2 parts lime per part of Portland cement.

E. Cement setting bed shall be 1 part Portland cement with 2 parts damp setting bed sand, with water to dampen sand, if required, but not added to the mix.

F. Mixing shall be performed in a machine mixer for a minimum of 5 minutes with sufficient water to produce a workable mix. Each batch shall have 1 or more full bags of cement.

G. Measure shall be by volume in buckets or boxes. Measure by shovel is not acceptable.

H. Mortar shall be used within 2 hours after mixing. Re-tempering shall be permitted within two hours, maximum, except in very hot weather. Re-tempering shall only be allowed once per batch.

I. Mortar shall not be deposited on or permitted in contact with the ground.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the area and conditions under which the concrete masonry units are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Walls shall be laid out in advance to accurately and properly locate openings, movement-type joints, returns and offsets. The use of less-than-half-size units at corners and jamb shall be avoided. The walls shall be laid-up plumb in a full bed of mortar with full head joints pushed, not slushed. Evidence of slushing shall require installer to rebuild the walls. Units shall be laid true with all courses level. Units shall be cut with a masonry saw, not broken. Abutting walls shall be bonded together at alternate courses.

B. Masonry unit pattern shall be common running bond unless shown otherwise on Drawings.

C. All joints shall be tooled concave except as follows:

1. Joints to receive sealants shall have mortar raked out 2 inches deep. Jointing shall measure 3/8 inch wide, normally, including those around interior door frames.

D. Units disturbed after laying shall be removed, cleaned, and re-laid in fresh mortar. If adjustments are required, masonry units shall be removed, cleaned of mortar, and reset in fresh mortar.

E. Masonry work shall be stopped only by raking (stepping) back two (2) masonry unit increments in each course. Grout pours shall be stopped 4 inches below tops of units. Prior to resuming work, loose units and unbonded mortar shall be removed.

F. Units shall be laid in alignment on face primarily exposed to view. If both faces are exposed, the Engineer shall be consulted as to which face to favor. Favored or exposed walls shall be laid from that side only.

H. Beginning at the lowest multiple of 16 inches, wall steel reinforcing shall be placed in bed joints 16 inches on centers and where otherwise noted on drawings, with 8 inch laps at splices and bed corners. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes in cavity wall construction.

I. Hollow metal frames abutting masonry and concrete shall be grouted solid allowing for joint for sealant between frame and masonry unit.

J. Masonry units shall not be laid when the mean air temperature is 40 degrees F or below. Minimum temperature of units when laid shall be 35 degrees F.

K. Install flood relief vents and nesting duct in complete accordance with manufacturer's written instructions. Coat surfaces in contact with cementitious materials with bituminous coating. Protect openings and surface finishes from mortar droppings and damage.

3.03 PROTECTION

A. Partially completed masonry shall be protected against the weather, when work is not in progress, by covering the tops of walls with strong, waterproof, non-staining membrane extending at least 24 inches down both sides of walls and held securely in place. Unbraced walls shall be properly braced against lateral forces.

B. Exposed masonry surfaces shall be protected against staining. Misplaced mortar shall be removed immediately. Work shall proceed on shady side of building where possible to protect mortar from too rapid drying.

3.04 LINTELS

A. Provide masonry lintels where shown and wherever openings of more than 2 feet 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. Temporarily support formed-in-place lintels.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.05 LOW-LIFT GROUTING

A. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

1. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

2. Place vertical reinforcement before grouting. Tie vertical reinforcement to dowels at base of masonry and thread CMU over or around reinforcement. Comply with ACI 530.1.

3. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 4 feet. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

    a. Place grout in lintels or beams over openings in one continuous pour.

4. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.06 REPAIR, POINTING, AND CLEANING

A. Mixers, boxes and all tools shall be cleaned with a forceful spray of water and hand scrubbing after each use and at the end of each day.

B. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

C. Pointing: During the tooling of joints, enlarge all voids or holes, except weep holes, and completely fill with mortar, striking surface flush with minimal smearing of mortar adjacent to patch. Point-up all joints at corners, openings, and adjacent work to provide a neat, uniform appearance, properly prepared for application of joint sealants.

D. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings. Comply with recommendations in NCMA TEK Bulletin No. 8-2 - Removal of Stains from Concrete Masonry Walls.

END OF SECTION 04220

DIVISION 05

METALS

SECTION 05300
METAL DECKING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Extent of metal decking is indicated on the Drawings, including basic layout for the following type of deck required:

1. Metal Roof Deck.

1.02 RELATED WORK

A. LIGHT GAUGE STEEL ROOF TRUSSES: Section 05425.

B. METAL FABRICATIONS: Section 05500.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with provisions of the following, except as otherwise indicated or specified:

1. American Iron and Steel Institute (AISI):

a. AISI Specification of the Design of Cold-Formed Steel Structural Members.

2. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

3. American Welding Society (AWS):

a.	AWS D1.1	Structural Welding Code - Steel.
b.	AWS D1.3	Structural Welding Code - Sheet Steel.

4. Steel Deck Institute (SDI):

a.	SDI Pub. No. 28	Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Decks with Electrical Distribution.

B. Qualification of Field Welding:

1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months.

a. If re-certification of welders is required, re-testing will be Contractor's responsibility.

C. Welded decking in place is subject to inspection and testing. The expense of removing and replacing portions of decking for testing purposes will be borne by the Department if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these Specifications.

B. Shop Drawings:

1. Submit detailed drawings showing layout and types of deck panels, anchorage details (including the type, size, spacing, location of all welds/screws), and conditions requiring closure panels, supplementary framing, cant strips, cut openings, special jointing or other accessories.

C. Insurance Certification:

1. Assist the Department in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

D. Welding Certifications:

1. Submit copies of certificates for welding procedures and personnel.

2. Contractor shall submit certificates to the Engineer for review.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Provide metal decking by one of the following manufacturers:

1. Vulcraft Div., Nucor Corp.

2. Wheeling Corrugating Co. Div. of Wheeling-Pittsburgh Steel Corp.

3. Epic Metals Corp.

2.02 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 653, Grade 33, G90 zinc coating.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces conforming to Department of Defense (DOD) P-21035A (SH).

D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

2.03 FABRICATION

A. Roof Deck Units:

1. Provide deck configurations complying with SDI "Roof Deck Specifications," of metal thickness, depth, and width indicated.

B. General:

1. Form deck units in lengths to span three (3) or more supports, with flush, telescoped, or nested 2-inch laps at ends and interlocking or nested side laps, unless otherwise indicated.

C. Metal Cover Plates:

1. Fabricate metal cover plates for end-abutting deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6 inches wide.

D. Metal Closure Strips:

1. Fabricate metal closure strips, for openings between decking and other construction, of not less than 0.045-inch minimum (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of flutes and sides of decking.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with the following:

1. Install deck units and accessories in accordance with manufacturer's published instructions and current recommendations and approved shop drawings, and as specified herein.

2. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

3. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

4. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

6. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

7. Do not use deck units for storage or working platforms until permanently secured.

B. Fastening Roof Deck Units: Comply with the following:

1. Install and anchor roof deck units to resist gross uplift loading as indicated on the Drawings.

2. Fasten roof deck units to steel supporting members as shown on roof plans. In addition, secure deck to each supporting member in ribs where side laps occur.

3. Comply with AWS requirements and procedures for manual shielded metal arc welding for appearance and quality of welds, and methods used in correcting welding work. Use welding washers where recommended by deck manufacturer.

C. Touch-Up Painting:

1. After decking installation, wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members. Touch up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

D. Cutting and Fitting:

1. Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

E. Reinforcement at Openings:

1. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, as shown.

F. Joint Covers:

1. Provide metal joint covers at abutting ends and changes in direction of deck units, except where taped joints are allowed.

G. Closure Strips:

1. Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

3.02 CLEAN-UP

A. Periodically and as directed, remove all rubbish and debris resulting from the Work. Upon completion of the work, remove all unused materials, equipment, scaffolding, and similar construction related items, and perform final cleaning services as may be necessary to leave the completed Work in a condition acceptable to the Department.

END OF SECTION 05300

SECTION 05400
COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish and install metal ceiling and soffit support systems and stud systems required for framing as located and detailed on Drawings.

B. Types of metal framing systems include:

1. Screw-type drywall metal studs, joists, and angles, including furring and ceiling support members, and related tracks.

2. Structural C type shaped steel joists.

1.02 RELATED WORK

A. ROUGH CARPENTRY: Section 06100.

B. INSULATION: Section 07200.

1.03 QUALITY ASSURANCE

A. Design Criteria: The Engineer has shown design conditions and effects required, however; arrangement, bracing, hanging, and support method for metal framing systems shall be the responsibility of the Contractor and the Contractor's Installer.

B. Component Design: Compute structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Cold Formed Steel Design Manual."

C. Welding: Qualify procedures and personnel according to AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel."

D. Reference Standards: Comply with referenced standards of the following:

1. American Galvanizers Association (AGA).

2. American Institute of Steel Construction (AISC).

3. American Society for Testing and Materials (ASTM).

4. American Welding Society (AWS).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for each material.

B. Shop Drawings: Submit the following:

1. Shop drawings, including design calculations, signed and sealed by a Professional Engineer licensed in the State of Florida.

2. Include special components and installations not fully dimensioned or detailed in manufacturer's product data and placing drawings for framing members showing size and gage designations, number, type, location and spacing. Indicate supplemental bracing, splices, accessories, and details as required for proper installation.

1.05 PRODUCT DELIVERY AND STORAGE

A. Upon delivery to the site, store materials in their original unopened packages in an enclosed shelter providing protection from damage from exposure to the elements. Damaged or deteriorated materials shall be removed from the site and replaced at no additional cost to the Department.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products: For each of the metal framing types listed herein, provide products by one of the following manufacturers:

1. Screw-Type Drywall Metal Studs and Ceiling Support Members:

a. Dale Industries, Inc.

b. National Gypsum Company.

c. Unimast, Inc.

2. Structural C Type Shaped Steel Studs:

a. Alabama Metal Industries Corp.

b. Dale/Incor Industries of Florida.

c. Marino Ware Div. of Ware Industries, Inc.

d. Unimast, Inc.

2.02 SYSTEM COMPONENTS

A. With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoe reinforcements, fasteners and accessories as recommended by manufacturer for application indicated, and/or as needed to provide a complete metal framing system.

2.03 MATERIALS AND FINISHES

A. Screw-Type Drywall Metal Studs, Ceiling Support Members, and Accessories:

1. Metal Studs: ASTM C 645, 25 gauge minimum thickness of hot-dipped galvanized base metal, complying with ASTM A 653, G40 for zinc coating. Use 20 gauge where limited heights and loading (i.e. ceramic tile, cabinets) as recommended by stud manufacturer are exceeded.

a. Depth of Section: As indicated.

b. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

2. Furring Members: Comply with the following:

a. ASTM C 645; 25 gauge minimum thickness of hot-dip galvanized base metal, hat shaped. 7/8 inch depth for wall furring members.

b. Fasteners for Furring Members: Type and size recommended by furring manufacturer for the substrate and application required.

3. Screw-Type Ceiling Support Members: Comply with the following:

a. Furring Channels: ASTM C 645; 25 gauge minimum thickness of hot-dip galvanized base metal, hat shaped, complying with ASTM A 653, G40 for zinc coating.

b. Runner Channels: 16 gauge minimum thickness of hot-dip galvanized base metal, 1-1/2 inches.

c. Hanger and Tie Wire: 9 gauge minimum for hanger and 18 gage minimum for tie.

4. Screws shall be corrosion-resistant steel, self-drilling and tapping type, with cross-recessed heads, 3/8 inch low-profile head.

B. Structural C Type Shaped Steel Studs: Comply with the following:

1. For 16 gauge and heavier units, fabricate metal framing components of structural quality hot-dip galvanized steel sheet complying with ASTM A 653, Grade 40, G60 zinc coating.

2. For 18 gauge and lighter units, fabricate metal framing components of commercial quality hot-dip galvanized steel sheet complying with ASTM A 653, Grade 33, G60 zinc coating.

3. “C”-Shape Studs: Manufacturer's standard load-bearing steel studs of size, shape and gauge indicated, with 1.625 inch minimum flange and flange return lip.

C. Corrosion Control Coating: Apply coating to all steel field cuts and areas where shop coating has been damaged or otherwise removed by shipping, storage, and/or construction operations.

1. Application: Prepare steel surfaces and apply coating in strict conformance with manufacturer's written instructions.

2. Basis of Design: "Z.R.C. Cold Galvanizing Compound"; ZRC Products Company.

2.04 PREFABRICATION OF STRUCTURAL STUDS

A. General: Structural framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, and true to line.

B. Fasten framing components by welding only, unless noted otherwise. Comply with AWS D1.3 requirements and procedures for welding appearance and quality of welds, and methods used in correcting welding work.

C. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift prefabricated assemblies to prevent damage or permanent distortion.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which cold formed metal framing shall be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. All partitions and framing shall be aligned accurately as shown on Drawings. All runners shall be securely attached to concrete slabs, metal joists or beams with power driven anchors or other suitable fasteners in accordance with manufacturer's published instructions and current recommendations, unless otherwise indicated.

B. Floor runner-tracks shall be set in full bed of sealant. Ceiling and floor tracks shall be anchored at 24 inch centers and positioned to insure vertical alignment of partitions. Studs of proper length shall be placed in tracks and rotated into place for a friction fit and secured on both tracks with screws. Double studs shall be provided at all openings.

C. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures equipment, services, casework, heavy trim and furnishings and similar work.

1. Wood blocking or plates shall be securely installed as required for equipment or other material support.

D. A minimum of 3 studs shall be installed at all partition intersections. Studs located at partition intersections shall be secured with screws through both flanges of studs and tracks. Headers for openings shall be a cut-to-length section of track with the flanges slit and web bent to allow flanges to overlap adjacent studs.

E. Install miscellaneous framing and connections to provide a complete and stable wall framing system.

F. For structural studs, attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

G. Wire tying of framing components shall not be permitted, except where indicated for suspended drywall ceilings.

3.03 REPAIRS

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 05400

SECTION 05425
LIGHT GAUGE STEEL ROOF TRUSSES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Section includes pre-engineered, pre-fabricated light gauge cold-formed steel roof trusses, roof framing members, and roof supporting members. Includes all required anchorage, bracing, and bridging for all items.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1.	ASTM A 653	Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy- Coated (Galvannealed) by the Hot Dip Process
2.	ASTM A 780	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

B. American Welding Society (AWS)

1.	AWS D1.1	Structural Welding Code - Steel.
2.	AWS D1.3	Structural Welding Code - Sheet Steel.

1.03 PERFORMANCE REQUIREMENTS

A. AISI “Standards”: Calculate structural characteristics of cold-formed steel truss members according to AISI’s “Standards for the Design of Cold-Formed Steel Framing - Truss Design.”

B. Structural Performance: Design, engineer, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.

1. Design Loads: As specified on Drawings.

2. Deflections: Live load deflection meeting the following (unless otherwise specified):

a. Roof Trusses: Vertical deflection less than or equal to 1/240 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 deg F.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of cold--formed steel framing and accessory required.

B. Submit shop drawings showing member, type, location, spacing, size, and gauge of members, method of attachment to supporting members and all necessary erection details. Indicate supplemental bracing, strapping, splices, bridging, accessories, and details required for proper installation.

C. Submit detailed roof truss layouts, along with bearing locations and minimum bearing lengths.

D. Submit truss drawings, sealed and signed by a Professional Engineer registered in the State of Florida, verifying truss ability to meet local code and design requirements. Include:

1. Description of design criteria.

2. Engineering analysis depicting member stresses and truss deflection.

3. Truss member sizes and gauges and connections at truss joints.

4. Truss support reactions, along with bearing locations and minimum bearing lengths.

5. Top chord, bottom chord, and web bracing requirements.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabrication shall be performed by an experienced cold-formed steel truss fabricator with not less than three satisfactory experiences designing and fabricating cold-formed steel truss systems equal in material, design, and extent to the systems required for this Project.

1. Cold Formed steel truss system installation shall be performed by an experienced installer approved by the steel truss system fabricator.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code--Steel” and AWS D1.3 “Structural Welding Code--Sheet Steel.”

1. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure.”

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection. Inspect trusses upon arrival at the site and prior to installation. Do not install damaged trusses without approval of Department and truss manufacturer.

B. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.

C. Protect trusses and accessories from corrosion, deformation, damage, and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.07 PROJECT CONDITIONS

A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one joist, truss, or other component.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Fabrication and design shall be performed by an experienced cold-formed steel truss fabricator with not less than three satisfactory experiences designing and fabricating cold-formed steel truss systems equal in material, design, and extent to the systems required for this Project.

2.02 COMPONENTS

A. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete light gauge cold formed steel truss system.

2.03 MATERIALS

A. Materials, General:

1. All Component Gauges: Fabricate components of structural quality steel sheet per ASTM A653 with a minimum yield strength of 40,000 psi.

2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653 for with a minimum yield strength of 33,000 psi.

B. Steel Truss Components: Provide sizes, shapes, and gauges indicated. Material thicknesses as follows:

1. Design Uncoated-Steel Thickness: 20 gage, 0.0360 inch.

2. Design Uncoated-Steel Thickness: 18 gage, 0.0470 inch.

3. Design Uncoated-Steel Thickness: 16 gage, 0.0580 inch.

4. Design Uncoated-Steel Thickness: 14 gage, 0.0750 inch.

C. Finish: Provide components with protective zinc coating complying with ASTM A653, minimum G90 coating.

D. Fastenings:

1. Manufacturer recommended self-drilling, self-tapping screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.

2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8 inch thick.

3. Other fasteners as accepted by truss engineer.

2.04 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.

1. Fabricate truss assemblies in jig templates.

2. Cut truss members by sawing or shearing or plasma cutting.

3. Fasten cold-formed steel truss members by welding or screw fastening, or other methods as standard with fabricator. Wire tying of framing members is not permitted.

4. Comply with AWS requirements and procedures for welding, appearance, and quality of welds, and methods used in correcting welding work.

5. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

B. Care shall be taken during handling, delivery, and erection. Brace, block, or reinforce truss as necessary to minimize member and connection stresses.

C. Fabrication Tolerances: Fabricate trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:

1. Squareness: Fabricate each cold formed steel truss to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine structure, substrates, and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION, GENERAL

A. General:

1. Erection of trusses, including proper handling, safety precautions, temporary bracing and other safeguards or procedures are the responsibility of the Contractor and Contractor's installer.

2. Exercise care and provide erection bracing required to prevent toppling or dominoeing of trusses during erection.

B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacings indicated.

C. Provide proper lifting equipment suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.

D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.

E. Install roof framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.

1. DO NOT cut truss members without prior approval of truss engineer.

2. Fasten cold-formed steel roof framing by welding or screw fastening, as standard with fabricator. Wire tying of roof framing is not permitted.

a. Comply with AWS requirements and procedures for welding, appearance, and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to cold-formed roof framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

c. Install roof framing in one-piece lengths, unless splice connections are indicated.

d. Provide temporary bracing and leave in place until trusses are permanently stabilized.

F. Erection Tolerances: Install trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 ROOF TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to manufacturer's recommendations and requirements of this Section.

B. Space trusses as shown on Drawings.

C. Do not alter, cut, or remove truss members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging truss members or connections.

F. Anchor trusses securely at all bearing points.

G. Install continuous bridging and permanent truss bracing per truss design requirements.

H. Install necessary roof cross and diagonal bracing per design professional recommendations.

3.04 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's printed instructions.

END OF SECTION 05425

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install all metal fabrications as indicated on the Drawings and/or specified herein.

B. Miscellaneous metal work shall include, but not be limited to, the following:

1. Miscellaneous Steel Framing and Supports.

1.02 RELATED WORK

A. CONCRETE WORK: Section 03310.

B. METAL DECKING: Section 05300.

C. LIGHT GAUGE STEEL ROOF TRUSSES: Section 05425.

D. FINISH HARDWARE: Section 08710.

E. PAINTING: Section 09900.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American Institute of Steel Construction (AISC):

a. AISC Code of Standard Practice for Steel Buildings and Bridges.

b. AISC Specification for Structural Buildings Allowable Stress Design and Plastic Design with Commentary.

2. American National Standards Institute (ANSI):

a. Referenced Standards.

3. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

4. American Welding Society (AWS):

a. AWS D1.1 Structural Welding Code - Steel.

5. Steel Structures Painting Council (SSPC):

a. Referenced Standards.

B. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months.

a. If re-certification of welders is required, re-testing will be Contractor's responsibility.

3. Special care shall be taken to keep welding electrodes free of moisture.

C. Field measurements shall be taken prior to preparation of shop drawings and fabrication, where possible. Trimming and fitting shall be allowed for wherever taking field measurements before fabrication might delay the work.

D. Items shall be preassembled in the shop to greatest extent possible to minimize field splicing and assembly. Units shall be disassembled only as necessary for handling and shipping limitations. Disassembled units shall be clearly marked for reassembly.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data for paint products.

B. Shop Drawings: Submit shop drawings for fabrication and erection of metal fabrications. Include plans, elevations, details of sections and connections, anchorages and accessory items. Provide templates for anchor and bolt installations.

C. Welding Certifications:

1. Submit certificates for welding procedures and personnel.

2. Contractor shall submit certificates to the Engineer for review.

1.05 PRODUCT DELIVERY AND STORAGE

A. Materials shall be delivered to the site undamaged and shall be stored and protected from the elements by covering in plastic. All material damaged shall be removed from the site and replaced at no additional cost to the Department.

PART 2 - PRODUCTS

2.01 METALS

A. Metal Surfaces, General: For metal fabrications work which will be exposed to view, only materials which are smooth and free of surface blemishes such as pitting, seam marks, roller marks, rolled trade names, and roughness shall be used.

B. Steel Plates, Shapes and Bars: Conform to ASTM A 36.

2.02 FASTENERS

A. General:

1. Zinc-coated fasteners shall be used for exterior locations or where built into exterior walls wherever possible.

2. Fasteners and connections shall be welded wherever possible.

B. Nuts and bolts shall be regular hexagon type conforming to ASTM A307, Grade A.

C. Lag bolts shall be square head type conforming to ASME B18.2.1.

D. Machine screws shall be cadmium plated steel conforming to ASME B18.6.3.

E. Wood screws shall be flat head carbon steel conforming to ASME B18.6.1.

F. Washers shall be round, carbon steel conforming to ASME B18.22.1.

G. Masonry anchorage devices shall be expansion shields conforming to ASTM E 488.

H. Toggle bolts shall be tumble-wing type conforming to Federal Specification (FS) FF-B-588, type, class and style as required.

I. Lock washers shall be helical spring-type carbon steel conforming to ASME B18.21.1.

2.03 PAINT

A. Shop Primer for Ferrous Metals: Manufacturer's or fabricator's standard, fast-curing, lead-and chromate-free, universal modified alkyd primer complying with performance requirements selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry firm containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A (SH) or SSPC-Paint 20.

C. Dissimilar Metals Coating:

1. Product: “Scotch-Clad Brand Protective Coating No. 1706”; 3M Corp.

2.04 FINISHES

A. General:

1. Comply with NAAMM “Metal Finishes Manual” for recommendations relative to application and designation of finishes.

2. Finish metal fabrications after assembly.

B. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process in compliance with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products.

C. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exterior: SSPC-SP 6 “Commercial Blast Cleaning.”

2. Interior: SSPC-SP 3 “Power Tool Cleaning.”

D. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 “Paint Application Specification No. 1” for shop painting.

2.05 FABRICATION

A. Miscellaneous Steel Framing and Supports:

1. Provide miscellaneous steel framing and supports that are not a part of light gauge steel roof truss framework, as required to complete the Work. Fabricate miscellaneous units to size, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate structural steel shapes, plates, and steel bars of welded construction, using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish cast-in-place inserts if units are required to be installed after concrete is placed. Except as otherwise indicated, space anchors 24 inches on center.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the metal fabrications are to be installed. Do not proceed until the unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Materials of type, size, and thickness shown shall be used, or if not shown, of required size and thickness to produce adequate strength and durability in the finished product. Metal shall be well formed to shape and size with sharp lines and angles.

B. Exposed work shall be formed true to line and level with accurate angles and surfaces and straight sharp edges. Exposed edges shall be eased to a radius of 1/32 inch unless otherwise shown. Bent metal corners shall be formed to the smallest radius possible without causing grain separation, or otherwise impairing work.

C. All corners and seams shall be welded continuously, complying with AWS recommendations. At exposed connections, exposed welds shall be ground smooth and flush to match and blend with adjoining surfaces.

D. Shearing and punching shall leave clean, true lines and surfaces. Curved work shall be evenly sprung.

E. Exposed connections shall be formed with hairline joints, flush and smooth, using concealed fasteners wherever possible. Exposed fasteners shall be of the type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts shall be used.

F. Anchoring devices shall be fabricated and spaced to provide adequate support for the intended use.

G. Metal fabrications shall be cut, reinforced, drilled and tapped, as required, to receive finish hardware and similar items.

H. All steel fabrications to be installed in exterior locations (outside the building) shall be galvanized as specified.

I. All metal fabrications shall be installed as shown on the Drawings, and adjusted to satisfactorily fulfill the use for which such is intended.

3.03 ADJUST AND CLEAN

A. All exposed surfaces shall be left clean and free from all blemishes or discolorations after erection.

END OF SECTION 05500

DIVISION 06

WOOD, PLASTIC, AND COMPOSITES

SECTION 06100
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Types of work in this section include, but are not limited to, rough carpentry for:

1. Wood grounds, nailers, plates and blocking.

2. Plywood backing.

3. Decay and termite resistant wood treatment.

1.02 RELATED WORK

A. UNIT MASONRY: Section 04220.

B. PAINTING: Section 09900.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American Forest & Paper Association (AFPA):

a. Manual for Wood Frame Construction.

2. American Lumber Standards Committee (ALSC):

a. Board of Review.

3. APA - The Engineered Wood Association (APA):

a. APA Standard Grading Rules.

b. Form No. E30K - APA Design/Construction Guide: Residential & Commercial.

4. American Society for Testing and Materials (ASTM):

a. Reference Standards.

5. American Wood Preservers' Association (AWPA):

a. Reference Standards.

6. Federal Specifications (FS):

a. Reference Standards.

7. U.S. Department of Commerce (DOC), National Institute of Standards and Technology:

a. Referenced Product Standards (PS).

8. Southern Pine Inspection Bureau (SPIB):

a. SPIB Standard Grading Rules.

9. West Coast Lumber Inspection Bureau (WCLIB):

a. WCLIB Standard Grading Rules.

10. Western Wood Products Association (WWPA):

a. WWPA Standard Grading Rules.

b. Recommended Nailing Schedule.

1.04 SUBMITTALS

A. Product Data for Treated Lumber:

1. Submit treatment plant's data showing the lumber type, certification by the treating plant stating chemicals and process used, net amount of treatment retained, and conformance with applicable standards. Include a statement that moisture content of treated materials was reduced to a maximum of 19 percent prior to shipment to the Project site.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Maintain materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. For lumber and plywood pressure treated with waterborne chemicals, provide space between each course to provide air circulation.

1.06 PROJECT CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, plates, blocking, grounds, and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber Standards, General:

1. Manufacture lumber to comply with DOC PS 20 “American Softwood Lumber Standard” and with applicable grading rules of inspection agencies certified by ALSC Board of Review.

2. Factory mark each piece of lumber 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.

3. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by DOC PS 20, for moisture content specified for each use.

4. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

B. Grounds, Blocking, Plates, Nailers, Blocking, and Similar Members:

1. Grounds, blocking, plates, nailers, and similar members shall be standard grade light framing size lumber of any species or board size lumber as required. No. 2 Common or Standard grade boards per WCLIB or WWPA rules, or No. 2 boards per SPIB rules.

C. Plywood Panels:

1. Comply with DOC PS 1 “U.S. Product Standard for Construction and Industrial Plywood” for plywood panels and, for products not manufactured under PS 1 provisions, with APA Form No. E30K.

2. Factory mark each construction panel with APA trademark evidencing compliance with grade requirements.

3. Where construction panels are used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, and thickness:

a. Sheathing: APA Rated Sheathing.

(1) Thickness: as indicated.

(2) Exposure Durability Classification: Exterior.

(3) Span Rating: 16/0.

D. Fasteners and Anchorages:

1. Provide size, type, material, and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

2. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating pursuant to ASTM A 153.

E. Decay and Termite Resistant Wood Treatment:

1. All lumber and plywood specified for decay and termite resistant treatment shall be pressure treated according to AWPA Standard P-5 and FS TT-W-550. Preservatives containing arsenic are NOT acceptable.

2. Products: Provide one of the following treatments:

a. "Natural Select" copper azole preservative; Arch Wood Protection, Inc.

b. "Preserve" ACQ; Chemical Specialties, Inc.

c. "NatureWood" Osmose, Inc.

2.02 WOOD TREATMENT

A. Decay and Termite Resistant Wood Treatment: Chemicals shall be applied in a closed cylinder by vacuum-pressure process in strict accordance with manufacturer's instructions and with the approved standards and recommended treating practices as listed in AWPA Standards C2 and C9 or the appropriate AWPA standard covering the commodity treated and as listed in FS TT-W-571.

1. After treatment and before shipment, lumber 2 inches nominal or less shall be dried to a 15 to 19 percent moisture content.

2. Plywood shall be dried after treatment and before shipment to moisture content of 18 percent or less.

B. Provide decay (termite) and fire treatment of the following lumber:

Location	Treatment (General)
Wood members in contact with concrete, used in connection with roofing, or exposed to moisture	Decay (Termite)
Backing	Decay (Termite)

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which rough carpentry work is to be installed. Do not proceed with rough carpentry work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Material with defects, which might impair the quality of the work, and units which are too small to fabricate with a minimum of joints or the optimum joint arrangement, shall be discarded.

2. All rough carpentry work shall be set accurately to required levels and lines, with members plumb and true, and accurately cut and fitted.

3. All rough carpentry work shall be securely attached to substrates by anchoring and fastening as shown, and as required for structural adequacy. On exposed rough carpentry work, nail heads shall be countersunk and holes filled.

4. Fasteners shall be of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Tight connections shall be made. Fasteners shall be installed without splitting of wood; pre-drill as required.

5. Use washers where required for fasteners to avoid movement of material through loading and/or vibration.

6. Seal cut ends of preservative-treated lumber and plywood where exposed to moisture or where moisture could migrate via gravity, capillary action, expansion, or pressure gradients. Comply with AWPA M4 for applying field treatment.

B. Wood Grounds, Plates, Nailers, and Blocking:

1. Wood grounds, plates, nailers, and blocking shall be installed where indicated on the Drawings, and wherever required for screeding or attachment of other work. Shapes shall be formed as shown and cut as required for true line and level of work to be attached.

a. Provide wood blocking behind all toilet stall handrails, wall guards, and chair rails where installation substrates are gypsum wallboard.

b. Provide wood blocking behind wall cabinets and shelving supports.

2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork prior to concrete placement.

C. Plywood Panels:

1. Comply with applicable recommendations contained in APA Form No. E 30K for types of plywood panels and applications indicated.

2. Fastening Methods: Fasten panels as follows, in strict accordance with the Florida Building Code:

a. Backing Panels: Nail and/or screw to supports, as applicable.

END OF SECTION 06100

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07111
UNDER-SLAB VAPOR BARRIER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install, complete in all respects, the under-slab vapor barrier located under all concrete floor slabs, including cut fill areas within building line.

1.02 RELATED WORK

A. SOIL TREATMENT: Section 02200.

B. CONCRETE WORK: Section 03310.

1.03 SUBMITTALS

A. Product Data:

1. Submit manufacturer's published descriptive literature, including typical details and installation instructions, for vapor barrier and mastic.

B. Samples:

1. Submit three (3) 12-inch by 12-inch samples of membrane.

1.04 DELIVERY AND STORAGE

A. Packaged Materials:

1. Deliver materials in bundles, rolls, and sealed containers bearing the manufacturer's original labels. Store materials in an enclosed area free from contact with soil and weather, and maintain at not less than 50 degrees F for at least 24 hours before use. If material is dated for use or “shelf life” is indicated on the labels, all outdated material shall be removed from the Site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Membrane:

1. Material: Flexible plastic or plastic laminate membrane, minimum 8.0 mils in thickness.

2. Products: Provide one of the following:

a. “Nervastral”; Nervastral, Inc.

b. “Fiberweb 210 Underslab Vapor Barrier”; Fiberweb Division of Hammerbeam, Inc.

c. “Moistop Underslab”; Fortiber Building Products.

d. “Griffolyn Type 65G”; Reef Industries.

B. Mastic:

1. Provide lap seam mastic compound as recommended by the membrane manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the under-slab vapor barrier is to be installed. Do not proceed with vapor barrier work until unsatisfactory conditions have been corrected.

3.02 APPLICATION

A. Apply directly to compacted earth base, under concrete slabs, one (1) layer of the vapor barrier membrane. Maintain 6-inch side laps and 9-inch end laps; turn down membrane 12 inches at slab/wall intersections.

B. Laps shall be fully sealed with mastic in strict accordance with manufacturer’s published instructions for application procedures and limitations for temperature and setting time.

C. Additional strips shall be used at penetrations of membrane to close openings in membrane. Set in mastic.

D. Extreme care and precaution shall be exercised after membrane has been applied to prevent punctures, tears, and other abuses. Should such vapor barrier damage occur, repair the membrane by application of a membrane patch, sized to lap 9 inches on all sides of the damaged area, and set in a full bed of mastic.

END OF SECTION 07111

SECTION 07131
SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes rubberized-asphalt sheet waterproofing for metal roof panel systems.

1.02 RELATED WORK

A. METAL ROOF PANELS: Section 07411.

1.03 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water.

1.04 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining construction, and other termination conditions.

C. Samples: For the following products:

1. 12-inch by 12-inch inch square of waterproofing and flashing sheet.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

F. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who is authorized, approved, or licensed by waterproofing manufacturer to install manufacturer's products.

B. Source Limitations: Obtain waterproofing materials and protection course through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at project site. Review requirements for waterproofing, including surface preparation specified under other sections, substrate condition and pre-treatment, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in rain, fog, or mist.

1.08 WARRANTY

A. Special Manufacturer's Warranty: Written warranty signed by waterproofing manufacturer agreeing to replace waterproofing material that does comply with requirements or that does not remain watertight during specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.

2. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special Installer's Warranty: Written waterproofing Installer's warranty, signed by Installer, covering work of this section, for warranty period of two (2) years.

1. Warranty includes removing and reinstalling protection board.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. “Bituthene”; W.R. Grace & Co.

2. “Mel-Rol”; W.R. Meadows, Inc.

3. “Miradri”; T.C. Miradri.

4. “Duramem 700-SM”; Pecora Corporation.

5. “Polyguard 650"; Polyguard Products, Inc.

2.02 RUBBERIZED-ASPHALT SHEET WATERPROOFING

A. Rubberized Asphalt Sheet: 60 mil thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4 mil thick, polyethylene film with release liner on adhesive side.

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Sheet Strips: Self-adhering, rubberized asphalt composite sheet strips of same material and thickness as sheet waterproofing.

E. Substrate Patching Membrane: Low viscosity, two-component, asphalt modified coating.

F. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

2. Detail strips: 62.5 mil thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

G. Protection Course: Semirigid sheets of fiberglass or mineral reinforced asphaltic core, pressure laminated between two asphalt saturated fibrous liners and as follows:

1. Thickness: 1/8 inch, nominal.

2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

C. Remove grease, oil, bitumen, form release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from substrate.

D. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over construction and contraction joints and cracks exceeding a width of 1/16 inch.

E. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 RUBBERIZED ASPHALT SHEET APPLICATION

A. Install self-adhering sheets according to waterproofing manufacturer’s written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrate at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing membrane in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2 inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, rubberized asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum 2-inch thickness of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.

F. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches beyond repaired areas in all direction.

H. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 PROTECTION COURSE INSTALLATION

A. Install protection course with butted joints over waterproofing membrane before starting subsequent construction operations.

3.05 PROTECTING AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07131

SECTION 07200
INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Types of insulation included under this work shall include, but not be limited to:

1. Polyisocyanurate Rigid Roof Insulation.

1.02 RELATED WORK

A. UNTI MASONRY: Section 04220.

B. METAL DECKING: Section 05300.

C. METAL ROOF PANELS: Section 07411.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Sample units for each type of insulation indicated.

1.04 QUALITY ASSURANCE

A. Code Compliance: Total installation (installed in metal roof system assembly) shall comply with the requirements of the Florida Building Code, current edition in force, including Test Protocols for High Velocity Hurricane Zones.

B. Product Compliance: The insulation when used with the metal roof system assembly must have a Miami-Dade County Product Control Notice of Acceptance (NOA) and comply with requirements of the Florida Product Approval System as required by Florida Statute 553.842 and Florida Administrative Code 9B-72.

C. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in original unopened packages, clearly marked with product brand name and manufacturer's labels. 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

2.01 MATERIALS

A. Polyisocyanurate Roof Insulation: Polyisocyanurate roof insulation in thickness indicated, and complying with ASTM C 1289, Class 2. Provide insulation in manufacturer's standard lengths and widths. Provide taped units as indicated.

1. Basis of Design: Apache Products Company's "Pyrox," or acceptable equivalent by one of the following:

a. Atlas Roofing Corporation.

b. Rmax, Inc.

B. Spray Foam Wall Insulation:

1. Two-Component Spray Polyurethane Foam Wall Insulation: Two-component, closed-cell polyurethane foam insulation. Compliant with ASTM E 84 for Class 1, with maximum flame spread of 25 and maximum smoke developed of 200 and minimum R-Value of 6/inch.

a. Basis of Design: "Tigerfoam"; Commercial Thermal Solutions, Inc.

2 Safing Insulation: UL Rated semi-rigid boards designed for use as a fire stop at top of rated walls and openings, for ratings indicated, ASTM C 612, Class 1 and 2, nominal density of 4.0 lbs. per cu. ft., passing ASTM E 136 for combustion characteristics.

a. Products: Provide United States Gypsum Company's "Thermafiber" safing insulation with "Thermafiber Smoke Seal" compound for firestopping and smokestopping.

3. Batt Insulation (Sound Attenuation Blankets): ASTM C 665, Type I, Class 25 flame spread, thickness as indicated or as required by STC Assembly Rating.

a. Products: Provide Owens Corning's "Sound Attenuation Batt Insulation" and "Firecore 60 Sound Attenuation Batt Insulation" for rated partitions.

b. Other Manufacturers: Equivalent products by one of the following manufacturers are also acceptable:

(1) CertainTeed Corp.

(2) Johns Manville Corp.

(3) Knauf Fiberglass.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with insulation with manufacturer's written instructions applicable to products and application indicated.

1. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up for total thickness.

B. Apply insulation units to substrates by method indicated. If no specific method is indicated, secure units to substrate as recommended by insulation manufacturer for permanent placement and support of units, and complying with governing authorities having jurisdiction.

3.02 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07200

SECTION 07411
METAL ROOF PANELS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install standing seam metal roof panels as indicated on the Drawings and specified herein.

1.02 RELATED WORK

A. METAL DECKING: Section 05300.

B. LIGHT GAUGE STEEL ROOF TRUSSES: Section 05425.

C. ROUGH CARPENTRY: Section 06100.

D. INSULATION: Section 07200.

E. JOINT SEALANTS: Section 07900.

F. METAL LOUVERS: Section 10200.

1.03 QUALITY ASSURANCE

A. Code Compliance: Total installation must comply with the requirements of the Florida Building Code, current edition in force, including Test Protocols for High Velocity Hurricane Zones.

B. Product Compliance: The metal roof panels system and self-adhering sheet underlayment must have a Miami-Dade County Product Control Notice of Acceptance (NOA) and comply with requirements of the Florida Product Approval System as required by Florida Statute 553.842 and Florida Administrative Code 9B-72.

C. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Installer's responsibilities include fabricating and installing metal roof panel assemblies and providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of data for metal roof panels, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type of metal roof panels through one source form a single manufacturer.

F. Pre-Installation Conference: Conduct conference at project site. Review methods and procedures related to metal roof panel assemblies.

1. Meet with Department, Architect, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, deck Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this project, by a qualified testing and inspecting agency.

B. 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

C. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft. and not more than 120.0 lbf/sq. ft.

2. Positive Pre-Load 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 Pre-Load Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 "Tests for Uplift Resistance of Roof Assemblies" for wind-uplift resistance indicated.

E. 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:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

   a. Uniform pressure required by the Florida Building Code, latest adopted edition, as amended, for the geographical location of the Project.

2. Deflection Limits: Engineer metal roof panel assemblies to withstand design loads with vertical deflections no greater than 1/180 of the span.

F. Thermal Movements: Provide metal roof panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, 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.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified Professional Engineer registered in the State of Florida responsible for their preparation.

C. 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.

D. Qualification Data: For Installer, professional engineer, and testing agency.

E. Material Certificates: For thermal insulation, signed by manufacturer.

F. Field quality control inspection reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

1. Metal Roof Panels: Include reports for air infiltration, water penetration, and structural performance.

2. Insulation: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

H. Maintenance Data: For metal roof panels to include in maintenance manuals.

I. Warranties: Special warranties specified in this section.

1.06 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 or 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.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instruction and warranty requirements.

B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements on shop drawings.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of 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: Two (2) 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. Fluoropolymer 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 (20) 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 (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alclad alloy 3003, 3004, or 3015 for painted finishes, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.

2. Exposed Finishes: Apply the following coating, as specified or indicated on Drawings:

   a. High-Performance Organic Finish: AA-C12C42R1x. Prepare, pre-treat, 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 fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

3. Concealed Finish: Apply pre-treatment 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.

2.02 UNDERLAYMENT MATERIALS

A. Self-Adhering Polyethylene-Faced Sheet: ASTM D 1970, 40 mils thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.

1. Products: One of the following:

a. "Grace Ice and Water Shield"; W.R. Grace & Co.

b. "Perma-Seal PE"; Henry Company.

c. "Polyguard Deck Guard"; Polyguard Products, Inc.

2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.

1. Fasteners for Roof Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal roof panels.

2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

3. Blind Fasteners: High-strength aluminum or stainless steel rivets.

B. 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.

2.04 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be field assembled 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 1637.

B. 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.

1. Basis of Design: "Zip-Rib"; Merchant & Evans, Inc., or approved equal.

2. Material: Aluminum sheet, 0.040 inch thick.

a. Exterior Finish: Fluoropolymer.

b. Color: As selected by Architect from manufacturer's full range.

3. Clips: Floating to accommodate thermal movement.

a. Material: 0.0625 inch thick, stainless steel sheet.

4. Panel Coverage: 12 inches.

5. Panel Height: 1-1/2 inches.

2.05 ACCESSORIES

A. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including trim, copings, fascias, 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. Clips: Minimum 0.0625 inch thick, stainless steel panel clips designed to withstand negative-load requirements.

3. Cleats: Mechanically seamed cleats formed from minimum 0.0250 inch thick, stainless steel or nylon-coated aluminum sheet.

4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.032-inch-thick aluminum sheet pre-painted with coil coating. 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, fascias, and fillers. Finish flashing and trim, including raw edges, with same finish system as adjacent metal roof panels.

C. Gutters: Formed from 0.032-inch-thick aluminum sheet pre-painted with coil coating. Provide gutter system complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches o.c., fabricated from same metal as gutters. Provide aluminum wire ball strainers at outlets. Finish gutters, including raw edges, to match metal roof panels.

D. Downspouts: Formed from 0.032-inch-thick aluminum sheet pre-painted with coil coating; in 10-foot-long sections, complete with formed elbows and offsets. Finish downspouts to match metal roof panels.

E. Pipe Flashing: Pre-molded, EPDM pipe collar with flexible aluminum ring bonded to base.

F. Roof Insulation: Specified in Section 07200 - INSULATION.

2.06 FABRICATION

A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile for full length of panel.

C. 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. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on installation substrates indicated on Drawings. Comply with temperature restrictions of underlayment manufacturer for installation. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between course. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days or replace material with new.

3.03 METAL ROOF PANEL INSTALLATION, GENERAL

A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal roof panels by torch is not permitted.

2. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels.

3. Provide metal closures at peaks, rake edges, and each side of ridge and hip caps.

4. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.

5. Locate and space fastenings in uniform vertical and horizontal alignment to provide equal temperature movement.

6. Install ridge and hip caps as metal roof panel work proceeds.

7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

8. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.

9. System to utilize hidden fasteners.

B. Fasteners:

1. Aluminum Roof Panels: Use stainless steel fasteners for surfaces exposed to the exterior and aluminum fasteners for surfaces exposed to the interior. Touch up exterior fasteners with panel color.

C. 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 aluminum roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

D. 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, sealants indicated or, if not otherwise indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.

2. Prepare joints and apply sealants to comply with requirements of Section 07900 – JOINT SEALANTS.

3.04 FIELD-ASSEMBLED 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 supports with self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged. Allow for floating clip system.

3.05 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 or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Touch up cut edges with manufacturer's matching color.

3.06 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of ¼ 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.

3.07 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal roof panel installation, including accessories. Report results in writing.

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.

3.08 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation 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.

B. 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 07465
SIDING AND SOFFIT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Fiber-cement siding and soffit.

1.02 RELATED WORK

A. ROUGH CARPENTRY: Section 06100.

B. JOINT SEALANTS: Section 07900.

C. PAINTING: Section 09900.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type, color, texture, and pattern specified.

1. 12 inches long by actual width sample of siding.

C. Product Certificates: For each type of siding, signed by product manufacturer.

D. Research/Evaluation Reports: For each type of siding and soffit required.

1.04 QUALITY ASSURANCE

A. Source Limitations for Siding and Soffit: Obtain each type, color, texture, pattern, and type of siding, including related accessories, through one source from a single manufacturer.

B. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build mockup approximately 48 inches long by 60 inches high. Include outside corner on one end of mockup.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.07 SEQUENCING

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.08 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming, or otherwise deteriorating beyond normal weathering.

1. Warranty Period: 50 years from date of Substantial Completion.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels clearly describing contents.

1. Furnish full lengths of siding in a quantity equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.01 SIDING AND SOFFIT

A. Fiber-Cement Siding and Soffit: Siding and soffit made from fiber-cement planks and boards that do not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis of Design Product: “Hardiplank Select Cedarmill”; James Hardie.

2. Other Acceptable Manufacturers: One of the following:

a. GAF Materials Corporation.

b. MaxTile, Inc.

3. Horizontal Pattern: Boards 6-1/4 to 6-1/2 inches wide in plain style.

4. Texture: Wood grain.

5. Factory Priming: Manufacturer’s standard acrylic primer.

2.02 ACCESSORIES

A. Siding Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories made from same material as adjacent siding, unless otherwise indicated.

2. Provide accessories matching color and texture of adjacent siding, unless otherwise indicated.

B. Elastomeric Joint Sealant: Single component urethane joint sealant complying with requirements in Section 07920 - JOINT SEALANTS for Use NT (non-traffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

C. Fasteners:

1. For fastening fiber-cement siding, use stainless steel fasteners.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.03 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.

B. Isolate dissimilar metals by separating with rubber gaskets or elastomeric sealant. Use rubber washers where fasteners made from dissimilar metal penetrate siding. Isolate dissimilar metals behind siding by covering with polyethylene film.

3.04 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07460

SECTION 07900
JOINT SEALANTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes the furnishing and installation of joint sealants as indicated on the Drawings and as specified herein.

1.02 RELATED WORK

A. SUBMITTALS: Section 01340.

B. PRODUCT SUBSTITUTIONS: Section 01630.

C. UNIT MASONRY: Section 04220.

D. STEEL DOORS AND FRAMES: Section 08110.

E. EXTERIOR GYPSUM BOARD SOFFIT: Section 09250.

F. PAINTING: Section 09900.

G. METAL LOUVERS: Section 10200.

1.03 QUALITY ASSURANCE

A. The installer shall have a minimum of five (5) years continuous documented experience in the application of the types of materials required.

1.04 PRODUCT DELIVERY AND STORAGE

A. All products shall be delivered to the site undamaged, and in the manufacturer’s original packing. Products shall be stored within the manufacturer’s published temperature tolerances.

1.05 SUBMITTALS

A. Product Data: Submit the following manufacturer's data for each manufactured item:

1. Complete instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant. Include Material Safety Data Sheets for joint cleaners.

B. Samples: Submit the following samples:

1. One tube, in original sealed container, of sealant specified.

2. One foot of each joint filler specified.

3. Color chart.

C. Installer's Qualification:

1. Submit documented evidence of Installer's qualifications.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not install materials when the temperature is below 40 degrees F, unless the manufacturer specifically recommends application of his materials at lower temperatures. If job progress or any other condition requires installations when temperatures are below 40 degrees F (or below the minimum installation temperature recommended by the manufacturer), consult the manufacturer's representative, and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with a copy to the Engineer, the conditions under which such installation must proceed, and the provisions made to ensure satisfactory work.

B. Do not proceed with installation of bulk compounds during inclement weather unless all requirements and manufacturer's instructions can be complied with. Do not proceed with the installation of elastomeric sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width, or when such extreme temperatures or heavy wind loads are forecast during the period required for initial or nominal cure of elastomeric sealants. Whenever possible, schedule the installation and cure of elastomeric sealants during periods of mean temperatures (nominal joint width shown) so that subsequent stresses upon the cured sealants will be minimized.

PART 2 - PRODUCTS

2.01 GENERAL

A. Hardnesses shown and specified are intended to indicate the general range necessary for overall performance. The manufacturer's technical representative shall determine the actual hardness recommended for the conditions of installation and use. Except as otherwise indicated or recommended, compounds shall be provided within the range of hardness (Shore A, fully cured, at 75 degrees F) of 25 to 40.

B. The Contractor shall confirm its compatibility with the joint surfaces, joint fillers, and other materials in the joint system. Only materials that are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification, shall be provided.

2.02 MATERIALS

A. Exterior Sealants:

1. Sealants for exterior locations and all interior and exterior expansion joints shall be cold-applied elastomeric joint sealant, two-part polyurethane sealant meeting Federal Specification (FS) TT-S-00227E and ASTM C 920.

2. Products, Horizontal Joints: Provide one of the following Type M, Grade P sealants:

a. “Urexpan NR-200”; Pecora Corp.

b. “Vulkem 227”; Tremco Inc.

c. “Sonolastic SL 2”; Sonneborn Building Products, Div. Of Chemrex, Inc.

3. Products, Vertical Joints: Provide one of the following Type M, Grade NS sealants:

a. “Dynatrol II”; Pecora Corp.

b. “Vulkem 227”; Tremco Inc.

c. “Sonolastic NP 2”; Sonneborn Building Products, Div. of Chemrex, Inc.

B. Miscellaneous Materials:

1. Joint cleaner shall be Xylene (“Xylol”), or any other type of compound recommended by the sealant compound manufacturer, for the joint surfaces to be cleaned.

2. Bond breaker tape shall be polyethylene tape, or other plastic tape, as recommended by the sealant manufacturer, to be applied to sealant contact surfaces where bond to the substrate or joint filler must be avoided for the proper performance of sealant. Self-adhesive tape shall be used wherever applicable.

3. Backer rods shall be closed-cell, expanded polyethylene. The size and shape of the rod shall be that which will control the joint, form optimum shape of sealant bead on the back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when the joint is compressed.

2.03 COLORS

A. For concealed joints and joints to be painted, provide manufacturer’s standard color that has the best overall performance qualities for the application shown. For exposed joints, the Engineer will select colors from the manufacturer's standard or non-standard colors that most closely match adjacent finish colors.

PART 3 - EXECUTION

3.01 INSPECTION

A. The sealant installer shall examine the areas and conditions under which the sealants are to be installed, and notify the Contractor in writing (with a copy to the Engineer) of any conditions detrimental to this phase of the work, and shall not proceed until the unsatisfactory conditions have been corrected. Commencement will be construed as acceptance of the conditions.

3.02 SURFACE PREPARATION

A. Sealant material shall be applied before any adjacent coating or painting is applied; otherwise, the laboratory test for durability specified in the following paragraph (B.) shall be required.

B. Installation of sealant over joint surfaces which have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating, shall not proceed unless a laboratory test for durability (adhesion), in compliance with Paragraph 4.3.9 of FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the particular coating or treatment. If laboratory test has not been performed, or if test results indicate bond interference, the coating or treatment shall be removed from joint surfaces before installing sealant.

C. Concrete and masonry joint surfaces shall be etched to remove excess alkalinity with dilute muriatic acid solution, and then sprayed with water and allowed to dry before installation, unless the sealant manufacturer's published instructions indicate that alkalinity does not interfere with sealant bond.

D. Comply with manufacturer’s published instructions and Material Safety Data Sheets for the handling, use, and disposal of Xylene or similar solvent-based flammable joint cleaners. Disposal of containers shall comply with governing authorities having jurisdiction.

3.03 INSTALLATION

A. Comply with the sealant manufacturer’s published instructions, except where more stringent requirements are shown or specified, and except where the manufacturer's technical representative recommends otherwise.

1. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. The joint surfaces shall be primed or sealed wherever shown or recommended by the sealant manufacturer. Primer/sealer shall not be spilled or allowed to migrate onto adjoining surfaces.

C. Sealant backer rod shall be installed for elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

D. Bond breaker tape shall be installed wherever required by manufacturer’s recommendations to ensure that elastomeric sealants will perform properly, or as detailed on the Drawings.

E. Only proven installation techniques shall be employed which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete “wetting” of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, sealant joints shall be filled to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, joints shall be filled to form a slight cove, so that the joint will not trap moisture and dirt.

F. Sealants shall be installed to depths as shown, or if not shown, as recommended by the sealant manufacturer, but within the following general limitations measured at the center (thin) section of the bead.

1. For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposure, joints shall be filled to a depth equal to 75 percent of the joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.

2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, joints shall be filled to a depth equal to 50 percent of joint width, but not more than 3/8 inch nor less than 1/4 inch.

3. For joints sealed with non-elastomeric sealant compounds, joints shall be filled to a depth in the range of 75 percent to 115 percent of the joint width.

G. Sealant compounds shall not be overflowed or spilled onto adjoining surfaces, or allowed to migrate into the voids of adjoining surfaces including rough textures. Masking tape or other precautionary devices shall be used to prevent staining of adjoining surfaces by either the primer, sealer and/or the sealant compound.

H. Any excess or spillage of compounds shall be removed promptly as the work progresses. Adjoining surfaces shall be cleaned by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes.

3.04 CURE AND PROTECTION

A. Sealant compounds shall be cured in compliance with the manufacturer's published instructions and current recommendations to obtain high early bond strength, internal cohesive strength, and surface durability.

B. The installer shall advise the Contractor of procedures required for the curing and protection of sealants compounds during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering), at the time of Final Acceptance.

END OF SECTION 07900

DIVISION 08

OPENINGS

SECTION 08110
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This work shall include furnishing and installing all steel doors and frames complete as located and detailed on the Drawings.

B. Types of steel doors used on this project shall include, but not be limited to:

1. Flush Steel Doors.

1.02 RELATED WORK

A. UNIT MASONRY: Section 04220.

B. JOINT SEALANTS: Section 07900.

C. FINISH HARDWARE: Section 08710.

D. PAINTING: Section 09900.

1.03 QUALITY ASSURANCE

A. Approved Products: As applicable, products used herein shall comply with requirements of the Florida Product Approval System as required by Florida Statute 553.842 and Florida Administrative Code 9B-72.

B. Manufacturer/Fabricator: Steel doors and frames shall be manufactured by a single firm specializing in the production of this type of work.

C. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American National Standards Institute (ANSI):

a. Referenced Standards.

2. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

3. Steel Door Institute (SDI):

a. SDI 100 Recommended Specifications for Standard Steel Doors and Frames.

b. SDI 105 Recommended Erection Instructions for Steel Frames.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for each type of door and frame.

B. Shop Drawings: Submit shop drawings for steel doors and frames as follows, and as a package with submittals for other doors and finish hardware to enable a coordinated review of all door openings for the project.

1. Submit shop drawings for the fabrication and installation of the steel doors and frames. Drawings shall include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware, and reinforcements and details of joints and connections, showing anchorage and accessory items.

2. Shop drawings shall indicate accurate dimensions of work shown. Frame returns shall allow for conditions (i.e., 5/8-inch gypsum board or exposed masonry as scheduled). Except where otherwise shown, 1/4-inch sealant space shall be provided for each jamb and head abutting wall materials.

3. Shop drawings shall list and locate all items of finish hardware furnished under other sections of the specifications, but prepared for by the manufacturer of hollow metal doors and frames, from templates provided by the hardware supplier.

C. Schedule:

1. A schedule of doors and frames shall be provided using the same opening numbers referenced on the Drawings and the same schedule format.

1.05 PRODUCT DELIVERY AND STORAGE

A. Doors and frames shall be protected during transit, storage, and handling to prevent damage, soiling, and deterioration.

B. Each door shall be packaged at the factory in a separate heavy paper carton. Each carton shall be marked for location to correspond with the shop drawings.

C. Ship welded frames in bundles securely strapped or in packages.

D. Store doors and frames at the building site under cover. Frames shall be stored in an upright position. Place the units on at least 4-inch wood sills or on floors in a manner that will prevent rust or damage. Avoid the use of non-vented plastic or canvas shelters that create a humidity chamber. If the wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4-inch air space between the doors to promote air circulation.

1.06 PROJECT CONDITIONS

A. Field Measurements: Obtain and verify all measurements at the buildings as required to properly fabricate and install all special door and frame requirements if and when they occur. Verify all conditions that may affect door installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Provide one of the following:

1. "Lock Seam Design"; American Steel Products.

2. "Series HT"; Pioneer Industries, Inc.

3. "Series LW"; Steelcraft/Ingersoll Rand.

2.02 MATERIALS AND FABRICATION

A. Pressed Steel Frames:

1. Frames shall be double rabbeted design, depth and profile as detailed and furnished with minimum 5/8 inch stop. Frames shall be fabricated from 14 gauge (exterior openings, including Basement/Tunnel doors) and 16 gauge (interior openings) commercial quality, level, cold-rolled steel conforming to ASTM A 1008 or hot-rolled, pickled and oiled steel conforming to ASTM A 1011. Frames shall have zinc coating applied by hot-dip process conforming to ASTM A 653 (G60) with coating weight not less than 0.60 oz. per square foot (0.30 oz. per square foot per side). Frames shall be designed with integral stop and trim.

2. Frame corners shall be mitered and continuously arc welded (both inside of mitered corners and butt edges) with all exposed welds ground and sanded smooth. Mitered corners shall be reinforced with 18-gauge channel-shaped reinforcements.

3. Head members shall be 4 inches high unless otherwise indicated.

4. Strike jambs shall be provided with three (3) holes for rubber bumpers (silencers); refer to Section 08710 - FINISH HARDWARE for furnishing and installation of silencers.

B. Steel Doors:

1. Hollow metal steel doors shall be fabricated from 18 gauge commercial quality, level, cold-rolled steel conforming to ASTM A 1008 or hot-rolled, pickled and oiled steel conforming to ASTM A 1011. Face sheets for doors shall have zinc coating applied by hot-dip process conforming to ASTM A 653 (G60) with coating weight not less than 0.60 oz. per square foot (0.30 oz. per square foot per side).

2. Door face sheets shall be 1-3/4 inches thick heavy-duty, full flush hollow steel formed from one sheet of metal with no seams permitted on the door face. Lock seam shall occur on hinge edge with seam continuously welded and welds ground smooth. Tops shall be flush and closed with no holes. Top and bottom of door shall be closed with a minimum 16 gauge flush or inverted closure channel.

3. A full-width dense rigid polyurethane core conforming to ASTM C 591 shall be installed in all doors to provide dimensional stability and high resistance to facial impact.

4. The clearances for doors shall be 3/32- to 1/8-inch at jambs and heads. The lock edges of stiles shall be beveled 1/8 inch in 2 inches for steel doors.

5. The top and bottom edges of all exterior steel doors shall be closed to provide a weather seal. This seal shall be provided as part of the door construction or by the addition of inverted steel channels or other suitable shapes welded, caulked and sealed to the face sheets and formed (shaped) so the assembly will not retain water.

6. All exterior double doors shall have a steel astragal attached to the active leaf.

C. Metal Finishes:

1. Shop Applied Primer Finish:

a. Apply a primed finish to all galvanized and non-galvanized metal surfaces furnished under this section. Clean and chemically treat metal surfaces to assure maximum paint adhesion; follow with a dip or spray coat of rust-inhibitive metallic oxide, zinc chromate, or synthetic resin primer on all exposed surfaces.

b. Finished surfaces shall be smooth and free from irregularities and rough spots. Paint shall be baked or oven dried. The time and temperature for drying shall be in accordance with manufacturer's recommendations for developing maximum hardness and resistance to abrasion.

2. Field Paint Finish: Finish painting of steel doors and frames is specified under Section 09900 - PAINTING.

D. Hardware Provisions and Reinforcing:

1. Hardware Provisions for Pressed Steel Frames:

a. Unless a different strike is noted on Hardware Schedule, frames shall have steel hinge plate reinforcement projection welded with provisions for 4-1/2 inch x 4-1/2 inch full mortise type hinges and steel strike tap plate reinforcement projection welded with provisions for Universal ANSI A115.1 or A115.2 strike.

b. Frames shall be provided for 1-1/2 pair of hinges, unless noted otherwise. Mortar guards shall be formed from 26-gauge galvanized steel and shall be welded in place.

c. Closer reinforcement shall be sleeve type installed in frame header for all doors that are indicated to receive door closers.

d. Provide metal reinforcements for all other hardware items indicated.

e. Minimum gauges of hardware reinforcing plates shall be as follows:

(1) Hinge Reinforcements: 8 gauge, 1-1/4 x 10-inch min. size

(2) Lock Reinforcements: 12 gauge

(3) Closer Reinforcements: 12 gauge

(4) Surface-Mounted Hardware: 12 gauge

2. Hardware Provisions for Steel Doors:

a. Mortise, reinforce, drill, and tap doors at the factory to receive all mortised type hardware. Drilling and tapping for surface applied hardware shall be performed in field. Provide concealed metal reinforcement for surface applied hardware indicated in the Hardware Schedule.

b. Doors shall have steel integral hinge reinforcement with provisions for 4-1/2 inch x 4-1/2 inch full mortise template type hinges for 1-1/2 pair of hinges per door, unless noted otherwise.

c. Doors shall have steel integral lock reinforcement with provisions for locksets as indicated.

d. Doors shall have steel closer reinforcement concealed in the door for all doors that are indicated to receive closers.

e. Minimum gauges for hardware reinforcing plates shall be as follows:

(1) Hinge Reinforcements: 8 gauge

(2) Lock Reinforcements: 12 gauge

(3) Closer Reinforcements: 12 gauge

(4) Surface Mounted Hardware: 16 gauge

E. Location of Hardware: The location of hardware in connection with hinged and other swing type hollow metal doors and frames shall be as follows, unless indicated or specified otherwise:

1. Top Hinge: To manufacturer's standard, but not greater than 5 inches from head rabbet to top of hinge.

2. Bottom Hinge: To manufacturer's standard but not greater than 10 inches from finish floor to bottom of hinge.

3. Intermediate Hinge: Equally spaced between top and bottom hinge.

4. Locks (cylindrical, mortise, unit, or integral): 38 inches from finish floor to center of strike.

5. Refer to Section 08710 - FINISH HARDWARE for additional locations.

F. Frame Anchors:

1. All frames shall have an integral or welded on sill anchor.

2. Furnish six (6) per frame, 10-inch-long corrugated or other deformed type adjustable anchors as condition applies.

2.03 FABRICATION

A. All work shall be shop fabricated to required profiles by forming and welding with corners, angles, and edges straight and sharp.

B. Fit and fabricate accurately with corners, joints, seams and surfaces free from warp, buckles, or other defects.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which steel doors and frames are to be installed. Do not proceed with steel door and frame installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install standard steel doors, frames and accessories in accordance with approved shop drawings, manufacturer's data and as herein specified.

B. Steel Frames:

1. Comply with provisions of SDI 105, unless otherwise indicated.

2. Except for frames located at in-place drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

3. In masonry and cast-in-place concrete construction, wall anchors shall be located at the hinge and strike levels, and frames shall be grouted solid (jambs and heads).

4. Install fire-rated frames in accordance with NFPA 80.

5. In concrete construction, locate three (3) wall anchors per jamb at hinge and strike levels.

C. Steel Doors:

1. Fit steel doors accurately in frames, within clearances specified in SDI 100.

2. Place fire-rated doors with clearances as specified in NFPA 80.

3.03 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after installation, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

C. Cleaning: Immediately prior to final inspection and before Final Acceptance, remove all protective materials and clean all exposed members. Thoroughly clean all glass, including removal of manufacturer's labels or any other material or substance on the glass, in the event this has not been performed at a prior time. Cleaning shall be performed by the use of cleaning materials and methods that will not damage the glass or surroundings in any way.

1. Do not use abrasives or harmful cleaning agents.

END OF SECTION 08110

SECTION 08710
FINISH HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work covered by this section consists of furnishing and installing all finish hardware as shown on the drawings, indicated on schedules, and as specified herein.

1. All hardware on accessible doors shall meet or exceed the requirements of the Americans with Disabilities Act (ADA) whether or not full compliance is indicated in the Hardware Schedule located at the end of this section.

1.02 RELATED WORK

A. STEEL DOORS AND FRAMES: Section 08110.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the latest adopted editions of the following:

1. Florida Administrative Code, Chapter 13D-1.

2. Florida Building Code, Latest Adopted Edition, as amended.

3. Door and Hardware Institute (DHI):

a. Referenced Standards.

B. Installer Qualifications: An experienced Installer who has completed finish hardware similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

1.04 SUPPLIER QUALIFICATIONS

A. Finish Hardware shall be furnished by one supplier, approved by the Engineer, with appropriate technical knowledge and experience to correctly interpret drawings and specifications. Supplier shall be prepared at all times during progress of installation to promptly provide a qualified Architectural Hardware Consultant (AHC) to approve its complete installation, in order that all items shall be installed in the best manner and function properly. This will necessitate a project site visit prior to final inspection. Supplier shall be bona-fide direct distributor of all materials furnished.

B. It shall be the supplier's responsibility to furnish hardware in accordance with the intent of this specification. Where, by virtue of architectural design or by function, a change is necessary, hardware of equal design and quality shall be furnished upon written approval of Engineer.

1.05 SUBMITTALS

A. Product Data: Submit complete product data for each item of finish hardware listed in the Finish Hardware Schedule. Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Finish Hardware Schedule: Submit complete typewritten sets of the Finish Hardware Schedule. Organize the Hardware Schedule into door hardware sets indicating complete designations of every item required for each door. Organize door hardware sets in the same order as in Article 3.03 - FINISH HARDWARE SCHEDULE. No factory order shall be placed for finish hardware items until approval has been given by the Engineer.

1. Each item in the Finish Hardware Schedule shall be identified on the first page of the Schedule by the manufacturer's name.

C. Keying Schedule: Submit a keying schedule prepared by the supplier, detailing the Department's keying instructions for locks. Include a schematic keying diagram and index each key to unique door designations. Refer to keying schedule at the end of this section for additional information.

D. Supplier Qualifications:

1. Submit documented evidence of supplier's qualifications.

1.06 DELIVERY, STORAGE, AND HANDLING

A. All items of finish hardware shall be delivered to the project site, or as otherwise specified or required, and shall be checked in for completeness and familiarization with the Contractor.

B. All items of finish hardware shall be packaged, numbered, and labeled to identify each opening for which it is intended, and to correspond with item numbers on the approved Finish Hardware Schedule.

1.07 COORDINATION

A. Templates: All finish hardware to be installed on, or in metal doors and/or frames, shall be manufactured to template. Template machine screws shall be furnished for all such materials. Supplier shall furnish an approved Finish Hardware Schedule and all necessary template transmittals to metal frame fabricators, or other suppliers requiring same, for their coordination and use.

PART 2 - PRODUCTS

2.01 GENERAL

A. An asterisk (*) after a manufacturer's name denotes whose product designation is used in the Finish Hardware Schedule for purposes of establishing minimum requirements.

B. Other than those doors that are restricted to less than 180 degree opening by building or by overhead holders or stops, all butts and closer arms shall be of sufficient size to allow full 180-degree opening of doors.

2.02 FINISHES

A.	Butts:	US32D
B.	Locks:	US32D
C.	Kick Plates:	US32D
D.	Closers:	SBL
E.	Door Stops and Miscellaneous:	US32D

2.03 LOCATIONS

A. Hardware locations dimension shall be as follows:

1. Distance from finish floor to center line of:

a.	Door Lever/Knob:	38 inches.

2. Butt Hinges:

a.	Bottom Hinge:	Finish floor to bottom of hinge 10 inches.
b.	Top Hinge:	Head rabbet to top of hinge 5 inches.
c.	Center Hinge:	Equidistant between top and bottom hinges.

2.04 BUTT HINGES

A. Doors (1-3/4 Inch Thick): Minimum 4-1/2 inches high.

B. Each door shall not have less than three (3) hinges.

C. All butts used with door closers shall be ball bearing. All exterior doors shall have ball bearing butts.

D. All exterior out-swinging doors shall have butts with non-removable pins (NRP).

E. Products: Provide butt hinges by one of the following manufacturers:

1. Hager Companies.*
2. Stanley Commercial Hardware Div. of The Stanley Works.
3. McKinney Products Co. Div. of ESSEX Industries, Inc.
4. Lawrence Brothers, Inc.

2.05 LOCKSETS

A. Locksets shall be furnished in the functions as specified in the hardware sets.

B. Levers, escutcheons, locksets and cylinders shall be the products of one manufacturer.

C. Minimum wall thickness of levers and roses shall be 0.101 inch and 0.099 inch, respectively.

D. All latch bolts shall have 3/4 inch throw. All deadbolts shall have hardened steel inserts and 1 inch throw.

E. Products: Provide one of the following locksets:

1. "Series 8200" lockset and "LNJ" handle design; Sargent Manufacturing Company Div. of ESSEX Industries, Inc.*

2. "Series ML2000" lockset and "LWA" handle design; Corbin Russwin Architectural Hardware Div. of Yale Security Inc.

3. "Series L9000" lockset and "03" handle design; Schlage Lock Company, An Ingersoll-Rand Company.

2.06 KEYING/KEY CONTROL SYSTEM

A. Keying: All locks shall be Grand Master Keyed as indicated. Coordinate with Department's site keying system.

B. Key Control System: 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 systems manufacturer, with capacity for 150 percent of the number of locks required for the project.

1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final keying schedule.

2. Provide hinged-panel lockable type cabinet for wall mounting as indicated on drawings.

C. Construction Keying (Construction Master Keys): Provide cylinders with feature that permits voiding of construction keys by use of the Department's master key without cylinder removal and without the need for special tools. Provide ten (10) construction master keys.

2.07 CLOSERS

A. Closers shall be provided in the manufacturer's recommended printed size for specified installation condition, unless otherwise noted in the Finish Hardware Schedule.

B. Closers shall be full rack and pinion complete with back check. Springs shall be motor clock type. Furnish flush mount transom brackets where no transom bar exists. Furnish parallel arm where required.

C. All closers shall be provided with limited opening resistance to meet handicap requirements.

D. Furnish drop plate brackets where required.

E. Closer at exterior doors shall be installed on the inside of the building.

F. Products: Provide one of the following:

1. "Series 1430" exterior and "Series 1431" interior closers; Sargent Manufacturing Company Div. of ESSEX Industries, Inc.*

2. "Series 8501"; Norton Door Controls Div. of Yale Security, Inc.

3. An equivalent product by one of the following manufacturers:

a. Corbin Russwin Architectural Hardware Div. of Yale Security, Inc.

b. LCN Closers, An Ingersoll-Rand Company.

2.08 DOOR TRIM

A. Products: Provide the following door trim items by one of the manufacturers specified herein:

1. Push Plates: Stainless steel, 0.050 inch thick; beveled top and sides.

a. "8200"; H.B. Ives.*

b. "100/8x16"; Baldwin Hardware Corporation.

c. "No. 70"; Rockwood Manufacturing Company.

2. Pull Plates: Stainless steel plates and pulls. 0.050 inch thick plates, beveled top and sides.

a. "8302-6"; H.B. Ives.*

b. "100x943/4x16"; Baldwin Hardware Corporation.

c. "111x70C"; Rockwood Manufacturing Company.

3. Kick Plates: Stainless steel, 0.050 inch thick; beveled top and sides.

a. H.B. Ives.*

b. Baldwin Hardware Corporation.

c. Hager Companies.

d. Rockwood Manufacturing Company.

2.09 DOOR STOPS

A. Products: Provide door stop types as follows:

1. Products by H.B. Ives:*

a. Wall: "No. 407-1/2."

b. Floor: "No. 436."

2. Products by Rockwood Manufacturing Company:

a. Wall: "No. 409."

b. Floor: "No. 441."

B. Other Products: Equivalent products by one of the following manufacturers are also acceptable:

1. Glynn-Johnson, An Ingersoll-Rand Company.

2. Russwin Corbin Architectural Hardware Div. of Yale Security, Inc.

2.10 FASTENERS

A. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Preparation: Comply with the following:

1. Steel Doors and Frames: Comply with Door and Hardware Institute (DHI) A115 Series, "Specifications for Steel Door and Frame Preparation for Hardware (ANSI)."

B. Mount hardware units at heights indicated in the following applicable publications, except as specifically listed herein under Article 2.03 - LOCATIONS, and/or otherwise directed by the Engineer and required to comply with governing regulations.

1. Steel Doors and Frames: Comply with DHI "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

C. Install each hardware item in compliance with the manufacturer's published instructions and current 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 re-installation or application of surface protection with finishing work specified in Division 09 sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

D. 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.

E. Clean adjacent surfaces soiled by hardware installation. Clean operating items as necessary to restore proper function and finish.

3.03 FINISH HARDWARE SCHEDULE

A. The following Hardware Sets are based on door location types as indicated. Refer to the drawings for specific door numbers, sizes, types, and swings.

1. DOORS

3^0 x 7'-0" x 1-3/4 MD X MF RHR/LHR

Hinges	1-1/2 pr	Hager BB1191 4-1/2 x 4-1/2 NRP US32D
Deadlock	1	Sargent 455 US32D
Lock Guard	1	Ives LG 13 US32D
Closer	1	Sargent 1231 EN
Pull Handle	1	Ives 8302-6
Wall Stop	1	Ives 407-1/2 US32D
Kick Plate	2	Ives 12" x 2" LDW US32D

END OF SECTION 08710

DIVISION 09

FINISHES

SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes the surface preparation and application of painting and related work in locations indicated on the drawings and specified herein.

1.02 RELATED WORK

A. CONCRETE WORK: Section 03310.

B. UNIT MASONRY: Section 04220.

C. METAL FABRICATIONS: Section 05500.

D. ROUGH CARPENTRY: Section 06100.

E. JOINT SEALANTS: Section 07900.

F. STEEL DOORS AND FRAMES: Section 08110.

1.03 QUALITY ASSURANCE

A. All surfaces of fabricated items that are left unfinished by the requirements of other sections shall be painted under this \section, whether exposed or concealed in the finished work. All work specified in this section shall be in addition to shop and mill coats, priming and field coats which are specified in other sections.

B. Perform all touching up of shop coats and field coats of paint on structural steel and miscellaneous steel or iron as required and/or specified.

C. Aluminum, steel, stainless steel, copper, bronze, chromium plating, nickel, monel metal, lead, lead coated copper, and other surfaces with factory finishes shall not be painted or finished, except as otherwise specified.

D. Remove and re-finish or otherwise correct in a manner approved by Engineer all work under this section which peels, crazes, blisters, fails to adhere, or otherwise fails to properly serve its intended purpose at no additional cost to the Department.

1.04 PRODUCT DELIVERY AND STORAGE

A. All materials shall be delivered to the project site in manufacturers' sealed packages, with labels intact.

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data for each type of product used.

B. Samples:

1. Submit three (3) sets of full color chip line for each type of paint specified, for color selection(s) by the Engineer.

C. Draw Downs:

1. Provide three (3) stepped draw downs, defining each separate coat, including block fillers and primers, for each color and material to be applied.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ready-mixed paints, both exterior and interior, varnish, stains, coatings, and waxes shall be first-line (best quality grade) retail products.

B. Thinners and additives shall be of types recommended by the paint manufacturer.

C. The use of lead-containing paint is not permitted.

D. Products: Provide paint products by one of the following manufacturers:

1. Benjamin Moore.

2. ICI Dulux.

3. Porter Paints.

4. PPG Architectural Finishes, Inc.

5. Pratt & Lambert.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which painting is to be applied. Do not proceed with painting work until unsatisfactory conditions have been corrected.

3.02 COLORS

A. The Engineer will select all colors and provide a schedule of colors and finishes as approved by the Department. Colors shall match exactly those indicated on Drawing Sheet A600.

B. Each coat of paint shall be applied in varying shades, with the final coat matching the approved color selected.

3.03 PREPARATION FOR PAINTING

A. Surfaces to be painted shall be clean, smooth, free from scratches and dust, and thoroughly dry. Wood surfaces shall be well sanded before painting work is started.

B. Concrete surfaces shall be cleaned, grouted, rubbed and pointed, water flushed clean, and free of all dust, oily grease and laitance, and allowed to dry prior to painting.

C. Steel and Iron shall be free from grease, rust, scale, and dust. Touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have heavy coating of scale, it shall be removed by wire brush or sand blasting necessary to produce a satisfactory surface for painting.

3.04 PROTECTION

A. Adjacent fixtures and hardware shall be removed during the painting application.

B. Particular care shall be taken by the use of clean drop cloths, masking, and other suitable means, to protect adjoining surfaces, fixtures, and materials of all kinds. Painting applicator shall be held responsible for, and shall repair, all damages resulting from the painting operation.

C. All ceiling and soffit overhead painting shall be applied only while the floor is completely and continuously covered with drop cloths.

3.05 APPLICATION

A. Paints shall be applied in the colors and minimum number of coats scheduled herein and at the square foot coverage as stated in the paint manufacturer's printed specifications. It is intended that paint so applied shall cover to the satisfaction of the Engineer or additional coats shall be applied until approval is obtained.

B. Paints shall not be applied to surfaces which show a moisture content greater than 15 percent as determined by an electronic moisture meter.

C. Paints shall not be applied when the temperature falls below 45 degrees F., in damp, rainy weather, or when the relative humidity exceeds 85 percent.

D. Paint shall be evenly spread and well distributed. The finish coats shall be free from any noticeable laps, brush marks, streaks, runs, sags, wrinkles, and shiners.

E. All wood surfaces shall be thoroughly sanded between coats as required for a flaw-free finish.

3.06 BACK PRIMING

A. All wood backs to be placed against concrete or masonry (except pressure treated wood) shall be painted with a sealer coat of paint or clear varnish before installation

3.07 DESTROYING WASTE

A. At the end of each day, all cloths and waste materials that have been used in preparation and application of inflammable paint materials shall be destroyed or placed in closed metal containers. Under no circumstances shall any waste be emptied into plumbing fixtures, drains, or clean-outs of the plumbing systems of the building. Waste shall not be allowed to accumulate on the Site.

3.08 TOUCH UP AND CLEANING

A. Upon completion, all touching-up as required shall be applied and any paint shall be removed from all surfaces that are not specified to receive paint.

3.09 PAINTING OF PIPING FOR IDENTIFICATION

A. Exposed piping, piping concealed in accessible pipe spaces and piping behind access panels shall be identified to designate service.

B. Legend shall be stencil applied (painted on) at 40 feet spacing on straight runs where pipes pass through walls or floors and regulators, strainers, and clean-outs (except valves and fittings on plumbing fixtures and equipment).

C. Legend shall give name in full or abbreviations. Size of stenciled identity lettering shall vary with the diameter of pipe covering as follows:

1. Up to 1” 1/2” high letters

2. Above 1” 3/4” high letters

3.10 PAINTING SCHEDULE

A. The following surfaces shall be finished with the designated number of coats (in addition to shop or manufacturer's coats) with the respective designated products of Sherwin Williams (SW), or equivalent products by one of the other listed manufacturers, with a Dry Film Thickness (DFT) of not less than indicated:

B. Trade Names used are only to set a standard of quality desired.

C. Omit primer on items with shop coat primer. All shop coats shall be touched up with the same kind of paint as the shop coat and allowed to dry before application of finish coats.

EXTERIOR

1. Metal, Galvanized: Gloss Finish.

   a. One (1) coat SW Water Based Catalyzed Epoxy Primer: 3.0 - 5.0 DFT

   b. Two (2) coats SW Corothane II: 2.0 - 4.0 DFT each coat.

   c. Total: 7.0 - 13.0 mils DFT.

2. Metal, Ferrous: Gloss Finish.

   a. One (1) coat SW Tile-Clad High Solids: 2.5 - 4.0 DFT

   b. Two (2) coats SW Corothane II: 2.0 - 4.0 DFT each coat.

   c. Total: 6.5 - 12.0 mils DFT.

3. Concrete Masonry Units: Satin Finish.

   a. One (1) coat SW Loxon Exterior Acrylic Masonry Primer: 3.1 DFT

   b. Two (2) coats SW A-100 Satin Latex House and Trim: 1.3 DFT each coat.

   c. Total: 5.7 DFT.

INTERIOR

1. Wood Trim for Opaque Eggshell Finish: Each coat of enamel applied and re-rolled to achieve uniform stipple.

   a. One (1) coat SW ProBlock Interior/Exterior Latex Primer Sealer: 1.4 mils DFT.

   b. Two (2) coats SW MPI-52 Gloss Level 3 Interior Latex Eg-Shel: 1.5 mils DFT each coat.

   c. Total: 4.4 mils DFT.

2. Galvanized Metal for Eggshell Finish:

   a. One (1) coat SW PrepRite ProBlock Interior/Exterior Latex Primer Sealer: 1.4 mils DFT.

   b. Two (2) coats SW MPI-52 Gloss Level 3 Interior Latex Eg-Shel: 1.5 mils DFT.

   c. Total: 4.4 mils DFT.

3. Ferrous Metal for Eggshell Finish:

   a. One (1) coat SW PrepRite ProBlock Interior/Exterior Latex Primer Sealer: 1.4 mils DFT.

   b. Two (2) coats SW MPI-52 Gloss Level 3 Interior Latex Eg-Shel: 1.5 mils DFT.

   c. Total: 4.4 mils DFT.

4. Piping and Conduit, Exposed Surfaces for Semi-Gloss Finish.

   a. Ferrous Metal:

      1) One (1) coat SW PrepRite ProBlock Interior/Exterior Latex Primer Sealer: 1.4 mils DFT.

      2) Two (2) coats SW MPI-52 Gloss Level 3 Interior Latex Eg-Shel: 1.5 mils DFT each coat.

      3) Total: 4.4 mils DFT.

5. Concrete Masonry Unit for Eggshell Finish.

   a. One (1) coat SW PrepRite Block Filler: 8.0 DFT.

   b. Two (2) coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.

   c. Total: 11.6 DFT.

END OF SECTION 09900

DIVISION 10

SPECIALTIES

SECTION 10200
METAL LOUVERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish and install exterior metal louvers as indicated on the drawings and specified herein.

1.02 RELATED WORK

A. UNIT MASONRY: Section 04220.

B. JOINT SEALANTS: Section 07900.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American Architectural Manufacturers Association (AAMA):

a. Referenced Standards.

2. Air Movement and Control Association (AMCA):

a. Referenced Standards.

3. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

4. American Welding Society (AWS):

a. Referenced Standards.

5. Steel Structures Painting Council (SSPC):

a. Referenced Standards.

B. Welding: Qualify procedures and personnel according to AWS D1.2 “Structural Welding Code.”

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of wind 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. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: Determine loads based on pressures in compliance with the Florida Building Code, Latest Adopted Edition, as amended for the geographical location of the project.

B. Provide louvers complying with performance requirements for louver types specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width, according to AMCA Standard 500-L. Provide a copy of the State of Florida Notice of Approval (NOA) for product.

C. Provide louvers with AMCA Certified Ratings Seal evidencing that product complies with specified requirements.

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturer's specifications, certified test data, and installation instructions for required products, including finishes.

B. Shop Drawings:

1. Complete shop drawings shall be prepared for this work indicating the materials, sizes of members and units, construction and clearances required, and methods of securing to attachment substrates. Include instructions for installation of anchoring devices built into other work. As a minimum, fasteners must be equal to test assembly.

C. Samples:

1. Submit three (3) 6-inch-square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work.

D. Warranty:

1. Submit specimen copy of specified warranty.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver louver units in substantial, protective cartons and with protective masking over finished surfaces. Retain masking until completion of Project work, unless otherwise determined by the Contractor.

B. Store louver units indoors and protected from any building contamination resulting from construction activities.

C. Handle all units carefully to preclude damage to surface finishes. In the event of damage, immediately make all repairs, or replacements, as necessary to the approval of the Engineer and at no additional cost to the Department.

1.07 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work.

B. Shop Assembly: Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Coordination: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints, and field assembly of units.

1.08 WARRANTY

A. Special Finish Warranty: Provide manufacturer's standard twenty (20) year finish performance warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products: Provide products by one of the following manufacturers:

1. The Airolite Company.

2. Construction Specialties, Inc.

3. Industrial Louvers, Inc.

4. Ruskin Company.

2.02 LOUVERS

A. Standard profile louvers shall be 4 inches deep and assembled completely by welding. Blades and frame shall be 12 gauge (.081 inch) extruded aluminum, alloy 6063-T52, ASTM B 221. Sightproof design for toilet room applications.

1. Basis of Design: Ruskin EME520MD.

B. Louvers shall bear AMCA Certified Ratings Seals for air performance and water penetration ratings and shall have received the State of Florida Notice of Approval meeting Florida Building Code requirements.

2.03 ACCESSORIES

A. Fastenings: Use same material as items fastened. Provide types, gauges, and lengths to suit unit installation conditions. Use phillips flat-head machine screws for exposed fastenings, unless otherwise indicated and/or required.

B. Screens: Provide for all louvers, and as follows:

1. Insect Screens: 18 - 14 mesh, 0.011 inch aluminum wire. Provide on all intake louvers.

2. Locate screens on inside face of louvers, unless otherwise indicated. Secure screens to louver frames with machine screws, located at each corner and spaced 12 inches on center. Screens shall be removable for maintenance and cleaning.

C. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 40-mil thickness per coat on surfaces of dissimilar metals.

2.04 METAL FINISHES

A. High Performance Coating: Provide manufacturer's standard fluoropolymer 2-coat thermocured coating system composed of specially formulated inhibitive primer and fluoropolymer color top coat containing not less than 70 percent polyvinylidene fluoride resin by weight; comply with AAMA 2605.

1. Color to be selected by Engineer.

2. Products, Resin Manufacturers: Provide fluoropolymer coating systems containing one of the following resins:

a. "Hylar 5000"; Ausimont USA, Inc.

b. "Kynar 500"; Elf Atochem North America, Inc.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the metal louvers are to be installed. Do not proceed with metal louver work until unsatisfactory conditions have been corrected.

3.02 FIELD MEASUREMENT

A. Verify louver openings by field measurements, before fabrication and indicate measurements on shop drawings.

3.03 INSTALLATION

A. Comply with manufacturer's published instructions and current recommendations for installation of metal louvers.

B. All items under this heading shall be set in their correct locations as shown on the Drawings and shall be level, square, plumb, and at proper elevations and in alignment with other work.

C. Install all members with adequate provisions for settling, expanding, and contracting to occur without bending louver blades. Firmly anchor all members, using all anchoring devices required to ensure positive attachment of the members. Set sill members in full bed of mastic.

D. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

E. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated and/or required.

F. Provide concealed gaskets, flashings, and joint fillers, and install as work progresses to make installations weathertight.

G. Sealants at perimeter joints of units be applied under Section 07900 - JOINT SEALANTS.

3.04 FINISH REPAIRS

A. Repair finishes which are damaged by cutting, welding, soldering, and grinding operations that are required for fitting and jointing.

B. Restore finishes so there is no evidence of corrective work. Return items that cannot be re-finished in field to shop; make required alterations; and re-finish entire unit, or provide new units at the direction of the Engineer.

END OF SECTION 10200

SECTION 10522
FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work of this Section shall include the following:

1. Fire Extinguishers.

2. Brackets.

3. Accessories.

1.02 RELATED WORK

A. UNIT MASONRY: Section 04220.

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. National Fire Protection Association (NFPA):

a. NFPA 10 - Portable Fire Extinguishers.

B. Single Source Responsibility:

1. Provide fire extinguishers, brackets, and accessories by single manufacturer.

C. Requirements of Regulatory Agencies:

1. All fire extinguishers shall be Underwriters' Laboratories (UL) approved and labeled.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s technical data and installation instructions for fire extinguishers and accessories to the Engineer for review and approval.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products: Provide fire extinguishers and accessories by one of the following manufacturers:

1. J.L. Industries, Inc.

2. Larsen's Manufacturing Company.

3. Potter-Roemer.

2.02 FIRE EXTINGUISHERS

A. Description: Fire extinguishers shall be multi-purpose, dry chemical type.

B. Products: Provide one of the following:

1. “MP 10”; Larsen's Manufacturing Company.

2. “Cosmic 10E”; J.L. Industries, Inc.

3. “3010”; Potter-Roemer.

2.03 FIRE EXTINGUISHER BRACKETS

A. Brackets shall be used for all utility/service areas.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify servicing, charging, and tagging of all fire extinguishers.

3.02 INSTALLATION

A. Install the items of this Section in strict accordance with the original design, approved shop drawings, NFPA 10, and requirements of agencies having jurisdiction, as approved by the Engineer, anchoring all components firmly into position.

END OF SECTION 10522

SECTION 10800
TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all toilet accessories as indicated on the drawings and herein specified.

1.02 RELATED WORK

A. UNIT MASONRY: Section 04220.

B. TOILET PARTITIONS: Section 10160.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.

B. Requirements of Regulatory Agencies:

1. Comply with requirements of the Florida Building Code, Latest Adopted Edition, as amended, including ADA requirements.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical information, catalog cuts, and installation instructions for each product to be furnished and installed.

1.05 PRODUCT DELIVERY AND STORAGE

A. Materials shall be delivered to the site undamaged. Materials shall be stored on the site in an area and in a manner to provide protection from damage until incorporated in the work.

1.06 PROJECT CONDITIONS

A. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in masonry walls; coordinate delivery with other work to avoid delay.

B. Accessory Locations:

1. Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

2. Locations shall comply with state and federal handicapped accessibility requirements for handicapped accessible units.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products: Model numbers shown for accessories are units manufactured by Bobrick Washroom Equipment Company, Inc., unless otherwise specified. Provide products by Bobrick or by one of the following manufacturers:

1. A&J Washroom Accessories.

2. American Specialties, Inc.

3. Bradley Corp.

2.02 MATERIALS, GENERAL

A. Stainless Steel: ASTM A 666 Type 304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed, theft and vandal resistant.

2.03 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are NOT permitted. Where locks are required for a particular type of toilet accessory, provide same keying throughout Project. Furnish two (2) keys for each lock.

B. Recessed Toilet Accessories: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with continuous stainless steel piano hinges. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet accessories in accordance with manufacturer's instructions and ADA requirements, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.02 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 after removing temporary labels and protective coatings.

3.03 TOILET ACCESSORY SCHEDULE

A. Refer to the drawings for the Toilet Accessory Schedule.

END OF SECTION 10800

DIVISION 15

MECHANICAL

SECTION 15050
GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies general mechanical requirements for all Division 15 specification sections.

1.02 RELATED DOCUMENTS

A. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of Division 15 Sections.

B. Review all other contract documents to be aware of conditions affecting work herein.

C. Division 16.

1.03 CODES AND STANDARDS

A. The codes and standards covering mechanical work include, but are not limited to:

1. American National Standards Institute (ANSI)

2. American Society for Testing and Materials (ASTM)

3. American Society of Mechanical Engineers (ASME)

4. American Welding Society (AWS)

5. National Fire Protection Association (NFPA)

6. National Electrical Manufacturers Associations (NEMA)

7. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

8. National Sanitation Foundation (NSF)

9. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

10. Florida Building Code (FBC)

11. Florida Department of Environmental Protection (DEP) Regulations

12. Americans with Disabilities Act (ADA)

B. These codes, society and association recommendations constitute minimum requirements and no reductions from design requirements will be permitted, even if allowed by the applicable codes, without expressed written permission of the Engineer.

1.04 SHOP AND ERECTION DRAWINGS AND SAMPLES

A. Submit required and requested shop and erection drawings for review by Engineer before ordering or installing any equipment or material. Equipment or material ordered or installed before Engineer's review may not be accepted and will have to be removed from the Project.

B. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall clearly indicate the construction, material, physical dimensions, wiring diagrams and complete operating data clearly marked for each item. Data of general nature will not be accepted.

C. Erection drawings shall consist of 1/4-inch scale drawings of the work including foundations in plan and elevation. These drawings shall show clearances between units and relation of equipment to space assigned and to the work of other trades. Normally, with the exception of drawings for ductwork, erection drawings are required for mechanical equipment rooms. Provide drawings for other areas requested by the Engineer.

D. Before Contractor elects to make any changes in work that is shown on the Contract Drawings, he shall prepare and submit to the Engineer a drawing with a minimum of 1/4-inch scale showing proposed change and Contractor shall not proceed with the change without a written approval by the Engineer. All such approved drawings shall be included into final set of record drawings.

E. The Engineer’s approval of shop drawings does not relieve the Contractor of his responsibility to comply with all requirements of this specification.

1.05 RECORD DRAWINGS

A. Record Drawings shall be submitted to the Engineer before final acceptance and shall include the following as a minimum requirement:

1. Utility surveys indicating the underground work performed under this section and giving dimensions from fixed reference points.

2. Equipment schedules shall reflect all changes in the approved equipment that deviate from the schedules and shall include the Manufacturer's name, model number, performance capacities, and accessories.

3. Ductwork: Drawings shall show routing of ductwork with dimensions and indications of balancing dampers, splitter dampers, fire and smoke dampers, access doors, and fans or other items needing periodic maintenance.

4. Piping: Drawing shall show routing of piping indicating valves, cleanout, access panels, and invert elevations.

1.06 FEES, PERMITS, AND INSPECTIONS

A. The Contractor shall obtain all permits for work under this contract and shall pay all expenses in conjunction therewith. He shall also procure and deliver to the Engineer all certificates issued by the authorities having jurisdiction.

B. The work will be observed by the Engineer during the course of construction. Provide for inspection by others having jurisdiction during the proper phases.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts, anchorage devices, and sleeves which are to be embedded in cast-in-place concrete or masonry, in ample time not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or support structures. Repair or replace damaged materials or structures as directed at no additional cost to the Department.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials or products specified herein and/or indicated on the drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified.

B. Since manufacturers reserve the right to change their products at anytime, Contractors shall verify all dimensions, performance data, and similar criteria for each piece of equipment submitted to assure compliance with the intent of the Drawings and Specifications.

C. All materials shall be new of the quality specified.

D. Deviations mean the use of any listed approved manufacturer other than those on which the Drawings are based.

2.02 SPACE AND ACCESS TO EQUIPMENT

A. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

B. Provide access panels for service and maintenance of devices such as cleanouts, air vents, service valves, air volume balancing dampers, fire dampers, etc. that are installed in concealed spaces.

2.03 CUTTING AND PATCHING

A. Unless otherwise indicated on the Mechanical Drawings, all cutting and patching necessary for the Work shall be performed by the Contractor. Where interferences occur, and departures from indicated arrangements are required, the Contractor shall coordinate the mechanical work with the other trades involved and make a determination as to changed locations and elevations of the ductwork and/or piping and shall obtain approval from the Engineer for the proposed changes.

2.04 SAFETY REQUIREMENTS

A. In addition to the components specified and shown on the drawings and necessary for the specified performance, the Contractor shall incorporate in the design and show on the shop drawings all the safety features required by the current codes and regulations, including but not limited to those of the Occupational Safety and Health Act of 1970, and Amendments thereto.

2.05 DRIVES AND BELT GUARDS

A. The Contractor shall provide for each V-belt drive or rotating shaft a protective guard which shall be constructed around an angle iron frame, securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements. Hinged access doors not less than 6-inches x 6 inches shall be provided for access to motor and fan shaft for test purposes. For double inlet fans, the belt guard shall be arranged so as not to restrict the air flow into the fan inlet. Guards shall not interfere with lubrication of equipment.

2.06 ELECTRICAL WORK

A. The Contractor shall furnish all control wiring and conduit for the HVAC equipment and shall include control devices such as thermostats, control switches, contactors, relays and starters. All Work shall conform in all respects to the requirements of the applicable paragraphs of Division 16 Specifications.

2.07 CLEANING AND PROTECTING

A. During construction protect all piping and equipment from damage and dirt. Cap the open ends of all piping and equipment.

B. After completion of project clean the exterior surface of equipment included in this section, remove all residues and as directed touch up paint or completely repaint all damaged surfaces.

2.08 PAINTING

A. All field painting, unless otherwise noted, shall be as specified in Section 09900 - PAINTING.

B. All equipment shall have factory standard finish, except as specifically indicated herein. Where zinc chromate paint is specified it shall be made up in synthetic resin vehicle.

C. Ironwork installed under this division of the specifications exposed to view within the building, and not otherwise specified to be painted, galvanized, copper or chrome plated, such as piping, pipe hangars, structural supports, supports for apparatus, black iron partitions or casings, tanks, etc., shall be painted with one coat of priming zinc chromate.

2.09 EQUIPMENT IDENTIFICATION

A. Identify each unit by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include packaged and split system air conditioning units and heating unit.

2.10 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done.

B. Provide all necessary sleeves, caulking, and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

PART 3 - EXECUTION

3.01 PREVENTION OF ELECTROLYSIS

A. Where the contact of dissimilar metals may cause electrolysis and where copper will contact concrete, mortar or plaster, the contact surface of the metals shall be separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface; or where deemed necessary by the Engineer, not less than open course of asphalt saturated cotton fabric cemented to both metals with flashing cement, shall be used. Finished works shall be cleaned and excess cement removed.

3.02 TESTS AND INSPECTIONS

A. Include all tests and inspections specified and/or required under laws, rules, and regulations of all departments having jurisdiction. Tests shall be performed as indicated herein and other sections of specifications.

B. Notify the Engineer at least 72 hours in advance of all tests. Furnish all necessary instruments, gauges and other equipment required for tests. Make preliminary tests prior to giving notice of final tests.

C. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition.

D. Correct defects disclosed by these tests without any additional cost to the Department. Repeat tests on repaired or replaced work.

E. Maintain separate log of all tests being conducted and have it available for review by Engineer. Log to indicate date, type of tests, duration and defects noted and when corrected.

3.03 ACCEPTANCE INSPECTION

A. Representatives of installers responsible for work under this division shall be present at time of acceptance inspections and shall furnish required mechanics, tools, and ladders to assist in the inspection.

B. As a precedent to requesting a final inspection, the following steps shall be met:

1. Complete all work under this section of the Specifications.

2. Have each system balanced to assure design performance. (See Section 15990 - TEST AND BALANCE for detailed requirements.)

3. Furnish the Engineer with letter from an authorized representative of the equipment manufacturer certifying that all work has been checked for operation and calibration and that the system is operating as intended.

4. Clean all dirty cooling coils and other equipment that may have accumulated dirt during construction.

C. A list of items to be corrected as a result of acceptance inspection will be furnished to the installer. Notify Engineer in writing of any items appearing on list of correction that are disputed by installer. When ready, request in writing a re-inspection of work.

D. The Contractor shall provide certification that all work is in conformance with all codes and standards by the governing agencies having jurisdiction of the work.

3.04 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Bound Instructions: Before final payment is made, the Contractor shall furnish six (6) sets of bound operation and maintenance manuals to the Department. The manuals shall consist of catalog cuts, bulletins, shop drawings, wiring diagrams, schedules, parts lists, procedures, and other data showing the equipment installed and shall include the following:

1. Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

2. A control sequence describing startup, operation, and shutdown.

3. Operating and maintenance instructions for each piece of equipment, including lubrication instructions.

4. Parts lists and recommended spare parts.

5. Other data and instructions as specified under the various sections.

B. All data furnished shall conform to the installation as constructed. Cuts showing other equipment and data not applicable to the installation shall be crossed out and where practical shall be omitted from the manual. The assembly of the manual shall be in a logical manner and each section shall be indexed in the Table of Contents.

C. Each manufacturer shall outline a maintenance procedure for his equipment installed and the Contractor shall then compile these procedures in a logical manner to provide a procedure for the operating personnel of the Department to follow in their day to day operation of the facility.

D. The materials shall be permanently bound into each booklet between rigid plastic or cloth binding covers. The instruction booklets shall be approximately 9-inches by 12-inches and the diagram booklet large enough to contain the drawing without excessive folding so that they may be easily opened.

E. The booklets shall be neatly entitled with a descriptive title, the name of the job, the location, year of installation, Department, Manufacturer, Contractor and Engineer. Copies of drawings shall be in black and white background and shall be easily legible. The arrangements of the booklets, the method of binding, materials to be included and the composite text shall all be reviewed and approved by the Engineer.

3.04 OPERATIONS INSTRUCTION TO DEPARTMENT

A. Provide a minimum of 1 hour of instruction to representatives of Department in operation and maintenance of all installed mechanical systems and equipment.

B. Provide maintenance manual and acquaint Department's representative with its contents during instruction.

C. Furnish letter naming Department’s personnel receiving instruction and dates when instruction was given.

D. Provide name, address, and telephone number of the manufacturer’s representative and service company for each piece of equipment so that service or spare parts can be readily obtained.

END OF SECTION 15050

SECTION 15100
PIPING AND SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish and install the soil, waste and vent piping systems complete with all supports, hangers, specialties and accessories as shown on Drawings and herein specified.

B. Provide new materials free from defects and of American manufacture, and clearly marked with manufacturer's name and weight, classification, or working pressure of pipe and fitting.

1.02 RELATED WORK

A. GENERAL MECHANICAL REQUIREMENTS: Section 15050.

1.03 SUBMITTALS

A. Submit manufacturer's data and shop drawings for approval before any work is commenced. Submit piping shop drawings and erection drawings.

1.04 DELIVERY, STORAGE AND HANDLING

A. Except for concrete, corrugated metal, hub-and-spigot, clay, and similar units of pipe, provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.

C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.01 PIPE

A. The following schedule covers the materials which shall be furnished and installed unless otherwise specified under the particular system section:

	MATERIALS	SERVICE
1.	Rigid copper tube, Type K.	Domestic water piping, below grade.
2.	Rigid copper tube, Type L.	Domestic water piping above grade.
3.	Copper drainage tube, Type DWV.	Waste arms, safe wastes.
4.	PVC schedule 40, DWV Pipe	Sanitary building sewer system underground.
5.	Cast Iron, Hubless	Aboveground waste vent system.

2.02 PIPE FITTINGS

A, Wrought Copper: Elbows, tees, reducers, couplings, etc., solder ends 150 PSIG WSP, conforming to ANSI B16.22. Use 95-5 solder for water service, heating hot water piping and refrigerant piping and 50-50 for waste service. Bronze unions for 2-1/2" pipe and smaller.

1. Products: Provide wrought copper fittings by one of the following manufacturers:

   a. Mueller Brass Co.

   b. Chase Brass.

   c. Lee Brass and Copper Co.

B. Dielectric Unions: Dissimilar pipe metals shall be dielectrically isolated from each other by couplings, unions, or flanges commercially manufactured for that purpose and rated for the service pressure and temperature. Use of steel or cast-iron fittings in a copper piping system is prohibited, except where specifically noted.

1. Products: Provide dielectric unions by one of the following manufacturers:

   a. Epco.

C. PVC Pipe: Schedule 40 for condensate drainage shall conform to the requirements of ASTM D 2751. All PVC socket type connections shall be made with PVC solvent cement complying with ASTM D 2564.

D. Hubless Cast Iron Pipe: Waste and vent lines shall be hubless cast iron sanitary system shall conform to CISPI Std. 310. CI NO-HUB Pipe and fittings CISPI Std. 301. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Pipe Institute or receive prior approval of the Engineer.

2.03 SPECIALTIES

A. Escutcheons:

1. Stainless steel or chromium plated brass, either one piece or split patterns, stamped or solid as applicable.

2. Unless otherwise noted, provide escutcheons securely in place on exposed pipes where they pass through walls, partitions, floors and ceilings or finished areas.

3. For interior walls, partitions and ceilings, escutcheons shall be solid or stamped chrome plated brass or stainless steel.

4. For floors and exteriors walls, escutcheons shall be solid cast brass, rough chrome plated or cast nickel bronze alloy.

B. Water Hammer Arrestors: Provide arrestors as necessary to safeguard the Water Distribution System. Arrestors shall have a stainless steel casing, flexible mechanical bellows, pressurized inert gas chamber, and certification stamp as conforming to PDI WH-201. Provide access panel for arrestor located above hard ceiling areas.

1. Products: Provide water hammer arrestors by one of the following manufacturers:

a. "Hydrotrol" Series; J.R. Smith.

b. Wade.

c. Zurn Industries, Inc.

d. Josam Co.

e. Precision Plumbing Products Inc.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports for the different applications as follows:

1. Hangers: Cast malleable or wrought iron split ring, clevis type or Auto-Grip. All designed for use with steel threaded support rods. Hangers and rods proportioned for the weight of the pipe supported. Copper plated hangers for the copper pipe.

a. Products: Provide hangers by one of the following manufacturers:

(1) Grinnell Corp.
(2) F & M.
(3) Auto-Grip.

2. Trapeze Hangers: For parallel pipes. Spacing determined by the smallest pipe supported.

3. Plumbers strap shall not be used.

4. Pipe Saddles: 18 gauge galvanized iron, 12 inches long (min.) installed at all points where insulated lines bear on hangers.

5. Supports shall be generally capable of maintaining the installed load plus 500 lb. Support C.I. at 5-foot intervals horizontally. Screwed pipe at 10-foot (max.) intervals horizontally. Copper tubing at 6-foot (max.) intervals horizontally. PVC piping every 4 feet. Support steel pipe at 8-foot intervals for piping up to 2-1/2 inches, and at 10-foot intervals for piping 3 inches and larger.

2.05 VALVES

A. Gate Valves: Gate valves shall be bronze body, screwed bonnet, non-rising stem, solid wedge, Class 125, 200 psi non-shock water service, with threaded ends.

1. Products: Provide one of the following gate valves:

a. "No. B-103"; Stockham Valves & Fittings, Inc.

b. "No. 609"; Hammond Valve Corporation.

c. "No. 438"; Crane Company.

B. Ball Valves: Brass or bronze body, screwed, blowout-proof stem, teflon seats and seals consolidated brass.

1. Products: Provide one of the following:

a. "No. 930-TRE"; Crane Company.

b. "No. 77"; Apollo.

c. "No 1101T"; Jenkins.

C Valve Boxes: Valve boxes shall be concrete box or equal with cast iron top.

1. Product: "#36"; Brooks Products.

2.06 PIPE SLEEVES

A. Interior: Galvanized sheet metal, 22 gauge. Provide for pipe passing through walls or floors before pouring concrete. Plastic sleeves are permitted.

B. All sleeves shall be large enough to allow full thickness of insulation through sleeves for insulated piping, and for two layers of 30 lb. felt wrapping around un-insulated piping.

PART 3 - EXECUTION

3.01 GENERAL

A. The design drawings are generally diagrammatic. They do not show every bend, off-set, elbow or other fittings which may be required in the piping for installation in the space allotted. Careful coordination of the work of this section with that of other divisions is necessary to avoid conflicts.

B. Line and Grade: Install gravity lines at uniform grade to low point after field verification of low point invert.

3.02 PIPE SLEEVES

A. Contractor shall be responsible for placing all sleeves for his piping prior to the pouring of the concrete or in time to set in place as the masonry walls are erected.

B. After piping is installed through the sleeves, complete with insulation or wrapping, the sleeves shall be sealed water-tight with an approved mastic or caulking compound.

3.03 JOINTING PIPE

A. Threaded Pipe: Ream all pipe after cutting and before threading. Use non-hardening pipe compound "Tite-Seal" or "Teflon" tape on male threads only.

B. Copper Tube: Ream all pipe after cutting and polish end to be soldered.

C. Provide nipples of same material and weight as pipe used. Part of standard weight nipples is less than 1-1/2 inches.

D. Provide reducing fittings where changes in pipe sizes occur.

E. Provide isolation bushings or dielectric unions between copper and steel piping and between brassware and steel.

F. Provide unions or flanges in all service lines at each piece of equipment, specialty valves or at other locations required for ready disconnect.

G. Provide all necessary drain piping from the low point of each of the systems, and other miscellaneous piping required by the various systems to make a complete installation. Drains shall not be smaller than connection at equipment and no drain shall be smaller than 3/4 inch.

H. PVC Pipe:

1. Remove all burrs from cut ends of PVC piping with knife, deburring tool or file.

2. Visually inspect the inside of pipe and fitting sockets and remove all dirt, grease or moisture with chemical cleaner and wipe clean with cloth prior to application of solvent.

3.04 PIPE PROTECTION

A. Spirally wrap all pipe lines embedded in concrete with two layers of 30 lb. felt.

B. Exposed un-insulated copper pipe shall have permanent, non-conductive type wrapping, or premolded plastic devices at all supports to prevent pipe and support from coming in physical contact.

C. All metallic pipe underground shall be coated with bitumastic.

D. No piping shall be backfilled or covered prior to inspection by the Engineer.

E. All underground piping shall have thirty inches minimum cover unless otherwise indicated on Drawings.

F. All copper lines in direct contact with ground soil shall be protected with minimum of two coats of bitumastic number 50 coal tar compound prior to backfill.

G. Wrap soil pipe that touches metal or is exposed to plaster with a layer of visqueen.

H. Coat all exposed threads on galvanized steel pipe with two coats of zinc chromate after assembly.

3.05 PIPE HANGERS AND SUPPORTS

A. Provide adjustable hangers inserts, brackets, rolls, clamps and supplementary steel as required for proper support of pipe lines. design hangers to allow for expansion and contraction of pipe lines and of adequate size to permit covering to run continuously through hangers. Support piping at equipment independently so that no weight will be supported by equipment. Coordinate location of hangers with light fixtures. Wire brush all steel or iron supports and prepare surfaces under this section for painting.

B. For horizontal cast iron pipe, hangers shall be placed within 18 inches of hub or joint. Hubless joints must be supported at every other joint except that when the length between supports exceeds four feet they shall be provided at each joint.

C. Pipes supported by trapeze hangers and not mounted on pipe rolls shall be secured to the trapeze with pipe clamps or "U" bolts.

D. Hangers shall be placed at each change of direction, within one foot of valves and other appurtenances installed in horizontal piping and not more than three feet from end of each branch runout.

E. Hangers for insulated pipes shall have a diameter large enough to include insulation, and protection shield shall be installed with each hanger.

F. Special Supports: All clamps, hangers and supports required by equipment manufacturers, shall be furnished and installed as per their recommendations.

G. Plumbers tape, straps, chain, wire hangers, or perforated bar shall not be allowed as means for hanging pipe.

3.06 ESCUTCHEONS

A. Fit and firmly secure escutcheons to pipes passing through finished floors, ceilings and walls. Escutcheons shall be of sufficient outside diameter to cover sleeved openings.

3.07 VALVES

A. Provide valves to isolate each cold water riser, branch line, hose bibs, and where indicated on plans or otherwise specified.

3.08 EQUIPMENT CONNECTIONS

A. Make connections between equipment and the piping systems as shown and specified.

B. Make connections between any piece of equipment and any piping system by means of unions, flange joints or other fittings which permit equipment to be disconnected and removed for maintenance.

C. Install valves or cocks in supply and return lines to each piece of equipment on system side of union connection.

3.09 TESTS

A. Apply a water pressure test to all parts of the water supply systems before the piping is concealed and before fixtures and equipment are connected. Use a hydrostatic pressure of not less than 125 psig applied to the system for a period of four hours. There shall be no leaks at any point in the system at this pressure.

B. Upon completion of installation of non-pressurized pipe, test pipe to demonstrate capability and compliance with requirements of the Florida Building Code - Plumbing.

C. Leave concealed work uncovered until required tests have been completed, but if necessary to make tests on portions of the work, those portions of the work may be concealed after being inspected and approved. Repair defects that are discovered as a result of inspection or tests with new materials. Caulking, peening or soldering of screwed joints, cracks, or holes will not be accepted. Repeat tests after defects have been corrected.

3.10 STERILIZATION

A. As soon as the water piping has been thoroughly flushed out, sterilize lines by introducing into them a solution of calcium hypochlorite or chloride of lime. Open and close all valves which system is being chlorinated. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 10 parts per million is indicated, repeat the process. When the tests show at least 10 parts

per million of residual chlorine, flush out the system until all traces of the chemical used are removed. Make necessary connections to sterilize piping.

3.11 LABELING OF PIPES

A. Pipes shall be properly labeled for identification according to their service type (including, for example, but not limited to, hot water, cold water, etc., as applicable). Label shall be equal to Brady or Seton.

END OF SECTION 15100

SECTION 15180
INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Insulate piping and equipment as specified and as shown on the Drawings.

B. Provide new materials, clean, dry and free from defects.

1.02 RELATED WORK

A. PIPING AND SPECIALTIES: Section 15100.

1.03 SUBMITTALS

A. Submit manufacturer's data for approval before any work is commenced.

1.04 JOB CONDITIONS

A. During storage and installation, protect all materials from the weather.

PART 2 - PRODUCTS

2.01 CONDENSATE DRAIN

A. All condensate drain piping except exterior shall be insulated as follows:

1. Insulate with flexible expanded elastomeric plastic tubing with a conductivity no greater than 0.253 at 75 degrees F., and have a maximum vapor barrier transmission of 0.02 perm. Wall thickness shall be 3/4 inch. For all pipe sizes.

2. Outdoors: all exposed insulation shall be finished with two coats of white Armstrong Armaflex finish paint.

3. Products: Provide products by one of the following manufacturers:

a. Armstrong Armaflex AP.

b. Rubatex.

2.02 DUCTWORK INSULATION

A. Building air conditioning supply, return, and exhaust ductwork shall be insulated.

1. Duct insulation shall have an installed thermal resistance (R) value of 4.2

minimum based on flat sections of insulation only excluding any air film resistances. The thermal resistance (R) value shall be determined in accordance with the following:

a. The relationship R = t/k where t (inches) is the installed thickness and k (BTU - in/hr sq. ft. deg. F) is the measured apparent thermal conductivity at 75 deg. F mean temperature and at installed thickness when tested in accordance with ASTM C 518 or ASTM C 177.

b. For duct wrap, installed thickness shall be assumed to be 75% (allowing for 25 % compression) of nominal thickness.

2. Duct insulation shall be covered with a vapor barrier having a maximum permeance of 0.05 perms or aluminum foil having a minimum thickness of 2 mils.

3. Vapor seal insulation joints and all breaks and tears in vapor seal jacket with fire resistant mastic.

4. Wrap insulation shall fit snugly to main and branch ducts using an adequate number of weld pins spaced at 6" or closer. Cold air ducts that do not run in return air plenums shall have insulation seams and joints sealed with mastic compound or foil insulation tape.

B. Weatherproof Duct Insulation: Provide ASTM C 591, polyurethane or polyiscocyanate board insulation, minimum density of 1.7 pcf and weatherproofing as specified in manufacturer's instruction. Exterior duct installation shall have a minimum thermal resistance (R) value of 8.0.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply all insulation over clean, dry surfaces.

B. Install in accordance with manufacturer's recommendations.

C. Seal all joints carefully.

D. Protect all piping insulation at points of supports with 18 gauge galvanized insulation shields, 12" long and covering one half of pipe insulation diameter.

END OF SECTION 15180

SECTION 15210
VIBRATION ISOLATION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide vibration isolation work indicated on Drawings and herein specified.

B. Types of vibration isolation products required for this Work include, but are not limited to, the following: Flexible Duct Connectors.

C. Vibration isolation products furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other DIVISION 15 Sections.

D. Refer to other Sections for equipment foundations, hangers, sealants, gaskets, and other work related to vibration isolation Work.

1.02 QUALITY ASSURANCE

A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer, with not less than five (5) years successful experience in production of units similar to those required for this Project.

B. Manufacturer Certification: Where vibration isolation support units are indicated for minimum static deflection, provide manufacturer's certification that units have been tested and comply with indicated requirements.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, detailed drawings, performance characteristics data and installation instructions for each type of unit required. Include performance certifications where required.

B. Shop Drawings: Submit shop drawings indicating scope of vibration isolation work and locations of units and flexible connections. Include schedule of units, showing size or manufacturer's part number.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Provide vibration isolation products by one of the following manufacturers:

1. Consolidated Kinetics Corp.
2. Korfund Dyunamics Corp.
3. Mason Industries, Inc.
4. Vibration Eliminator Co., Inc.
5. Vibration Mountings and Controls, Inc.

2.02 ISOLATION MATERIALS

A. Flexible Duct Connectors: Laminated flexible sheet of cotton duct and sheet elastomer (butyl, neoprene or vinyl), reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as flexible isolation unit, and of manufacturer's standard length for each size unless otherwise indicated. Equip each unit with galvanized steel retaining rings for airtight connection with ductwork.

PART 3 - EXECUTION

3.01 PERFORMANCE OF ISOLATORS

A. General: Comply with minimum static deflections recommended by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), including definitions of critical and non-critical locations, for selection and application of vibration isolation materials and units as indicated.

B. Manufacturer's Recommendations: Except as otherwise indicated, comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

3.02 APPLICATIONS

A. Apply types of vibration isolation materials and units indicated at locations shown or scheduled. Selection is installer's option where more than one type is indicated.

B. Except as otherwise indicated, apply the following types of vibration isolators at indicated locations or for indicated items of equipment. Selection is Installer's option where more than one type is indicated.

1. Flexible Duct Connectors: Install at the following ductwork connections:

a. Connections to air handling and exhaust fan equipment.

3.03 INSTALLATION

A. Except as otherwise indicated, comply with manufacturer's published instructions for installation and load application to vibration isolation materials and units.

B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.

C. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly.

D. Bond flanges of flexible duct connectors to ducts and housings to provide airtight connections. Seal seams and penetrations to prevent air leakage.

END OF SECTION 15210

SECTION 15440
PLUMBING FIXTURES AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. The work to be performed under this section includes plumbing fixtures and equipment as indicated on Drawings and specified herein.

B. Types of plumbing fixtures and equipment specified in this section include the following:

1. Water Closets.

2. Lavatories.

3. Drinking Fountain.

4. Mop Service Basin

5. Floor Drains.

6. Hub Drain.

7. Wall Faucet.

8. Cleanouts.

1.02 RELATED WORK

A. SUBMITTALS: Section 01340.

B. PRODUCT SUBSTITUTIONS: Section 01630.

C. PIPING AND SPECIALTIES: Section 15100.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of plumbing fixtures of type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:

1. Plumbing Fixture Standards: Comply with applicable portions of Florida Building Code pertaining to materials and installation of plumbing fixtures.

2. ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.

a. Construct and install barrier-free plumbing fixtures in accordance with ANSI Standard A117.1 "Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People."

3. PDI Compliance: Comply with standards established by PDI pertaining to plumbing fixture supports.

4. Federal Standards: Comply with applicable FS WW-P-541/Series sections pertaining to plumbing fixtures.

5. ASHRAE Compliance: Test and rate water coolers in accordance with ASHRAE Standard 18 "Method of Testing for Rating Drinking Water Coolers with Self-Contained Mechanical Refrigeration Systems."

6. ARI Compliance: Construct and install water coolers in accordance with ARI Standard 1010 "Drinking-Fountains and Self-Contained Mechanically-Refrigerated Drinking-Water Coolers," and provide Certification Symbol.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's technical product data sheets, including rated capacities of selected model clearly indicated, furnished specialties, chair carrier supports, accessories, and installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures and equipment individually wrapped in factory-fabricated containers.

B. Handle plumbing fixtures and equipment carefully to prevent breakage, chipping and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES AND EQUIPMENT

A. Provide factory-fabricated fixtures and equipment of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, and as required for complete installation. All fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.02 MATERIALS

A. General:

1. Unless otherwise specified, comply with applicable FS WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with requirements of WW1-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-.

2. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting seam marks, roller marks, foundry sand holes, stains, decoloration, or other surface imperfections on finished units are not acceptable.

3. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated brass or polished stainless steel units. Provide copper or brass where not exposed.

B. Stainless Steel Sheets:

1. ASTM A 167, Type 302/304, hardest workable temper with No. 4, bright, directional polish finish on exposed surfaces.

C. Steel Sheets for Baked Enamel Finish:

1. ASTM A 591, coating Class C, galvanized-bonderized.

D. Steel Sheets for Porcelain Enamel Finish:

1. ASTM A 424, commercial quality, Type I.

E. Galvanized Steel Sheet:

1. ASTM A 526, except ASTM A 527 for extensive forming; ASTM A 525, G90 zinc coating, chemical treatment.

F. Aluminum:

1. ASTM B 209/B 221 sheet, plate and extrusions, as indicated; alloy, temper and finish as determined by manufacturer, except 0.40 mil natural anodized finish on exposed work unless another finish is indicated.

G. Plastic Laminate:

1. NEMA LD3, general purpose high pressure type, 0.050" thick, smooth (non-textured) white unless another texture and color are indicated or selected by Engineer.

H. Synthetic Stone:

1. High quality, free from defects, glaze on exposed surfaces, stain resistant.

2.03 PLUMBING FITTINGS, TRIM, AND ACCESSORIES

A. Water Outlets:

1. At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems. All exposed fittings and pipe shall be chrome plated and shall be provided with chrome plated escutcheons at wall penetrations, including those locations inside cabinets.

B. Vacuum Breakers:

1. Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.

C. P-Traps:

1. Include removable P-traps where drains are indicated for direct connection to drainage system.

D. Fixture Bolt Caps:

1. Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Aerators:

1. Provide aerators of types approved by Health Departments having jurisdiction.

F. Concealed Support Systems:

1. All urinals, lavatories, etc., hung on masonry walls shall be supported on concealed carriers with structural steel supports and welded base plates securely bolted to the floor slab. Furnish complete with all necessary bolts, nuts, washers and gaskets.

2. The support shall NOT depend on the wall construction or piping to prevent movement unless otherwise specified herein or indicated on the Drawings.

3. All adjustments on carriers shall have set screws or some other type locking device to secure carrier when it is positioned.

4. Products, Water Closets: Concealed carrier supports by Josam, Wade, Zurn, J.R. Smith.

   a. “Model No. 14444”; Josam.

   b. “Model No. 371”; Wade.

   c. “Model No. Z-1204”; Zurn.

5. Products, Lavatories: Wall mounting hardware by Acorn Engineering Company.

2.04 FIXTURE AND EQUIPMENT SCHEDULE

A. WC- Water Closet - Handicapped:

1. Type: Wall hung; elongated, 16-gage type 304 stainless steel construction, "Dura-Ware." Exterior satin finish. Siphon jet flushing action. 1-1/2” wall concealed flush valve connection; 1.6 gallon per flush or less. ADA 18" integral contoured seat height.

   a. Toilet: “2105 W-1-CN Series”; Acorn Engineering Company.

   b. Flush Valve: “Royal Model 611-1.6”; Sloan.

   c. Flush Valve Access Panel: "2898 Dura-Ware"; Acorn Engineering Company.

B. LAV- Lavatory – Wheelchair:

1. Type 14-gage, type 304, stainless steel construction. “Dura-Ware” exposed surfaces polished to a satin finish. 18” x 22” ADA compliant. Provide ADA compliant air control pneumatically operated, metering, non-hold open pushbutton valve for cold water only. Provide a clearance of at least 29” above the finish floor to the bottom of the apron, carrier and trap enclosure.

   a. “1953-ADA-1-DMS-4-GT-TE": Acorn Engineering Company.

   b. Water Saver Cast Bronze P-Trap, 1-1/4” x 1-1/2”: J.R. Smith Fig 2698.

C. DF Drinking Fountain – Wheelchair:

1. Type Barrier-free, wheelchair access model, 16-gage stainless steel “Dura-Ware.” 1-1/4” x 1-1/2” P-trap mounting bracket, push buttons and bottom of unit with removable enclosure.

D. Mop Service Basin:

1. Type: Floor Mounted, 24” x 24” x12” terrazzo construction square style with tilting flange, caps and stainless steel wall guard.

2. Fittings: Wall-mounted top braced sink faucet, renewable valve seats, vacuum breaker, chrome finish, stops in shanks. Heavy duty rubber hose, 36” length standard female hose connection on one end with hose bracket.

a. Basis of Design: KFC Faucet.

3. Finish: Chrome.

4. Products: Provide one of the following:

a. “Model No. TSH-24”, Acorn Engineering Company.

b. “Model No. 24x24x12”; Florestone Products Co.

E. FD Floor Drain:

1. Type: Coated cast iron drain, two-piece body with double drainage flange, invertible non-puncturing flashing collar, adjustable satin Nikaloy 6" x 6" square strainer, 1/2" trap primer tap.

2. Products: Provide one of the following:

a. “Model No. ZN-415-S-P"; Zurn Industries, Inc.

b. “Model No. 2010-B-P"; J.R. Smith.

c. “Model No. 30000-S”; Josam Co.

F. HD Hub Drain:

1. Type: Coated cast iron hub with cast iron strainer.

a. “Model No. 88562” Josam Co.

G. WF Wall Faucet:

1. Type: Encased hose valve, self-draining, vandal resistant vacuum breaker. Stainless steel box and cover with hinged locking cover. 3/4" hose connection.

a. Hose valve; Series 8121-CR, Acorn Engineering Company.

b. Wall frame with door; Series 8292, Acorn Engineering Company.

2.05 CLEANOUTS AND CLEANOUT ACCESS COVERS

A. Exterior, Heavy Duty:

1. Cast iron, inside caulk outlet, brass internal plug, ductile iron scoriated heavy duty cover.

2. Products: Provide one of the following:

a. “56040-15"; Josam Co.

b. “Model No. Z-1406-VP”; Zurn Industries, Inc.

c. “Model No. 4100-U”; J.R. Smith.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installation fixtures. Also examine floors substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF PLUMBING FIXTURES AND EQUIPMENT

A. Install plumbing fixtures and equipment of types indicated where shown and at indicated heights; in accordance with manufacturer's written instructions, rough-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of Florida Building Code and Americans with Disabilities Act (ADA) pertaining to installation of plumbing fixtures and equipment.

3.03 INSTALLATION OF FLOOR DRAINS

A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

B. Coordinate flashing work with work of waterproofing and adjoining substrate work.

C. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

E. Position drains so that they are accessible and easy to maintain.

F. Protect drains during remainder of construction period, to avoid clogging with construction materials and debris, and to prevent damage from traffic and construction work.

3.04 INSTALLATION OF TRAP PRIMERS

A. Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping towards drain trap, minimum of 1/8" per foot (1%).

3.05 INSTALLATION OF CLEANOUTS

A. Floor Cleanout: Full pipe size up through 4 inches, pipe cleanouts with bodies of standard pipe size and caulking ferrules conforming in thickness to that required for pipe and fitting of same metal. Removable cleanout plugs to be of brass with screw threads and to extend no less than 1/4 inch above pipe hub. Plugs shall have raised nut, except where flush with floor, provide recessed socket.

3.06 FIELD QUALITY CONTROL

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, text fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise remove fixture and replace with new unit. Feasibility and match to be judged by Engineer. Remove cracked or dented units and replace with new units.

3.07 ADJUSTING AND CLEANING

A. Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation.

B. Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow stream and specified gpm.

C. Adjust or replace washers to prevent leaks at faucets and stops.

3.08 EXTRA STOCK

A. Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every 10 units.

3.09 BASIS OF PAYMENT

A. All of the Work of this Section is included in the Lump Sum Cost of the Restroom Construction Work, Item 735-73-1.

END OF SECTION 15440

SECTION 15860
FANS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Fans.

B. Motors and drives

C. Fan Accessories.

1.02 REFERENCES (Latest Edition or Revision)

A. AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 Standards Handbook.

D. AMCA 210 Laboratory Methods of Testing Fans for Rating Purposes.

E. AMCA 300 Test Code for Sound Rating Air Moving Devices.

F. AMCA 301 Method of Calculating Fan Sound Ratings from Laboratory Test Data.

G. NEMA MG1 Motors and Generators.

H. NFPA 70 National Electrical Code.

I. NFPA 90A Installation of Air Conditioning and Ventilating Systems.

J. SMACNA HVAC Duct Construction Standards - Metal and Flexible.

1.03 SUBMITTALS

A. Submit under provisions of Division 1 and Section 15050.

B. Product Data: Provide data on centrifugal fans and accessories.

C. Submit operation and maintenance data under provisions of Section 15050.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Acme Engineering & Mfg. Corp.

B. Greenheck Fan Corp.

C. Loren Cook Co.

2.02 GENERAL

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Performance Base: Sea level conditions.

E. Temperature Limit: Maximum 300 degrees F.

F. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

2.03 CEILING MOUNTED EXHAUST FANS

A. Ceiling mounted exhaust fans shall be of the centrifugal direct drive type.

B. The fan housing shall be constructed of steel. The steel duct collar shall be 6 inch in diameter to accept 6 inch round ductwork and shall include a backdraft damper.

C. The grille shall be constructed of aluminum with white enamel finish and attached to the housing with hidden attachment screws.

D. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type.

E. The motor shall be mounted on vibration isolators with solid state speed control.

F. The fan wheel shall be of the forward curved centrifugal type, constructed of calcium carbonate filled polypropylene and dynamically balanced.

G. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be UL/cUL Listed.

2.04 SIDEWALL EXHAUST FANS

A. Factory finish before assembly with enamel prime coat.

B. Propellers shall be fabricated aluminum, or cast aluminum blades and hubs. A standard square key and set screw or tapered bushing shall lock the propeller to the motor shaft. All propellers shall be statically and dynamically balanced.

C. Motors shall be permanently lubricated, heavy duty type, carefully matched to the fan load and furnished at the specified RPM, voltage, phase, and enclosure.

D. Motor drive frame assemblies and fan panels shall be painted steel.

E. Drive frame assemblies shall be welded wire or formed channels and fan panels shall have pre-punched mounting holes, formed flanges, and a deep formed inlet venturi.

F. The axial exhaust or supply fans shall bear the AMCA Certified Ratings Seals for both sound and air performance.

2.05 BEARINGS AND DRIVES

A. Bearings: AFBMA 9, L-10 life at 50,000 hours heavy duty pillow block type, self-aligning, grease-lubricated ball bearings, or AFBMA 11 L-10 life at 120,000 hours pillow block type, self-aligning, grease-lubricated roller bearings.

B. Shafts: Hot rolled steel, ground and polished, with key-way, protectively coated with lubricating oil, and shaft guard.

2.06 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: Comply with division 16 requirements.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.07 ACCESSORIES

A. Backdraft dampers: Aluminum

B. Inlet/Outlet Screens: Aluminum

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fans with resilient mountings and flexible electrical leads.

B. Provide safety screen where inlet or outlet is exposed.

C. Provide backdraft dampers on discharge of exhaust fans and as indicated.

D. Install per manufacturers recommendations and guidelines.

3.02 BASIS OF PAYMENT

A. All of the Work of this Section is included in the Lump Sum Cost of the Restroom Construction Work, Item 735-73-1.

END OF SECTION 15860

SECTION 15890
DUCTWORK

PART 1 - GENERAL

1.01 SUMMARY

A. The Work to be performed under this Section includes ductwork as follows:

1. Low pressure ducts.
2. Ductwork accessories.
3. Duct cleaning.

1.02 RELATED WORK

A. PAINTING: Section 09900. Weld priming, weather resistant, paint or coating.

1.03 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts maintain sizes inside lining.

B. Low Pressure: Three classifications: 1/2-inch WG positive or negative static pressure and velocities less than 2,000 fpm; 1-inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2-inch WG positive or negative static pressure and velocities less than 2,500 fpm.

1.04 QUALITY ASSURANCE

A. Reference Standards:

1. American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE):
    a. ASHRAE Handbook Fundamentals; Duct Design.
    b. ASHRAE Handbook Equipment; Duct Construction.
2. American Society for Testing and Materials (ASTM):
    a. ASTM A 90 Test Method for Weight of Coating in Zinc-Coated (Galvanized) Iron or Steel Articles.
    b. ASTM A 525 Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process.
    c. ASTM A 527 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
    d. ASTM B 209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.
3. National Fire Protection Association (NFPA):
    a. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems.

b. NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

a. SMACNA Low Pressure Duct Construction Standards.

5. Underwriters Laboratories (UL):

a. UL 181 Standard for Safety Factory-Made Air Ducts and Air Connectors.

1.05 SUBMITTALS

A. Submit the following for products and assemblies required for ductwork on this Project, such as balancing and fire dampers, turning vanes, access doors, pre-fabricated ductwork, duct sealer, and similar items.

1. Ductwork sheet metal fabrication shop drawings.

2. Air distribution system erection drawings.

3. Product data for manufactured products and assemblies

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver product to site in a manner to prevent denting, wetting and crushing the ducts.

B. Store and protect products under cover and off the ground.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Building HVAC Ductwork: All supply, return, fresh-air, and exhaust ducting within buildings shall be low pressure type, constructed of galvanized sheet metal, ASTM A 525 or ASTM A 527 galvanized sheet steel, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A 90.

2.02 LOW PRESSURE DUCT

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated.

B. All rectangular elbows and tees shall be provided with air-foil type turning vanes.

C. 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.

2.03 FIXED VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. All dampers shall be multi-blade type, of opposed blade pattern. Assemble center and edge crimped blades in galvanized channel frame with suitable hardware.

E. Provide oil-impregnated nylon or sintered bronze bearings on all dampers.

F. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

G. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.04 AIR TURNING DEVICES

A. Air Extractors: Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

B. Turning Vanes: Multi-blade, air foil type devices with double thickness blades attached to steel or aluminum frames.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 oz. per sq. yd., approximately 2 inches wide, crimped into metal edging strip.

2.06 DUCT SEALER

A. Provide duct sealer at all ductwork longitudinal seams, slip joints, couplings, and elsewhere as required. Duct sealer shall be equal to Hardcast #601 with a minimum flame spread of 25 and smoke development of 50 when sealer is dry.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fabricate, install and support all sections in strict compliance with the SMACNA Low Pressure Duct Construction standard.

B. Provide openings in ductwork where required to accommodate thermometers and controllers.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. Install accessories in accordance with manufacturer's published instructions.

E. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

F. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from large ducts as required for air balancing. Use splitter dampers only where indicated.

END OF SECTION 15890

SECTION 15900
AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. The work to be performed under this Section includes air distribution devices as follows:

1. Registers/grilles.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Air Diffusion Council (ADC):

a. ADC 1062 Certification, Rating and Test Manual.

2. Air Movement and Control Association (AMCA):

a. AMCA 500 Test Method for Louvers, Dampers and Shutters.

3. Air Conditioning and Refrigeration Institute (ARI):

a. ARI 650 Air Outlets and Inlets.

4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

a. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

5. National Fire Protection Association (NFPA):

a. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems.

6. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

a. SMACNA Low Pressure Duct Construction Standard.

1.03 SUBMITTALS

A. Submit product data for manufactured products and assemblies required for this project.

B. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

C. 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products, Ceiling Diffusers, Sidewall Diffusers, Exhaust Grilles and Return Air Grilles: Provide products by one of the following manufacturers:

1. Titus.
2. Metalaire.
3. Krueger.
4. E.H. Price.

2.02 EXHAUST GRILLES

A. Aluminum lattice face with frame and 13/16-inch square holes on 1-inch Centers. Security lattice face shall be constructed of 0.125-inch aluminum with 13/16-inch square holes on 1-inch centers. An aluminum mounting frame shall be provided. Units shall be mounted using tamper proof security screws to meet structural requirements. Tamper proof screws shall be provided by the installing contractor according to job requirements.

B. Provide surface mount type frame with gasket or lay-in as required for ceiling type.

C. Fabricate of extruded aluminum with baked enamel off-white finish.

D. Provide opposed blade adjustable type damper excluding transfer grilles.

E. Size shown on Drawings is duct connection size.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer's published instructions.

B. See architectural reflected ceiling plan for exact locations of ceiling mounted diffusers and grilles.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, regardless whether dampers are specified as part of the diffuser assembly.

END OF SECTION 15900

SECTION 15990
TEST AND BALANCE

PART 1 - GENERAL

1.01 SUMMARY

A. Procure the services of an independent Test and Balance Agency, approved by the Engineer, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems.

B. Agency to balance, adjust and test following systems and/or equipment:

1. Air distribution systems including packaged units, ducts, and air devices.

2. All exhaust air systems.

C. As soon as possible after receipt of this Contract, allow the Test and Balance Agency to schedule it's work in cooperation with other trades involved and comply with the completion date(s) or calendar days required for completion, as specified.

1.02 QUALITY ASSURANCE

A. The testing agency shall provide proof of having successfully completed at least five (5) projects of similar size and scope, and shall be certified as conforming to the standards and guidelines of the Associated Air Balance Council (AABC), unless otherwise approved.

B. All instruments used shall be accurately calibrated within six months of balancing and maintained in good working order. If requested, the test shall be conducted in the presence of the Engineer and/or his representative.

1.03 CONTROLS TESTING

A. Test and record control temperature or pressure setpoint of each device and compare to actual measured condition. Include in report.

B. Test each sequence of operation for all systems to verify proper operation. Include description of operation in report.

C. Record the dry bulb temperature in each space and in addition, record a wet bulb temperature at each thermostat or sensor.

1.04 DEFICIENCIES

A. All deficiencies shall be noted by the Agency in a field report and submitted to the Engineer and Contractor on a regular basis.

B. Upon correction of the deficiency, the Contractor shall notify the Agency in writing that the problem is resolved. If the deficiency is not corrected, the Contractor will bear the cost of additional retesting.

1.05 WARRANTY

A. Include an extended warranty of six (6) months after completion of test and balance work, during which time the Engineer at his discretion may request or recheck, or resetting of any outlet or exhaust fan as listed in the test report. Provide technicians to assist in making any tests required. If system is not working properly it shall be rebalanced any time during the first year of operation. Also, provide for balancing during winter or summer operation.

1.06 AIR BALANCE SCOPE

A. The test and balance agency shall perform the following tests of and balance the air handling systems in accordance with the following requirements:

1. Test and adjust RPM to original requirements.
2. Test and record motor full load amperes.
3. Make pilot tube traverse of main supply and return ducts and obtain design CFM at fans.
4. Test and record system pressures.
5. Test and adjust system for original design CFM recirculated air.
6. Test and adjust system for original design CFM outside air.
7. Test and record entering air temperatures. (D.B. heating and cooling)
8. Test and record entering air temperatures. (W.B. cooling)
9. Test and record leaving air temperatures. (D.B. heating and cooling)
10. Test and record leaving air temperatures. (W.B. cooling)
11. Adjust main supply air ducts to proper design CFM.
12. Test and adjust each diffuser, grille, and register to within 5% of design requirements.
13. Each grille, diffuser, and register shall be identified as to location, area and system.
14. 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.
15. Readings and test of diffusers, grilles and registers will include required FPM velocity and test resultant velocity, required CFM after adjustments.
16. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustments by contractor.
17. Test all ductwork and advise installer of all ductwork that shall be sealed or otherwise repaired to reduce air leakage. Maximum system leak shall not exceed 5% of total air.
18. Tested sections of ductwork shall be visually marked by agency with

certifications sticker and initials of field test inspector.

1.07 TEST BALANCE REQUIREMENTS

A. All information required as shown but not listed to shall be compiled in a neat, orderly itemized format on AABC Test Forms. All test data shall be submitted to the Engineer.

1.08 FANS

A. Mark Number.

B. Manufacturer and Model Number.

C. Total CFM Supply Specified and Actual.

D. Total Pressure (Discharge Total - Suction Total).

E. Specified External Total Pressure.

F. Motor HP Specified and Actual.

G. Motor and Fan RPM Specified and Actual.

H. Sound Level (DB) Specified and Actual.

I. Voltage, Phase and Cycles Specified and Actual.

1.09 AIR DEVICES (GRILLES, REGISTERS AND DIFFUSERS)

A. Mark Number.

B. Room Number.

C. CFM Specified and Actual.

D. Size.

E. Effective Area.

F. Velocity FPM.

PART 2- PRODUCTS

"Not Used"

PART 3 - EXECUTION

3.01 GENERAL

A. Air balance and testing shall not begin until modifications to the system have been completed and the system is in full working order. Mechanical systems installer shall make all preliminary tests and adjustments, shall place all systems and equipment into full operation and continue the operation during each working day of testing and balancing.

B. Replacement of adjustable pulleys, additional balancing dampers, pressure taps,

balancing valves, cocks, and fittings, etc., required to effect proper air balance shall be furnished and installed by the mechanical HVAC installer at no additional cost to the Department.

C. Test and balance agency shall furnish the Contractor and Engineer at the end of each day a list of items that must be repaired or adjusted.

D. This work shall be performed as soon as possible so as not to delay the completion of the test and balance work.

E. Submit complete report of the test and balance data of air conditioning, heating, and ventilating systems for review by the Engineer.

F. All air filters and strainers shall be cleaned or replaced by the mechanical HVAC Installer before the test and balance work can proceed and thereafter as required by the test and balance agency.

G. Test & Balance personnel shall be responsible for the drilling of test holes into ductwork and shall install suitable insert plug into each hole at the conclusion of each test.

H. Lock in place all volume damper handles after final adjustments are made and permanently mark the set point of adjustment.

END OF SECTION 15990

DIVISION 16

ELECTRICAL

SECTION 16050
GENERAL ELECTRICAL REQUIREMENTS

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. This Section specifies general requirements for all Division 16 Specification Sections.

B. The electrical system required for this work is indicated on the Drawings and specified herein. The work includes, but is not necessarily limited to, the following:

1. Electrical service to the new restroom and storage building.

2. Panelboard with main and branch circuit breakers in new restroom and storage building.

3. Complete branch circuit wiring system for lighting fixtures, wall switches and receptacles.

4. All other electrical equipment and services needed to complete a usable and operable facility in accordance with all pertinent codes and regulations.

C. The Electrical Drawings are diagrammatic and shall be followed as closely as actual construction of the building and the work of other trades will permit. All changes from Drawings necessary to make the work of other trades shall be performed at the Contractor's expense.

D. Unless explicitly stated to the contrary, furnish and install each item of equipment or material hereinafter specified, complete with all necessary fittings, supports, trim, piping, and related components, as required for a complete and operating installation.

1.02 RELATED WORK

A. EARTHWORK: Section 02200.

1.03 QUALITY ASSURANCE

A. Supervisory Qualifications:

1. The electrical work on the Project shall be under the direct supervision of a licensed master electrician.

B. Qualifications of Installers:

1. For the actual fabrication, installation, and testing of the work of this Section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements of this work and with the installation recommendations of the manufacturers of the specified items.

1.04 SHOP DRAWINGS

A. The approval of shop or working drawings by the Engineer shall not relieve the Contractor of responsibility for erroneous or inconsistent dimensions, notations, omissions or other errors, or for the proper functioning of the completed installation.

1.05 CODES AND STANDARDS

A. The installation shall comply with all laws applicable to the electrical installations which are enforced by the regulations of the currently adopted edition of the National Electrical Code, the latest edition of the Florida Building Code, the latest editions of the ANSI National Electrical Safety Code and NFPA Life Safety Code, all local codes, the Americans with Disabilities Act (ADA), NEMA, ANSI, and UL Standards.

B. Where, in any specific case, different sections of any of the aforementioned codes or these Drawings and Technical Special Provisions specify different materials, methods of construction or other requirements, the most restrictive shall govern.

C. All materials shall be listed by UL as conforming to its standards, where such a standard has been established for the particular type of material in question.

D. Where the Contract Document requirements are in excess of code requirements and are permitted under the code, the Contract Documents shall govern.

1.06 PROTECTION OF MATERIALS, EQUIPMENT, AND WORK

A. Materials shall be stored so as to ensure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall be subject to re-inspection prior to their use in the work. Coordinate the storage of all materials with the Department's Authorized Representative.

B. Protect electrical raceway, cable, lighting fixtures and associated support systems against damage from movement of equipment and material, welding, flame cutting, and other construction damage. Raceway and supporting structures for raceway and lighting fixtures shall not be used as access scaffolding at any time. Whenever welding or flame cutting operations occur above or near raceways, cables or lighting fixtures not shielded from such operations by concrete floor or other protective covers, protect the raceways, cables, and lighting fixtures from damage by means of fireproof boards or blankets. Damaged materials shall be repaired or replaced, by and at the Contractor's expense, subject to the Engineer's discretion and acceptance.

C. Surfaces of most equipment, such as panelboards, outlet boxes, and cabinets, are finished at the factory. Great care shall be exercised to prevent damage to this original finish during installation of the equipment and during construction work. If the factory finish is damaged during the course of construction, the entire surface of the damaged component shall be refinished by and at the expense of the Contractor.

1.07 CONCRETE WORK

A. Furnish all equipment anchor bolts and be responsible for their proper installation and accurate location.

1.08 IDENTIFICATION

A. Provide nameplates for wiring systems and equipment as called for herein. All nameplates shall have beveled edges and 1/2 inch lettering. If equipment is smaller than 10 inches by 6 inches, 1/4 inch lettering may be used. Smaller lettering may be used with permission of the Engineer.

B. Nameplates shall be three-layer laminated phenolic plastic, black front and back with white core, with lettering etched through the outer covering. White engraved letters on black background. Attach nameplates with 4-40 stainless steel self-tapping screws, or rivets. Where conditions do not warrant piercing the enclosure "LOCTITE" brand adhesive can be used with permission of the Engineer.

C. Panelboard shall be identified with nameplates. The nameplate shall include as a minimum, the following:

1. Equipment Name.

2. Voltage Rating.

3. Source Panel.

1.09 EXCAVATING, TRENCHING AND BACKFILLING

A. Perform excavating necessary for underground work and backfill trenches and excavations and compact after work has been inspected. Care shall be taken in excavating that walls and footings and adjacent load bearing soils are not disturbed in any way, except where lines must cross under a wall footing. Where a line must pass under a footing, the crossing shall be made by the smallest possible trench to accommodate the conduit. Excavation shall be kept free from water. No greater length of trench shall be left open in advance of conduit laying than that authorized by the Department's Representative.

1. Refer to Section 31 20 00 - EARTHWORK for additional requirements for excavation, backfilling, and compaction.

1.10 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

PART 2.00 - PRODUCTS

Not used.

PART 3.00 - EXECUTION

3.01 TESTS AND INSPECTIONS

A. Include all tests and inspections specified and/or required under laws, rules and regulations of all departments having jurisdiction. Tests shall be performed as indicated herein and other Sections of Specifications.

B. Notify the Engineer at least 72 hours in advance of all tests. Furnish all necessary instruments, gauges and other equipment required for tests. Make preliminary tests prior to giving notice of final tests.

C. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition.

D. Correct defects disclosed by these tests without any additional cost to the Department. Repeat tests on repaired or replaced work.

E. Maintain separate log of all tests being conducted and have it available for review by Engineer. Log to indicate date, type of tests, duration and defects noted and when corrected.

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Bound Instructions: Before final payment is made, furnish six (6) sets of bound operation and maintenance manuals to the Department. The manuals shall consist of catalog cuts, bulletins, shop drawings, wiring diagrams, schedules, parts lists, procedures and other data showing the equipment installed and shall include the following:

1. Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

2. Operating and maintenance instructions for each piece of equipment.

3. Parts lists and recommended spare parts.

4. Other data and instructions as specified under the various Sections.

B. All data furnished shall conform to the installation as constructed. Cuts showing other equipment and data not applicable to the installation shall be crossed out and where practical shall be omitted from the manual. The assembly of the manual shall be in a logical manner and each section shall be indexed in the Table of Contents.

C. Each manufacturer shall outline and furnish a maintenance procedure for his equipment installed to the Contractor, who shall then compile these procedures in a logical manner to provide a procedure for the operating personnel of the Department to follow in their day-to-day operation of the facility.

D. The materials shall be permanently bound into each booklet between rigid plastic or cloth binding covers. The instruction booklets shall be approximately 9-inches by 12-inches and the diagram booklet large enough to contain the drawing without excessive folding so that they may be easily opened.

E. The booklets shall be neatly entitled with a descriptive title, the name of the job, the location, year of installation, Department, manufacturer, Contractor and Engineer. Copies of drawings shall be in black and white background and shall be easily legible. The arrangements of the booklets, the method of binding, materials to be included and the composite text shall all be reviewed and approved by the Engineer.

3.03 OPERATIONS INSTRUCTION TO DEPARTMENT

A. Provide a minimum of 1 hour of instruction or as indicated to representatives of Department in operation and maintenance of all installed electrical systems and equipment.

B. Provide maintenance manual and acquaint Department's representative with its contents during instruction.

C. Furnish letter naming Department's personnel receiving instruction and dates when instruction was given.

D. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

END OF SECTION 16050

SECTION 16060
GROUNDING & BONDING

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing the grounding Work as indicated on the Drawings and/or herein specified, except for items specifically indicated as "NIC ITEMS."

B. This Section includes basic materials and methods for all Division 16 - ELECTRICAL Sections and related electrical work.

1.02 RELATED WORK

A. “Not Used”.

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. American Society for Testing and Materials (ASTM):

a. Referenced Standards.

2. Institute of Electrical and Electronic Engineers (IEEE):

a. IEEE 81 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

b. IEEE-142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.

3. National Electrical Code (NEC):

a. Article 250 Grounding.

4. Underwriters Laboratories (UL):

a. UL 467 Standard for Safety Grounding and Bonding Equipment.

1.04 SUBMITTALS

A. Submit manufacturer’s product data on ground rods, ground bas bar, exothermic welds.

B. Submit test reports.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Ground Rods:

1. Ground rods shall be copper clad with a driving point on one end as indicated on the Drawings. Rods shall conform to ASTM A 207. Ground rods shall have a thick copper covering inseparably welded to a steel core. All contacts shall be copper to copper.

a. Basis of Design: Copper Weld.

2. Grounding Accessories: Provide connectors, terminals, lugs and clamps for all indicated applications.

a. Products: Provide grounding accessories by one of the following manufacturers:

(1) Burndy.
(2) Copper Weld.
(3) Blackburn.

3. Ground rods shall be 3/4 inch x 20 feet long minimum, unless otherwise noted on the Drawings.

4. All equipment shall conform to UL 467 and shall be labeled for their intended usage.

PART 3.00 - EXECUTION

3.01 INSTALLATION

A. General:

1. End-to-end fixtures shall be continuously bonded.

2. Grounding contacts of receptacles shall be connected to a solidly grounded conduit system or to a system grounding conductor (not the system neutral) by a stranded copper wire not smaller than #12 AWG or shall be grounded in some other approved manner. The resistance between the contact and solid earth ground shall not exceed 3 ohms.

3. Bond all metal parts. Make equipment and bus connections with suitable lugs or clamps.

4. Bond all conduits stubbing under main panel and similar locations using bonding bushings.

5. Use PVC for sleeving grounding conductors except that where sleeves are subject to extreme injury, use rigid metal conduit bonded at both ends.

6. Ground all separately derived sources such as transformers to adjacent cold water metallic pipe or building steel in accordance with NEC Article 250.

7. All underground connections shall be made using exothermic welds. All ground rod connections shall be welded.

B. Circuit Grounding:

1. Metal conduit shall not be used as the circuit ground path on feeders to motors, panelboards and branch circuits. Provide pulled green ground wire.

2. Flexible conduit is not to be used for grounding. Provide pulled green ground wire as required by NEC Article 250.

3. Provide pulled green equipment ground wire inside all conduits for all power and lighting circuits.

4. Provide an isolated pulled green (with yellow tracer) ground wire for all branch circuits fed from the "Clean" generator power system.

C. Special Equipment Grounding:

1. The following items shall be grounded and provided with local ground rods:

a. Metal buildings.

b. Any other large metallic pieces of equipment.

3.02 TESTING

A. Each new ground rod shall be tested individually to ensure the maximum resistance-to-ground shall not exceed 10 ohms, and every rod that fails the test shall be driven deeper, using additional lengths of ground rod if necessary until the required resistance is achieved. Upon completion of installation of electrical grounding and bonding systems, test ground resistance-to-ground with ground resistance tester. Complete grounding system resistance-to-ground shall not exceed 3 ohms. Where tests show resistance-to-ground exceeds 3 ohms, take appropriate action to reduce resistance to 3 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance. Install rods at least 8 feet apart.

B. Method for testing individual ground rods and overall grounding system shall be accomplished by the three point method. Test probes shall be placed minimum of 30 feet and 60 feet from rod being tested. Furnish written report of all test results for all ground rods.

END OF SECTION 16060

SECTION 16075
ELECTRICAL IDENTIFICATION

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing engraved nameplates or other means of identification on all major units of equipment.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Equipment:

1. The following items shall be equipped with nameplates: panelboards and circuit breakers.

2. Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the Drawings, inscription and size of letters shall be as shown and shop drawing shall be submitted for approval. Nameplates for panelboards shall include the panel designation, voltage phase of the supply, and source panel. For example, "Panel P1, 120/240V, 1-phase, 3-wire Fed From Panel WL2".

3. Nameplates for equipment on normal power only shall be laminated phenolic plastic, black front and back with white core, with lettering etched through the outer covering. White engraved letters on black background. Attach with plated self-tapping screws or brass bolts.

B. Empty Conduits:

1. Each end of each pull rope shall be tagged to identify the conduit system and the other end of the pull rope. Each tag shall contain, but not be limited to, the following information:

a. Conduit system name (e.g. "CCTV").

b. Device for which future connection is planned (e.g. "camera").

PART 3.00 - EXECUTION

Not used.

END OF SECTION 16075

SECTION 16123
600 VOLTS OR LESS CABLES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing the system of conductors for power and lighting service, including all related system and accessories as shown on the Drawings and hereinafter specified.

1.02 RELATED WORK

A. RACEWAYS: Section 16130.

PART 2.00 - PRODUCTS

2.01 CONDUCTORS

A. All conductors shall be copper of 98% conductivity with 600-volt insulation.

B. Conductor sizes specified are AWG up to 4/0, and circular mils above 4/0.

C. Conductors used for secondary distribution shall be as follows:

1. Conductors No. 10 and smaller shall be solid, No. 8 and larger, stranded.

2. Conductors shall be NEC standard type, "THHN-THWN" and UL Labeled.

3. All wire and cable shall be of the same name brand, and shall be in the original wrapping.

4. Provide equipment grounding conductors with green type insulation.

2.02 SPLICES AND CONNECTORS

A. Splices, taps, termination devices and insulation systems shall be approved for use with the conductors on which they are installed.

B. Connections of all wires No. 8 and larger shall be made with copper compression or mechanical connectors, with rubber and friction or plastic tape insulation. For wires smaller than No. 8, use solderless connectors consisting of a copper sleeve applied with a pressure tool covered with a vinylite insulating cap.

1. Products: Provide connectors by one of the following manufacturers:

a. Buchanan.

b. Thomas and Betts.

C. Screw-on connectors shall not be used except for fastening lighting fixtures to the basic wiring system. The screw connectors for fastening lighting fixtures shall have nylon insulation and shall be Thomas & Betts "Piggy Pigtails".

D. All splices shall be made in pull boxes or wireways. No splices shall be permitted inside the conduit.

E. Tapes for splices and terminations shall comply with UL 510.

PART 3.00 - EXECUTION

3.01 INSTALLATION

A. Minimum size conductors installed shall be No. 12 AWG for all applications except where specifically noted otherwise for special system circuits.

B. All lighting and receptacle branch circuit conductors shall be color coded. Feeder cables and service entrance conductors shall be color coded by use of colored plastic tape applied within 6" of each conductor end. All color coding shall be with the same color as used with its respective phase or bus through the entire Project as follows:

120/240 Volt System

Phase A -	Black
Phase B -	Not Used in New Panelboard
Phase C -	Blue
Neutral -	White
Ground -	Green

C. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with solderless pressure connectors and insulated with Scotch 33 tape, if insulation is not provided in pressure type connector used. Where connection is made to any terminal of more than 30 amperes capacity and where conductors larger than No. 10 are connected to any terminal, copper terminal lugs shall be bolted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each connector shall be used.

D. All wires and cables for power, lighting, control and signal shall be continuous from origin to destination with proper splices as specified. At the end of these wires and cables only sufficient slack shall be left as may be required for making proper connections.

E. Where conductors are to be connected directly to the devices without the use of lugs, such as occurs at side connections of lighting switches and plug receptacles, the conductors shall be formed into suitable loops to fit around the terminal screws.

F. Where wires and cables are connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the mechanical connectors. The lacquer coating of conduits shall be removed where ground clamps are to be installed.

G. The conductors terminating at each wired outlet shall be left not less than 8 inches long at their outlet fitting to facilitate the installation of devices of fixtures. Where two or more pairs of conductors or circuits enter an outlet, the several pairs of conductors or circuits shall be neatly spliced and made mechanically and electrically secure to one or more single or multiple conductors which shall be not less than 8 inches long within the outlet.

H. Branch circuit wiring which supplies more than one fluorescent fixture through the wireway of other fixtures shall be approved for use at 90^{o}C.

I. Wall switch outlets shall be wired to provide control of outlets indicated. All connections to single pole switches shall be so made that the off operation of the switch opens the ungrounded leg.

J. Each wire in a pull box, junction box or equipment wire chamber shall be labeled with the proper panel letter and circuit number identification, and where two or more wires are spliced each shall be labeled. Labels shall be printed numbers and letters on suitable plastic tape. Wires and cables shall be identified by suitable Brady or approved equal adhesive label tapes.

K. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation. Use pulling means, including fish tape, cable or rope that cannot damage raceway.

L. Install splices and tapes that have mechanical strength and insulation rating equivalent-or-better than conductor. Use splice and tap connectors that are compatible with conductor material.

M. Pulling tensions shall be governed by recommended standard practices for straight pulls or bends. Manufacturer's recommended pulling tensions shall not be exceeded. The cable pull tension shall be monitored on every pull exceeding 300 feet in length. A lubricant approved by the cable manufacturer shall be used on all cable pulls exceeding 25 feet in length. At the request of the Engineer, calculate the expected pull tension or monitor the actual pull tension of the cable pull. The methods used shall be acceptable to the Engineer.

N. Bushing must be installed before any wire is pulled in; see Section 16130 - RACEWAYS.

END OF SECTION 16123

SECTION 16130
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing the electrical conduit, wireway, and surface raceway system, including all related systems and accessories as shown on the Drawings and hereinafter specified.

1.02 RELATED WORK

A. 600 VOLTS OR LESS CABLES: Section 16123.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Metallic Conduit:

1. Rigid galvanized steel conduit shall conform to ANSI Standard C80.1 and UL 6.

2. Galvanized steel tubing (Electrical Metallic Tubing - EMT) shall conform to ANSI Standard C80.3 and UL 797.

3. Flexible conduit shall be galvanized steel with polyvinyl jacket, liquid tight and shall conform to UL 360. Fittings shall conform to UL 514.

B. Non-Metallic Conduit:

1. Polyvinyl Chloride (PVC) Schedule 40 conduit shall conform to NEMA TC-2 and UL 651. Fittings shall conform to NEMA TC-3 and UL 514.

C. Connectors, Couplings and Fittings:

1. One coupling of the appropriate type shall be furnished with each length of conduit.

2. Rigid Conduit Fittings: Threaded, heavy steel, water and concrete tight. Grounding type nylon insulated bushings for connectors at cabinets, boxes, switchboards, gutters, panelboards, and disconnect switches.

3. Electrical Metallic Tubing Fittings: Compression type steel, water and concrete tight. Connectors with nylon insulated throats at cabinets, boxes and gutters. Indentor or set screw type fittings will not be allowed.

4. Flexible Metal Conduit Fittings: Squeeze or clamp type galvanized steel with nylon insulated throats. Set screw type will not be allowed.

5. Liquidtight Flexible Conduit Fittings: Galvanized steel with watertight gaskets, "O" ring and retainer and nylon insulated throats.

6. Condulet Fittings: Exposed conduit fittings shall be Ferris Condulet (cast metal) type for sharp turns, tees, and similar conditions.

7. Expansion Fittings: Expansion fittings, properly bonded, shall be installed in each conduit run that crosses an expansion joint, or where conduit is subjected to expansion/deflection.

   a. Products: Provide expansion fittings by one of the following manufacturers:

      (1) Appleton Electric Company.

      (2) Crouse-Hinds Electrical Co.

      (3) Carlon Power & Telecom Systems.

      (4) O.Z./Gedney.

8. Die-cast fittings are not permissible.

9. Watertight Fittings: Ferrous cast metal with flanges and glands to properly seal conduit wall penetration from water passage.

D. Joint Material Used in Connecting Two Pieces of Conduit:

1. For PVC conduit the material for the joints shall be slip-fit plastic couplings, designed specifically for such use. The bonding material shall be a solvent-type cement, which will assure a fully waterproof joint.

2. The joint material for rigid conduit shall be threaded couplings, of the same material as the conduit. The coupling shall be used with a pipe-threaded sealant that will assure a fully waterproof joint.

E. Surface Metal Raceways:

1. Provide surface metal raceways of sizes and channels indicated; in compliance with FS W-C-582; construct of galvanized steel with snap-on covers, with 1/8" mounting screw knockouts in base approximately 8" o.c. Provide fittings indicated which match and mate with raceway. Finish with manufacturer's standard prime coating suitable for painting.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to all work of this section, 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.

B. Verify that the new electrical installation has been made in complete accordance with all pertinent codes and regulations, and the original design.

3.02 DISCREPANCIES

A. In the event of discrepancy, immediately notify the Engineer.

B. Do not proceed with the installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 PREPARATION

A. Coordinate the installation of electrical items with the schedules for work of other trades to prevent unnecessary delays in the total work.

B. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install all required supports and wiring to clear the encroachment.

3.04 GENERAL REQUIREMENTS

A. Conduit exposed shall be galvanized rigid steel. Conduit installed underground in general outdoor areas shall be PVC schedule 40, or as indicated on the Drawings. PVC conduit encased in minimum of 3 inches of concrete shall be installed under any building or as required on the Drawings. Conduit 2" and smaller installed within building may be EMT, run above hung ceilings and within walls of metal stud construction.

B. Generally, all conduit shall be concealed above ceilings, within walls, underground, or as otherwise noted.

C. No conduit shall be installed less than 2 inches from piping installed by other trades or 8 inches if the pipe is to be insulated. Coordinate the conduit installation with all trades.

D. Certain conduits (rigid galvanized steel and Schedule 40 PVC only) are permitted to be embedded in structural concrete work. PVC schedule 40 conduit installed under asphalt roadways shall be encased in minimum of 3 inches of concrete. Rigid galvanized steel conduits shall be used within cells of masonry walls. PVC Schedule 40 conduits are allowed within cells of masonry walls only when cells are fully grouted. Coordinate with all trades to effect the following:

1. Reinforcing steel shall be securely anchored in place before installing conduit.

2. No steel reinforcing shall be displaced from plan dimensions without approval of the Engineer.

3. Conduit shall not be placed over top of reinforcing or under bottom of reinforcing.

4. Conduit and fittings shall not displace concrete in columns in excess of 4 percent of total cross-section area of column without approval of Engineer.

5. Conduits shall not be placed closer than 1 inch from side to side, so that 1 inch aggregate can pass between conduits.

E. Raceway floor and wall penetrations shall be sealed with approved fire resistive materials to meet the fire rating and load bearing capability of the surface penetrated. Fire stopping shall comply with the requirements of the Florida Building Code and ASTM E 119.

F. Provide rigid galvanized steel elbows for all PVC conduits; except, use PVC elbows for PVC conduit installed in salty soils or other conditions that may present a corrosive environment for galvanized steel. Conduit leaving elbow to final termination box, cabinet, device or stub-up shall be rigid galvanized steel conduit.

3.05 INSTALLATION OF RACEWAYS AND FITTINGS

A. All wires for power, lighting, miscellaneous systems and controls shall be installed in conduit. Conduit shall be of the sizes required to accommodate the number of conductors in accordance with the National Electrical Code, or as noted on the drawings. The sizes shown on the plans may be increased if desired to facilitate the pulling of conductors. The minimum conduit size shall be 3/4 inch, unless noted otherwise.

B. Steel conduit shall be continuous from outlet to outlet, from outlet to cabinet, junction box, or pull box. Conduit shall enter and be rigidly secured thereto in such a manner that the raceway system will be electrically continuous.

C. Conduit shall be installed so that not more than the equivalent of three (3) 90-degree bends occur in any one run. If a greater number of bends is required, a junction box or pull box shall be installed, unless approved by the Engineer.

D. Exposed conduit shall be run parallel with or at right angles to the structure and supported from the walls or structure with straps or clamps with machine screws for metal construction, and inserts and bolts or lead expansion anchors for masonry or concrete construction. Exposed conduit runs shall be supported at intervals of approximately five feet. Back straps or "stand-offs" shall be used to keep the conduit far enough away from supporting surfaces to allow painting and to prevent the accumulation of dirt and moisture.

E. Wherever conduit crosses an expansion joint an approved expansion fitting, for this type of installation, shall be installed in all conduits.

F. Conduit connection to a box that has no threaded hub for its reception shall be double locknutted with locknuts designed to bite into the metal. Provide an insulated bushing at each end of each conduit run. Use insulated bushings with separate locknuts on all conduit entering panel cabinet. All conduits entering outlet boxes, pull boxes and panel cabinets, shall be provided with either insulated throat connectors or separate locknuts and insulated bushing. Bushing must be installed before any wire is pulled in.

G. Rigid steel couplings and conduits shall be threaded so that they meet in the coupling. Right and left couplings shall not be used; conduit couplings of the Erickson type shall be used at locations requiring such joints.

H. Conduit shall be secured in place and protected to prevent damage to work during construction. The ends of all conduit runs shall be plugged with approved type plug to avoid filling with plaster, etc. Duct tape shall not be used. All conduit shall be blown out and/or swabbed clear of water and trash prior to pulling wire. Remove burrs.

I. Flexible metal conduit shall be used for connections to lighting fixtures, HVAC equipment, pumps, transformers, or where indicated on the Drawings. Liquid Tight flexible conduit shall be used for exterior installation.

J. Conduit connections from outlet boxes, junction boxes, conduit, switch boxes, or motor controller to rotating or vibrating machinery or equipment shall be made with flexible conduit, which shall be as short as possible with a maximum length of 24 inches. For connections to recessed ceiling lighting fixtures, maximum flexible conduit length shall be 60 inches.

K. All exterior elbow risers in underground duct shall be galvanized rigid steel conduit. Conduit leaving elbow shall be galvanized rigid steel.

L. All direct buried galvanized rigid steel conduit shall be given two (2) coats of asphaltic or Bitumastic paint for corrosion protection.

M. Provide polyester pull rope in all empty conduit raceways and provide tag at each end labeling destination of conduit.

N. Unless noted otherwise on Drawings, all exterior conduits run underground shall be a minimum of 36 inches below finish grade.

O. Field cut conduit shall be cleaned; ream or file conduit ends to remove rough edges. Field made threads shall be cleaned, wire brushed and sprayed with an acceptable cold galvanized compound.

END OF SECTION 16130

SECTION 16131
JUNCTION AND PULL BOXES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing junction and pull boxes, including all related systems and accessories as shown on the Drawings and hereinafter specified.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each type of box.

PART 2.00 - PRODUCTS

2.01 JUNCTION AND PULL BOXES

A. Boxes shall be sized in accordance with requirements of the National Electric Code with covers accessible at all times. Boxes on concealed conduit shall be set with covers flush with the finished concrete unless otherwise shown.

B. All junction and pull boxes shall be fabricated of galvanized steel or cast iron or polymer concrete (exterior use only). The dimensions of the box shall be sized to allow adequate working space and cable capacity. All junction boxes shall form a complete enclosure and shall be raintight and of adequate strength. The terminals used shall be constructed of a non-corrosive material. A removable front cover shall be provided, and installed such that when closed, it will be secured sufficiently to prevent accidental opening. Cable and conduit entrances and exits shall be made with appropriate connectors in such a manner that raintight integrity is retained. All conduit terminations within junction and pull boxes shall be made securely sealed "water tight" at both ends using a gun grade non-fungicidal silicone caulk. All future empty conduits shall be sealed with a galvanized threaded cap at both ends.

PART 3.00 - EXECUTION

3.01 INSTALLATION

A. Junction boxes and pull boxes shall be furnished and installed where such boxes may be necessary to facilitate the pulling or splicing of cables. Boxes must be made accessible. Conduits shall enter these boxes through tight fitting clearance holes.

B. Where required, suitable supports shall be provided in all pull boxes to support feeders passing through the boxes so that feeder conductors will not remain unsupported for a distance greater than 3 feet.

C. Junction boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have suitable provisions to secure covers.

D. Junction and pull boxes shall be securely attached to the building structure, in a manner approved by the Engineer.

E. Provide a pull box every 100 feet of conduit run and whenever an excessive number of bends necessitates a pull box for ease of wire installation.

F. Junction and Pull Box Identification:

1. Junction boxes, pullboxes and their covers shall be distinctively painted to identify their service. (A convenient way to facilitate this is to spray-paint the boxes and covers in groups before installation.)

2. Boxes shall be color coded to match those in existing building:

END OF SECTION 16131

SECTION 16135
OUTLET BOXES AND FITTINGS

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing outlet boxes, including all related systems and accessories as shown on the Drawings and hereinafter specified.

1.02 QUALITY ASSURANCE

A. Manufacturer: Firms regularly engaged in manufacture of electrical boxes and fittings, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. ANSI/NEMA Standards Compliance: Comply with ANSI C 134.1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports.

PART 2.00 - PRODUCTS

2.01 FABRICATED MATERIALS

A. Outlet Boxes: Provide corrosion-resistant galvanized or cadmium plated cast-iron weatherproof outlet wiring boxes, of types, shapes and sizes, including depths of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.

B. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of types, shapes and sizes, to suit respective locations and installation, construct with threaded conduit entrance ends, removable covers, and corrosion-resistant screws.

C. Bushing, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes to suit respective uses and installation.

D. Outlet boxes for all exposed work shall be of the cast iron type.

E. Products, Cast Metal Outlet Boxes: Provide products by one of the following manufacturers:

1. Appleton Electric Company.

2. Crouse-Hinds Company.

PART 3.00 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

C. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.

F. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.

G. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Provide electrical connections for installed boxes.

END OF SECTION 16135

SECTION 16140
WIRING DEVICES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing wiring devices, including all related systems and accessories as shown by the Drawings and hereinafter specified.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each type of wiring device.

PART 2.00 - PRODUCTS

2.01 WALL SWITCHES

A. Switches shall be totally enclosed, rated at 120/277 volts, ivory plastic handles, of the quiet type, full rated at 20 amperes.

B. Products: Provide products by one of the listed manufacturers for the following categories:

Switch	Hubbell	Arrow Hart	Leviton
Single Pole	1221-I	1991-I	1221-21

2.02 RECEPTACLES

A. Single and duplex receptacles shall be 20 ampere, 125 volts, back and side wired, with grounded pole, of ivory plastic color.

B. Products: Provide products by one of the listed manufacturers for the following categories:

Receptacle	Hubbell	Arrow Hart	Leviton	Taymac	Raco/Bell
Duplex GFIC	GF5362-I	GF5342-1	6898-I		
Weatherproof Safety Outlet Enclosure			5977-GY	20,000 Series	Rayntite II

C. Provide device plates for each and every outlet box requiring same, and of the type required for the service and device involved; furnish in gangs as necessary. Plates and screws shall be the product of the same manufacturer of the devices installed. Finish of the plates shall be 0.04 stainless steel, finish 302 satin unless otherwise noted.

D. Ground-Fault Interrupter: Provide heavy-duty duplex receptacles, ground-fault circuit interrupters; feed-thru type, capable of protecting connected downstream receptacles on single circuit, grounding type UL-rated Class A, Group 1, 20-amperes rating, 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 miliamperes ground-fault trip level; equip with 20-ampere plug configuration, NEMA 5-20R.

E. Receptacles installed outdoors or within 6'-0" from plumbing fixtures and waterpipes shall be ground fault circuit interrupter type.

PART 3.00 - EXECUTION

3.01 INSTALLATION OF WALL SWITCHES

A. Wall switches shall be installed in the vertical position.

B. Vertically operated switches shall be "On" in the upper position, except for 3-way switches.

C. Where more than one switch is shown at one outlet, they shall be installed under one plate in an order appropriate to the location of the outlets controlled, unless otherwise indicated on drawings.

D. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.

E. Install galvanized steel wall plates in unfinished spaces.

F. Delay installation of wiring devices until wiring work is completed.

G. Delay installation of wall plates until after painting work is completed.

3.02 PROTECTION OF WALL PLATES AND RECEPTACLES

A. Upon installation of wall plates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Final Acceptance, replace those items that have been damaged, including those burned and scored by faulty plugs.

3.03 GROUNDING

A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.04 TESTING

A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

END OF SECTION 16140

SECTION 16160
PANELBOARDS

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing of the panelboards, including all related systems and accessories as shown on the Drawings and hereinafter specified.

1.02 RELATED WORK

A. CIRCUIT BREAKERS: Section 16182.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for each type of panelboard.

B. Shop Drawings: Shop drawings for each panelboard shall show that all requirements as specified herein have been incorporated into each panel. The branch circuit breaker arrangement in each respective panel shall be as indicated in the panel schedules on the Drawings.

1. Any deviation for circuiting from the panel schedule must be identified in the Project Record Documents.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Panelboards shall be of the dead-front type incorporating switching and protective devices of the number, rating and type specified herein or shown on the drawings. Panelboards shall have general purpose enclosures and shall be suitable for flush or surface mounting as indicated. All panelboards shall be rated for the intended voltage and shall be in accordance with the Underwriter's Laboratories, Inc. (UL) Standards UL 50 "Standard for Safety, Panelboards" and UL 67 "Standard for Safety, Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA PB 1 "Panelboards", National Electrical Code, and Federal Specification FS-W-P-115A "Power Distribution Panels" where applicable.

B. Products: Provide panelboards by one of the following manufacturers:

1. Square D Co.
2. Siemens ITE.
3. General Electric Company.
4. Cutler Hammer.

2.02 INTERIORS

A. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper wire of the sizes indicated on the drawings.

B. Interiors shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

C. A nameplate shall be provided listing panel type, number of protective and switching devices and ratings.

D. Bus bars for the mains shall be copper sized in accordance with UL Standards. Unless otherwise noted, full-size insulated neutral and ground bus bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Bracing shall be equivalent to, or compatible with, the rate interrupting capacity of the smallest overcurrent device in that panelboard.

E. Phase bussing shall be full height without reduction. Cross connectors shall be silver-plated copper.

F. Insulated neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection or shall utilize set-screws to bond the neutral wire to the neutral bus through holes drilled in the neutral bar. A neutral bus utilizing flathead screws to hold the neutral wires will be acceptable provided that ring type crimp-on connectors are used on the conductors that are to be connected to the neutral bus. A bonded ground bus shall be provided and bolted to the interior. Provide additional isolated ground bus only where indicated on Drawings.

G. Spaces for future installation of molded case circuit breakers on the job site may be permitted, if so required, to utilize the manufacturer's standard panelboard design. The spaces shall be complete with all bus and bus connectors such that future breakers can be installed without adding or changing bus connectors on the main bus. Bus connectors connected to the energized main bus shall be rigidly anchored at the other end with insulating bus supports or dummy breakers or spare breakers.

H. Circuit breakers shall be UL Series Rated such that 10,000 AIC branch breakers will withstand rating equivalent to or greater than the upstream feeder breaker which protects branch panel.

2.03 BOXES

A. Boxes shall be made from unpainted galvanized code gauge steel having multiple knockouts except where noted. Boxes shall be of sufficient size to provide a minimum gutter space of 4" on all sides, and to have a minimum width of 20". Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be so sized as to include this wiring space. This wiring space shall be in addition to the minimum gutter space specified above and the limiting width may be increased accordingly.

B. At least 4 interior mounting studs shall be provided.

C. Box identification number shall be on box.

2.04 TRIMS

A. Hinged doors covering all switching device handles shall be included in all panel trims, and shall not uncover any live parts in making switching device handles accessible. Doors shall have semi-flush-type cylinder lock and catch, except that doors over 48" in height shall have a vault handle and 3-point catch, complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. All locks shall be keyed alike. A directory frame and directory card having a transparent plastic cover shall be furnished on the inside face of each door.

B. The trims shall be fabricated from code gauge sheet steel.

C. All exterior and interior steel surfaces of the panelboard trim shall be properly cleaned and finished with grey ANSI-61 paint over a rust-inhibiting phosphatized coating.

D. Trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver without the need for special tools.

PART 3.00 - EXECUTION

3.01 INSTALLATION

A. Panelboards shall be mounted on metal channel (Kindorf Channel) secured to masonry with expansion bolts or as indicated on Drawings.

B. Provide a black finish, white core bakelite nameplate for each panelboard with engraved letters 1/2" high. Nameplates shall be installed centered above trim doors and fastened with sheet metal screws or rivets.

C. Panelboards shall have a circuit directory card mounted in a frame with a plastic cover mounted on the inside of the door, and the directory card shall be completed with a typewriter by the electrical contractor to indicate areas and/or devices served by each circuit. Spares and spaces shall be marked in pencil. Circuits intended to serve future or N.I.C. loads shall have the names of those loads marked in pencil.

D. Panelboards shall be mounted with their centerlines approximately 5'-6" above the finished floor. Except that the highest breaker shall in no case be more than 6'-0" above the finished floor. Locate panelboards as indicated on the Drawings.

END OF SECTION 16160

SECTION 16182
CIRCUIT BREAKERS

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing the circuit breakers, including related systems and accessories as shown on the Drawings and hereinafter specified.

1.02 RELATED WORK

A. PANELBOARDS: Section 16160.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each type of circuit breaker.

PART 2.00 - PRODUCTS

2.01 CIRCUIT BREAKERS

A. All circuit breakers shall be UL labeled and shall be thermal and magnetic, molded case type, quick-make and quick-break both on manual and on automatic operation and shall be bolted to the panel bus. Breakers shall be the over-the-center toggle operating type, with the handle going to a position between "On" and "Off" to indicate automatic tripping. All multi-pole breakers shall be internal common trip. The breakers to be furnished shall, in each instance, be determined by the specifications, the ampacity and poles in schedules or as indicated, and by the minimum UL labeled RMS symmetrical amperes interrupting capacity at circuit voltage as indicated by the schedules but in no case less than 10,000 RMS symmetrical amperes. However, the minimum interrupting rating of circuit breakers used as feeders and branches shall be in accordance with prescribed UL recognized series connected circuit breakers combinations. All electrical equipment using these UL recognized circuit breaker combinations shall be clearly marked indicating same. NEMA ratings are not acceptable in lieu of UL ratings. Breakers shall be labeled as required by the NEC. Provide with mechanical screw type removable connector lugs, AL/CU rated.

B. Circuit breakers shall be positively identified and panels properly marked.

C. Products: Provide circuit breakers by one of the following manufacturers:

1. Square D Co.
2. Siemens ITE.
3. General Electric Company.
4. Cutler Hammer.

PART 3.00 - EXECUTION

3.01 INSTALLATION

A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.

C. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

END OF SECTION 16182

SECTION 16190
SUPPORTING DEVICES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Extent of supports, anchors, sleeves and seals is indicated on the Drawings and specified in other Electrical sections, or as required by other equipment installation.

B. Types of supports, anchors, sleeves and seals specified in this section include the following:

1. Riser clamps.
2. I-beam clamps.
3. Two-hole conduit straps.
4. Round steel rods.
5. Lead expansion anchors.
6. Toggle bolts.
7. Wall and floor seals.

1.02 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three years.

PART 2.00 - PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices, complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation, and as herein specified.

B. Supports: Provide supporting devices of types, sizes and materials indicated, and having the following construction features:

1. Riser Clamps: For supporting two-inch and larger rigid metal conduit; black steel; with two bolts and nuts, and four-inch ears; approximately 510 pounds per 100 units.
2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.
3. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.

4. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes. Strap shall have back plate to hold conduit 1/4" from the wall.

5. Hexagon Nuts: For 3/8" rod size; galvanized.

6. Round Steel Rod: Black steel; 3/8" diameter; approximately 30 pounds per 100 feet.

7. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.

8. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features.

   a. Lead Expansion Anchors: 1/2"; approximately 38 pounds per 100 units.

   b. Toggle Bolts: Springhead; 3/16" x 4", approximately five pounds per 100 units.

C. Sleeves and Seals: Provide sleeves and seals, of types, sizes and materials indicated; and having the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of sizes required; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

PART 3.00 - EXECUTION

3.01 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports, clamps and attachments to support conduit properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings indicated.

END OF SECTION 16190

SECTION 16431
SURGE-PROTECTIVE DEVICES, 1 KV OR LESS

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Provide and install all materials, labor and auxiliaries required to furnish and install complete Surge Protective Devices (SPDs) for the protection of building electrical from the effects of line induced transient voltage surge and lightning discharge as indicated on drawings or specified in this section for power systems with voltages between 120VAC to 240VAC (single phase).

B. Provide surge protective device (SPDs) for the panel located in restroom and storage building as indicated on drawings.

C. It is understood that each manufacturer of the electronic equipment being protected has different circuit requirements; therefore this specification is a modified performance specification. Provide the best type SPD that matches these specifications and matches the equipment being protected.

D. Install SPDs on the outside of panelboards.

1.02 REFERENCES

A. UL 1449 3rd Edition listed

B. UL 1283 listed

C. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002

D. ANSI C84.1, American National Standard for Electric Power Systems and Equipment B Voltage Ratings (60 Hertz).

E. NFPA 70 - National Electrical Code (NEC), current adopted year. Article 285

F. American National Standards Institute (ANSI) approved ANSI/NETA Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems, 2009 edition (ANSI/NETA ATS-2009).

1.03 DEFINITIONS

A. ATS: Acceptance Testing Specifications

B. In: Nominal discharge current rating as required by UL 1449 third edition

C. MCOV: Maximum Continuous Operating Voltage

D. VPR: Voltage Protection Rating (Clamping voltage)

E. SCCR: Short Circuit Current Rating

F. SPD: Surge Protective Device

1.04 SUBMITTALS

A. Submit under provisions of the General Requirements of the Contract Documents and Section 16050.

B. Product Data: For each type of product indicated. Include rated capacities, bill of materials of number of MOVs installed per phase with MOV part number and surge current rating, operating weights, operating characteristics, furnished specialties, and accessories.

C. Product Certificates: SPD submittals shall include Listing documentation, signed by product manufacturer certifying compliance with the following standards:

1. UL 1283 compliance verified information is posted at www.UL.com, under Certifications, searching using UL Category Code: FOKY.

2. UL 1449 3rd Edition certification listing and classification page, VPR,

3. MCOV, In, and Type 1 information is posted at www.UL.com, under

4. Certifications, searching using UL Category Code: VZCA. SCCRs are posted in manufacturer's UL docs.

5. NFPA 70, National Electrical Code – article 285 latest edition

D. Field quality-control test reports, including the following:

1. Test procedures used.

2. Measure the continuity of each conductor between the equipment being protected and the SPD. The maximum resistance is 1milliohm.

3. Failed test results and corrective action taken to achieve requirements.

E. Operation and Maintenance Data: For Surge protective Devices to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance (O&M) data as called for in Section 16050.

B. O&M data to include:

1. All approved shop drawings, product data, and/or cutsheets.

2. Installation, connection, and maintenance information on each type of surge suppression.

3. Procedure and/or timetable for recommended periodic inspection of devices to determine continued usefulness, as applicable.

1.06 QUALITY ASSURANCE

A. All SPDs shall be manufactured by a company normally engaged in the design, development, and manufacture of such devices for electrical and electronics systems equipment for a minimum of five years.

1. Manufacturing facility shall operate a Quality System Certified as ISO 9001:2008 (or latest version) Compliant.

2. The SPD manufacturer shall provide requested technical assistance through support (including on-site as needed) by a factory-trained representative.

3. Source Limitations: Obtain SPDs and accessories through one source from a single manufacturer located in the United States.

4. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of SPDs and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Environment in Low-Voltage (1000 V and Less) AC Power Circuits",

D. IEEE C62.41.2-2002, "IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits", and test devices according to IEEE C62.45-2002, "IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits".

E.

1. Comply with UL 1283, "Electromagnetic Interference Filters," and UL

F. 1449 3rd Edition, "Surge protective Devices".

1. NFPA 70, National Electrical Code article 285 latest edition.

1.07 REGULATORY REQUIREMENTS

A. Equipment Certification: SPDs shall be listed by Underwriter Laboratories, shall bear the U.L. seal and be marked in accordance with referenced standard. SPDs shall be U.L. listed and labeled for intended use.

1.08 COORDINATION/PROJECT CONDITIONS

A. Verify proper grounding is in place.

B. Verify proper clearances, space, etc. is available for SPD.

C. Coordinate so that proper overcurrent device, as recommended by manufacturer, is installed to feed each surge suppression device.

1.09 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of SPD's that fail in materials or workmanship within five years from date of Substantial Completion.

B. Any SPD, that shows evidence of failure or incorrect operation during the warranty period (to include failure of visual failure indicators) shall be replaced or repaired by the manufacturer during the warranty period. The manufacturer shall provide replacement units to the Department for installation.

PART 2.00 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following. (Any product that meets or exceeds the performance of the following manufacturers will be considered.)

1. Advanced Protection Technologies

2. Liebert

3. L.E.A. International

4. Surge Suppression, Inc.

2.02 SURGE-PROTECTIVE DEVICE (SPD) FOR PANELBOARDS

G. Surge protective Device Description: Modular design incorporating sine-wavetracking type with the following features and accessories:

1. SPD shall be UL 1449 3rd Edition listed.

2. SPD shall be UL 1449 Third Edition, labeled as Type 1 intended for use without need for external or supplemental overcurrent controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.

3. SPD shall be UL 1449 Third Edition labeled with 20kA nominal discharge current (In) (verifiable at UL.com).

4. Install external SPD to distribution equipment with installation leads as short and straight as possible.

5. SPD marked with a 200kA short-circuit current rating (SCCR).

6. Modes of Protection: Line to Neutral, Line to Ground, Line to Line, and Neutral to Ground

7. The SPD shall include visual LED indicator lights including a minimum of one green LED indicator per phase for power and protection status and one red service light.

8. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

9. SPD shall include dry contacts indicating status for SCADA monitoring.

H. Minimum Surge Current Capability**: 200** kA per phase

I. Protection modes and UL 1449 3rd Edition VPRs for circuits with voltages of 120/240V, 1-Phase, 3-Wire shall not exceed:

1. Line to Neutral: 700V for 120/240V, 1PH, 3W

2. Line to Ground: 700V for 120/240V, 1PH, 3W

3. Neutral to Ground: 700V for 120/240V, 1PH, 3W

4. Line to Line: 1200V for 120/240V, 1PH, 3W

PART 3.00 - EXECUTION

3.01 GENERAL

A. Provide, install and connect an SPD at branch panelboard that serves restroom and storage building. Branch breaker in the panelboard shall serve as the disconnecting means for the SPD.

B. Surge protection equipment must be selected by contractor to match the equipment being protected including wire sizes, operating volts, amps, and circuit impedance.

C. Installation of SPD equipment and its grounding must be in accordance with the manufacturer’s recommendations to assure short and proper ground paths.

D. Install external SPDs with a maximum of 24” length leads. Position the SPD as close to the circuit breaker used as possible. Utilize the breakers closest to the SPD mounting.

E. Install the leads slightly twisted together, but as short and straight as possible with no kinks or coils and an 8-inch minimum bending radius.

3.02 INSTALLATION OF SPDS

A. SPDs shall be close-nippled to the panelboard in a position nearest the neutral bus to minimize wire lead length between SPD and the buses to which the SPD connects. SPD leads shall not extend beyond the SPD manufacturer's recommended maximum lead length without specific approval of the engineer.

3.03 PLACING SYSTEM INTO SERVICE

A. Before energizing any SPD, the installer shall measure the electrical system voltage and frequency and verify that each SPD is properly rated for use with measured voltage and frequency.

3.04 FIELD QUALITY CONTROL

A. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. Testing: Perform the following field tests and inspections.

1. After installing surge protective devices, but before the electrical circuitry has been energized, measure the continuity of each lead. Measure between the equipment being protected and the point of connection to the SPD.

2. Complete startup checks according to manufacturer's written instructions.

3.05 DEMONSTRATION

A. Train Department's maintenance personnel to adjust, operate, and maintain SPDs.

END OF SECTION 16431

SECTION 16511
LIGHTING FIXTURES

PART 1.00 - GENERAL

1. 01 WORK INCLUDED

A. The work included under this Section consists of furnishing and installing the lighting fixtures, including all related systems and accessories, as shown on the Drawings and hereinafter specified.

1. 02 LIGHT FIXTURES

A. Products: Refer to Lighting Fixture Schedule on the Drawings for products.

B. Each lighting fixture shall have been tested and certified for proper operation by the fixture manufacturer for the type of environment and mounting on in which it is to be installed.

C. All LED lighting fixtures shall bear a UL Label and be approved for the intended use.

PART 2.00 – PRODUCTS

Not used.

PART 3.00 – EXECUTION

3.01 INSTALLATION

A. Lighting fixtures shall be installed as indicated on the Drawings.

B. No wiring splice or tap shall be located within an arm, stem, etc., used for support of lighting fixture. Wire shall be continuous from splice in outlet box to terminals.

C. Coordinate with other electrical work as appropriate to properly interface installation of interior lighting fixtures with other work.

D. Fasten fixtures securely to indicate structural support and check to ensure that fixtures are plumb.

3.02 ADJUST AND CLEAN

A. Clean interior lighting fixtures of dirt and debris upon completion of installation.

B. Protect installed fixtures from damage during remainder of construction period.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then re-test to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.

3.04 GROUNDING

A. Provide tight equipment grounding connections for each lighting fixture installation where indicated.

END OF SECTION 16511

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32313
CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Chain-link fencing.

2. Swing gates.

1.02 DEFINITIONS

A. CLFMI: Chain Link Fence Manufacturers Institute.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and cages capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Determine 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.

1.04 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finish selections for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.

2. Chain-link fabric, reinforcements, and attachments.

3. Gates and hardware.

B. Shop Drawings: Show locations of fences, each gate, posts, tension wires, gate opening direction, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

D. Qualification Data: For Installer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on the drawings. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Allied Tube & Conduit.
2. Boundary Fence Systems.
3. Master-Halco.
4. Wheatland Tube Company.

2.02 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated 9 gauge wire.

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.

2. Selvage: Knuckled at both selvages.

2.03 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: 8’-0”.

3. Strength Requirement: Heavy industrial according to ASTM F 1043.

4. Post Diameter and Thickness: As indicated on the drawings, unless stricter requirements per ASTM F 1043.

a. Swing Gate Post: According to ASTM F 900.

1) Openings up to 12 Feet: Steel post, 2.875 inch diameter, and 4.64 lb/ft. weight.

5. Coating for Steel Framing:

a. Metallic Coating: Type A, consisting of not less than minimum 2.0 oz./sq. ft. average zinc coating per ASTM A 123.

2.04 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: 2 inches less than adjacent fence height.

2. Leaf Width: As indicated.

3. Frame Members: Tubular steel, 1.90 inches round.

C. Frame Corner Construction: Welded.

D. Hardware: Latches permitting operation from both sides of gate and hinges. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.05 FITTINGS

A. General: Comply with ASTM F 626.

B. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

C. 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.

D. Tension and Brace Bands: Pressed steel.

E. Tension Bars: Steel, length not less than 2 inches shorter than full height of chin-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

F. Tie Wires, Clips, and Fasteners: According to ASTM F 626. All fasteners shall be tamper-resistant.

G. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. zinc.

2.06 ANCHORING CEMENT

A. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at project site to create pourable anchoring, patching, and grouting compound.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.03 CHAIN-LINK FENCE INSTALLATION

A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F.

B. Line Posts: Space line posts uniformly as indicated on Drawings.

C. Post Anchorage: Form or core drill holes in concrete slab not less than 5 inches deep and 3/4 larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer’s written instructions.

D. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at mid-height of fabric on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.

E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, and terminating into rail end attached to posts fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.

F. Bottom Rails: Install, spanning between posts.

G. Chain-Link Fabric: Apply fabric to enclosing framework. Leave 1 inch between finish floor 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.

H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

I. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one 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 12 inches o.c. and to braces 24 inches o.c.

J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.04 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.05 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 323113