- 1. MSS SP 58 Pipe Hangers and Supports Materials, Design and Manufacturer.
- 2. MSS SP 69 Pipe Hangers and Supports Selection and Application.
- 3. MSS SP 70 Cast Iron Gate Valves, Flanged and Threaded Ends.
- 4. MSS SP 71 Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- 5. MSS SP 80 Bronze Gate, Globe, Angle and Check Valves.
- 6. MSS SP 89 Pipe Hangers and Supports Fabrication and Installation Practices.
- 7. MSS SP 110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sump-pumps, catch basins and manholes.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
 - 4. Storm Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
 - 5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
 2)Regional materials
 3)Low-emitting adhesives.

FACILITY STORM DRAINAGE PIPING

4)Low-emitting sealants.
5)Low-emitting insulation.
6)Low-emitting coatings and paints.
7)Enviromental Product Declarations (EPD): For each product.
8)Health Product Declaration (HPD): For each product.
9)Laboratory tests for the products used.

PART 2 PRODUCTS

2.1 STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74, service weight, bell and spigot or plain ends.
 - 1. Fittings: Cast iron, ASTM A74.
 - 2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron, CISPI 301.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2729, polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.
 - 1. Fittings: PVC, ASTM D2729.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74 service weight, bell and spigot or plain ends.
 - 1. Fittings: Cast iron, ASTM A74.
 - 2. Joints: ASTM C564, neoprene gasket system or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron, CISPI 301.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2665 or ASTM D3034 SDR 26, polyvinyl chloride (PVC) material.
 - 1. Fittings: ASTM D2665 or ASTM D3034, PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - 2. PVC Piping: PVC.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. PVC Piping: PVC flanges.
 - 2. Gaskets: 1/16 inch (1.6 mm) thick preformed neoprene gaskets.

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C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

2.4 PIPE HANGERS AND SUPPORTS

- A. Drain, Waste, and Vent: Conform to ASME B31.9.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- C. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- E. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
- F. Wall Support for Pipe Sizes 3 inches and Larger: Welded steel bracket and wrought steel clamp.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- I. Copper Pipe Support: Carbon-steel, copper-plated adjustable ring.

2.5 ROOF DRAINS

- 1. Manufacturers:
 - a. Jay R Smith
 - b. Zurn
 - c. Substitutions: Engineer approved equivalent.
- 2. Roof Drains: Lacquered cast iron body with sump:
 - a. Strainer: Removable metal dome.
 - b. Accessories: Coordinate with roofing type:
 - 1) Membrane flange and membrane clamp with integral gravel stop.
 - 2) Adjustable under deck clamp.
 - 3) Roof sump receiver.
 - 4) Waterproofing flange.
 - 5) Controlled flow weir.
 - 6) Leveling frame.
 - 7) Adjustable extension sleeve for roof insulation.
 - 8) Perforated or slotted ballast guard extension for inverted roof.
 - 9) Perforated stainless steel ballast guard extension.
- 3. Roof Overflow Drains: Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended above flood elevation.
- B. mp with integral gravel stops.

2.6 CLEANOUTS

- 1. Manufacturers:
 - a. Jay R Smith
 - b. Zurn.
 - c. Substitutions: Engineer approved equivalent.
- 2. Finished Floor: Lacquered cast iron body with anchor flange, reversible clamping collar, and adjustable nickel-bronze round scored cover in service areas and depressed cover to accept floor finish in finished floor areas.
- 3. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Inserts:

- 1. Provide inserts for placement in concrete forms.
- 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- B. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.

- 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
- 7. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

3.4 INSTALLATION - BURIED PIPING SYSTEMS

- A. Verify connection size, location, and invert are as indicated on Drawings.
- B. Install pipe on prepared bedding.
- C. Route pipe in straight line.
- D. Pipe Cover and Backfilling:
 - 1. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
 - 2. Do not use wheeled or tracked vehicles for tamping.

3.5 INSTALLATION - ABOVE GROUND PIPING

- A. Establish invert elevations, slopes for drainage. Maintain gradients.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearance at cleanout for snaking drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install non-conducting dielectric connections wherever jointing dissimilar metals.
- F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- G. Install piping to maintain headroom. Group piping to conserve space.
- H. Group piping whenever practical at common elevations.
- I. Support cast iron drainage piping at every joint.
- J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation.

- L. Provide access where valves and fittings are not accessible.
- M. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- O. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

END OF SECTION

SECTION 230060 PIPING, GENERAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, heat tracing, insulation, lining and coating, testing, disinfection, excavation, backfill and encasement, to provide a functional installation.
- B. The piping shown is intended to define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical Drawings are not pipe construction or fabrication Drawings. It is the Contractor's responsibility to develop the details necessary to construct all mechanical piping systems to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, etc., for a complete and functional system.

1.3 **REFERENCE STANDARDS**

- A. Codes: All codes, as referenced herein are specified in Section 01420, "Reference Standards".
- B. Commercial Standards:
 - 1. ANSI/ASME B1.20.1 Pipe Threads, General Purpose (inch).
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.
 - 3. ANSI/AWWA C207 Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in
 - 4. ANSI/AWWA C606 Grooved and Shouldered Joints.
 - 5. ANSI/AWS D1.1 Structural Welding Code.
 - 6. ASTM A 307 Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile.
 - 7. ASTM A 325 Specification for High-Strength Bolts for Structural Steel Joints.
 - 8. ASTM D 792 Test Methods for Specific Gravity and Density of Plastics by Displacement.
 - 9. ASTM D 2000 Classification System for Rubber Products in Automotive Applications.

1.4 SUBMITTALS

A. The Contractor shall submit complete shop Drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the requirements as specified in the individual sections. The shop Drawings shall include all necessary dimensions and details on PIPING, GENERAL 010005-1

pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication Drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system.

- B. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.
- C. The Contractor shall submit as part of the shop Drawings a certification from the pipe fabricator stating that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the Engineer for review prior to the fabrication of any pipe

1.5 QUALITY ASSURANCE

- A. Inspection: All pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the Engineer shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.
- B. Tests: Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards. The Contractor shall perform all tests at no additional cost to the City.
- C. Welding Requirements: All welding procedures used to fabricate pipe shall be pre-qualified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- D. Welder Qualifications: All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing WORK on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.
- E. The Contractor shall furnish all material and bear the expense of qualifying welders.

1.6 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is advisable, in order to obtain perfect pipe joints, supports, or special connections, the Contractor shall furnish such assistance at no additional cost to the City

1.7 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

1.8 CLEANUP

A. After completion of the WORK, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Sections of Division 2 and as specified herein.
- B. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified.
- C. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified. Pipes above ground or in structures shall be field-painted as directed by the Engineer.
- D. Grooved Piping Systems: Piping systems with grooved joints and fittings may be provided in lieu of screwed, flanged, welded, or mechanical joint systems for ductile iron yard piping. (All piping above and below ground within the property limits of treatment plants, pump stations, and similar installations). All grooved couplings on buried piping must be bonded. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer. The Contractor shall make the coupling manufacturer responsible for the selection of the correct style of coupling and gasket for each individual location.

2.2 PIPE FLANGES (STEEL PIPE)

- A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150 pound class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150 pound class. However, AWWA flanges shall not be exposed to test pressure greater than 125% of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300 pound class. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flanges for miscellaneous small pipes shall be in accordance with the standards specified for these pipes.
- B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes. All blind flanges for pipe sizes 12 inches and over shall be provided with lifting eyes in form of welded or screwed eye bolts.
- C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- D. Flange Bolts: All bolts and nuts shall conform to pipe manufacturer's recommendations. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.
- E. Insulating Flanges: Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.
- F. Insulating Flange Sets: Insulating flange sets shall be provided where shown. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel

washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2inch or smaller and shall be made of acetal resin. For bolt diameters, larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325. Insulating gaskets shall be full-face.

Insulating Flange Manufacturers, or Equal:

- 1. JM Red Devil, Type E;
- 2. Maloney Pipeline Products Co., Houston;
- 3. PSI Products, Inc., Burbank, California.
- G. Flange Gaskets: Gaskets for flanged joints shall be full-faced, 1/16-inch thick compressed sheets of aramid fiber base, with nitrile binder and non-stick coating, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

Flange Gasket Manufacturers, or Equal:

- 1. John Crane, style 2160;
- 2. Garlock, style 3000.

2.3 THREADED INSULATING CONNECTIONS

- A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.
- B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. General: Cast mechanical-type couplings shall be provided where shown. The couplings shall conform to the requirements of ANSI/AWWA C606. All gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of all grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, all equipment connections shall have rigid-grooved couplings, or harness sets in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. The Contractor shall have the coupling Manufacturer's service representative verify the correct choice and application of all couplings and gaskets, and the workers, to assure a correct installation.

Couplings for Steel Pipe, Manufacturers, or Equal:

- 1. Gustin-Bacon (banded or grooved);
- 2. Victaulic Style 41 or 44 (banded, flexible);

3. Victaulic Style 77 or 07 (grooved).

Ductile Iron Pipe Couplings, Manufacturers, or Equal:

- 1. Gustin-Bacon;
- 2. Victaulic Style 31.

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

2.5 SLEEVE-TYPE COUPLINGS

- A. Construction: Sleeve-type couplings shall be provided where shown, in accordance with ANSI/AWWA C219 unless otherwise specified, and shall be of factory-epoxy coated steel with stainless steel fasteners, without pipe stop, and shall be of sizes to fit the pipe and fittings shown. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold-expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory as specified.
- B. Pipe Preparation: The ends of the pipe, where specified or shown, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.
- C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer.
 - 1. The rubber in the gasket shall meet the following specifications:
 - a. Color Jet Black
 - b. Surface Non-blooming
 - c. Durometer Hardness 74±5
 - d. Tensile Strength 1000 psi Minimum
 - e. Elongation 175% Minimum
 - The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid utilized.
- D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall

have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: All sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be in accordance with the requirements of the appropriate reference standard, or as shown. Harnessing hardware shall be Type 316 stainless steel.

Manufacturers or Equal:

- 1. Dresser, Style 38;
- 2. Ford Meter Box Co., Inc., Style FC1 or FC3;
- 3. Smith-Blair, Style 411.

2.6 FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where shown. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged, braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise shown. The connectors shall be 9 inches long, face-to-face flanges, unless otherwise shown. The final material selection shall be approved by the manufacturer. The Contractor shall submit manufacturer's shop Drawings and calculations.

2.7 EXPANSION JOINT

A. All piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement, without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials, best suited for each individual service. The Contractor shall submit detailed calculations and manufacturer's shop Drawings, guaranteeing satisfactory performance of all proposed expansion joints, piping layouts showing all anchors and guides, and information on materials, temperature and pressure ratings.

2.8 PIPE THREADS

A. All pipe threads shall be in accordance with ANSI/ASME B1.20.

PART 3 - EXECUTION

3.1 GENERAL

- A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Section of Divisions 2. The lining manufacturer shall take full responsibility for the complete, final product and its application. All pipe ends and joints at screwed flanges shall be epoxy-coated, to assure continuous protection.
- B. Where core drilling is required for pipes passing through existing concrete, core drilling

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locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebars.

C. All exposed piping shall be painted. All piping to be painted shall be color coded in accordance with City's standard color code. Color samples shall be submitted to Engineer for final color selection.

END OF SECTION 230060

SECTION 230100 VALVES, GENERAL

PART 1 - GENERAL

1.1 THE REQUIREMENTS

- A. The Contractor shall furnish and install, complete with all assemblies and accessories, all valves shown on the Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.

1.2 **REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

- A. Codes: All codes, as referenced herein, are specified in Section 01420, Reference Standards.
- B. Commercial Standards:
 - 1. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
 - 3. ANSI/ASME BI.20.1 General Purpose Pipe Threads (Inch).
 - 4. ANSI/ASME B31.1 Power Piping.
 - 5. ASTM A 36 Specification for Structural Steel.
 - 6. ASTM A 48 Specification for Gray Iron Castings.
 - 7. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 8. ASTM A 536 Specification for Ductile Iron Castings.
 - 9. ASTM B 61 Specification for Steam or Valve Bronze Castings.
 - 10. ASTM B 62 Specification for Composition Bronze or Ounce Metal Castings.
 - 11. ASTM B 148 Specification for Aluminum Bronze Castings.
 - 12. ASTM B 584 Specification for Copper Alloy Sand Castings for General Applications.
 - 13. ANSI/AWWA C500 Gate Valves for Water and Sewerage Systems.
 - 14. ANSI/AWWA C504 Rubber Seated Butterfly Valves.
 - 15. AWWA C508 Swing Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS.

16. ANSI/AWWA C509 - Resilient Seated Gate Valves, 3 through 12 NPS, for Water and VALVES, GENERAL 230100-1

Sewage Systems.

17. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.

1.3 CONTRACT SUBMITTALS

- A. Shop Drawings: Shop Drawings conforming to the requirements of the drawings and details, Product Data, and Samples, are required for all valves, and accessories not specifically preapproved by the OWNER. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics and complete descriptive information to demonstrate full compliance with the Documents. Shop Drawings for electrically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the electrical power supply and remote status and alarm indicating devices. Electrical control schematic diagrams shall be submitted with the Shop Drawings for all electrical controls. Shop Drawings for pneumatically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the compressed air (service air) system and electrical controls.
- B. Operation and Maintenance Manuals: Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.
- C. Valve Labeling: The Contractor shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

1.4 QUALITY ASSURANCE

- A. Valve Testing: Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.

PART 2 - PRODUCTS

2.1 VALVES

- A. General: The Contractor shall furnish all valves, valve- operating units, stem extensions, and other accessories as shown or specified. All valves shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 6-feet above working level shall be provided with chain operators. All valves shall have a minimum design pressure rating of 150 psi and capable of a test pressure of 300 psi. For service applications with pressures in excess of 150 psi, valves shall have a minimum pressure rating in excess of the service application working pressure.
- B. Materials: All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Cast iron parts of valves shall meet the requirements of ASTM A 126, "Standard Specifications for Grey Iron Castings for Valves, Flanges and Pipe Fittings, Class 'B'." All castings shall be clean and sound, without defects

of any kind and no plugging, welding or repairing of defects will be permitted. Nonferrous alloys of various types shall be used for parts of valves as specified. Where no definite specification is given, the material shall be the recognized acceptable standard for that particular application.

- C. End Connections: Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein.
- D. All buried valves shall be provided with cast-iron valve boxes unless otherwise indicated. The boxes shall be asphalt varnished, or enameled cast iron, adjustable to grade, and installed perpendicularly, centered around and covering the upper portions of the valve or valve operator, or the pipe. The top of each valve box shall be placed flush with finish grade unless otherwise indicated on the Drawings. Valve boxes shall be as specified elsewhere in this section.
- E. All buried valves and other valves located below the concrete operating deck or level, specified or noted to be key operated, shall have an operator to finish grade or deck level, a 2-inch square AWWA operating nut, and cover or box and cover, as may be required.
- F. Valve Flanges: Flanged ends shall be flat-faced and have bolt circle and bolt patterns conforming to ANSI B16.1 Class 125 unless otherwise specified hereinafter. All bolt heads and nuts shall be hexagonal conforming to ANSI B18.2. Gaskets shall be full face and made of natural or synthetic elastomers in conformance with ANSI B16.21 suitable for the service characteristics, especially chemical compatibility and temperature.
- G. Gate Valve Stems: Where subject to dezincification, gate valve stems shall be of bronze to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum. Where dezincification is not a problem, bronze to ASTM B 584 may be used. For valve stems with a minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured.
- H. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged valves, shall receive a fusion-bonded epoxy coating in accordance with AWWA C550. Flange faces of valves shall not be epoxy coated. The Contractor, through the valve manufacturer, shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.
- I. Valve Operators: Valves and gates shall be furnished with operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant. Operator orientation shall be verified with the ENGINEER prior to installation. If this requirement is not met, changes to orientation shall be made at no additional cost.
- J. All operators, unless otherwise specified, shall turn counter- clockwise to open. Operators shall have the open direction clearly and permanently marked. All valve operators, shall be provided with the valve by the valve manufacturer. The Contractor, through the valve manufacturer, shall be solely responsible for the selection of the proper operator to meet the operating conditions specified herein. Field calibration and testing of the operators and valves to ensure a proper installation and an operating system shall be the responsibility of the Contractor.

VALVES, GENERAL

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- K. All manual operators shall have levers or handwheels, unless otherwise shown. Where buried, the valves shall have extensions with square nuts or floor stands. Valves mounted higher than 6 feet above floor or operating level shall have chain operators. Unless otherwise shown or specified, valves of sizes 4-inch and larger shall have gear-assisted operators.
- L. Operation of valves and gates shall be designed so that the effort required to operate the handwheel, lever or chain shall not exceed 40 pounds applied at the extremity of the wheel or lever. The handwheels on valves 14 inches and smaller shall not be less than 8 inches in diameter, and on valves larger than 14 inches the handwheel shall not be less than 12 inches in diameter.
- M. Chainwheel operator shall be fabricated of malleable iron and pocketed type chainwheels with chain guards and guides. Chainwheel operators shall be marked with an arrow and the word "OPEN" indicating direction to open. Indicators shall be provided at ground level. The operators shall have galvanized smooth welded link type chain. Chain that is crimped or has links with exposed ends shall not be acceptable.
- N. Floor Stands: Floor stands shall be cast iron, non-rising stem type with lockable hand wheel operator, valve position indicator and steel extension stem. Hand wheel shall be lockable in the full closed position. The floor stand shall be furnished with an armored padlock and six keys. Lock shall be as manufactured by Master, Schlage or equal. Floor stand shall be standard pattern type as manufactured by Clow Corporation, or equal.
- O. Valve Labeling: A label shall be provided on all shut-off valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch bronze or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve or as indicated by the ENGINEER.
- Ρ. Butterfly Valves: Shall meet or exceed AWWA C-504, Class 150B, latest revision. Body and disc material shall be cast or ductile iron meeting or exceeding ASTM A126 (latest revision) or A536, latest revision. Seat and all rubber material shall be chloramine resistant. Shaft, nuts, screws, and hardware material shall be stainless steel (Type 304 minimum). Valve disc shall be rigidly attached to the shaft to eliminate any relative motion. Shaft shall be offset from the disc and body seats so that they do not intersect. Shafts of 3 inch diameter and smaller shall be one piece through the valve with factory set thruster(s) to center the disc in the seat. Shafts larger than 3 inch diameter shall be stub-shafts rigidly keyed to the disc. Stub-shafts shall be provided with an adjustable thruster(s) to move the disc and shaft assembly positively in either direction to center the disc in the seat. Valves shall open left, or counterclockwise. Buried service valves shall have a 2 inch operating nut. Valve operators for valves 24 inch and smaller shall be traveling nut or worm gear type; Valves larger than 24 inch shall be equipped with worm gear type operators. Operators shall be one size larger than the minimum specified by the manufacturer. Except where otherwise specified, interior and exterior ferrous surfaces, exclusive of stainless steel surfaces, in all valves shall be coated with two-part thermosetting epoxy coating or fusion bonded epoxy coating. Flange faces of valves shall not be epoxy coated. The epoxy shall be suitable for use in potable water, reclaimed water, and wastewater.

2.2 VALVE BOXES

- A. The Contractor shall furnish and install valve boxes as shown on the Drawings and specified herein.
- B. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be

fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the Drawings shall be provided around the valve box, sloped outwards.

C. All valve boxes shall be 2-piece cast iron ASTM A48 (latest revision), extension, adjustable screw type, 5-1/4-inch shaft, with locking type lid marked with the appropriate carrier product. The stem of a buried valve shall be within 18 inch of the finished grade.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. General: Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings.
- B. All valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. Valves shall be firmly supported to avoid undue stresses on the pipe.
- C. Access: Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and to avoid conflicts between valve operators and structural members or handrails. Unless otherwise approved, install all valves plumb and level. All valves shall be installed to provide easy access for operation, removal, and maintenance.
- D. Valve Accessories: Where combinations of valves, sensors, switches, and controls are specified or shown on the drawings, it shall be the responsibility of the Contractor to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.
- E. Valve boxes shall be set plumb, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.
- F. All valves shall be tested at the operating pressures at which the particular line will be used. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All motor operated and cylinder operated valves shall be tested for control operation as directed by the ENGINEER.

3.2 VALVE SCHEDULE

A. The following abbreviations are used:

1. Body Type

a.OS&Y - Outside Screw and Yoke

b.RS - Rising Stem

2.Ends

a.Flg - Flanged b.Thd - Threaded

3. Materials

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a.Cl - Cast Iron b.SS - Type 316 Stainless Steel

END OF SECTION 230100

SECTION 230200 PIPELINE TESTING

PART 1 - GENERAL

1.1 THE REQUIREMENTS

A. The Contractor shall perform flushing and testing of all pipelines and appurtenant piping, complete, including conveyance of test water from City-designated source to point of use and all disposal thereof, all in accordance with the requirements of the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards
 - 1. ANSI/AWWA B300 Hypochlorites
 - 2. ANSI/AWWA B301 Liquid Chlorine
 - 3. ANSI/AWWA C651 Disinfecting Water Mains

1.3 SUBMITTALS

- A. A testing schedule, including proposed plans for water conveyance, control, and disposal shall be submitted in writing for approval a minimum of seven (7) days before testing is to start.
- B. The Contractor shall submit hydrostatic test reports in accordance with Project Closeout.

1.4 SUBMITTALS

- A. The Contractor shall submit complete shop Drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the with drawings` and as specified in the individual sections. The shop Drawings shall include all necessary dimensions and details on pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication Drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system.
- B. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.
- C. The Contractor shall submit as part of the shop Drawings a certification from the pipe fabricator stating that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the Engineer for review prior to the fabrication of any pipe

PART 2 - PRODUCTS

2.1 MATERIALS REQUIREMENTS

A. All test equipment, temporary valves or bulkheads, temporary vents or drains, or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer & City's review. No materials shall be used which would be injurious to the construction or its future function.

PIPELINE TESTING

PART 3 - EXECUTION

3.1 GENERAL

- A. Notify the Engineer and City 48 hours in advance to obtain City's approval to commence testing and/or disinfection of any particular structure and/or pipeline.
- B. Unless otherwise provided herein, water for flushing and testing pipelines will be furnished by the City; however, the Contractor shall make all necessary provisions for conveying the water from the City-designated source to the points of use.
- C. All pressure and gravity pipelines shall be tested. All testing operations shall be performed in the presence of the City and Engineer.

3.2 FLUSHING

A. At the conclusion of the installation work, the Contractor shall thoroughly clean all new liquid conveying pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered the pipe during the construction period. If after this cleaning any obstructions remain, they shall be corrected by the Contractor, at the Contractor's expense, to the satisfaction of the City. Liquid conveying pipelines shall be flushed at the rate of at least 2.5 feet per second for a duration suitable to the City or shall be flushed by other methods approved by the City.

3.3 HYDROSTATIC TESTING OF PIPING

- A. Following pipeline flushing, the Contractor shall hydrostatically test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete or mortar have attained an age of 14 days. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Care shall be taken to see that all air vents are open during filling.
- B. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb what water it will and to allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the City shall be taken.
- C. The test pressure for the hydrostatic test shall be 150 psi.
- D. The hydrostatic test shall consist of holding the test pressure on the pipeline for a period of 2 hours. All visible leaks shall be repaired in a manner acceptable to the City.
- E. The maximum allowable leakage shall be determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148000}$$

L = Allowable leakage, in gallons per hour

PIPELINE TESTING

Where,

- S = Length of pipe being tested in feet
- D = Nominal pipe diameter; in inches
- P = Average test pressure during the test, in psi gauge
- F. In the case of pipelines that fail to pass the prescribed leakage test, the Contractor shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines. The Contractor shall provide all reaction blocking and necessary plugs and caps required to test all piping installed as part of this Contract.
- G. The Contractor shall submit to the City a detailed description of the testing procedures to be utilized.

END OF SECTION 230200

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes building wire and cable, conduit and tubing, surface raceway, boxes, wiring devices, wiring connectors, and connections.

1.2 SYSTEM DESCRIPTION

- A. Wiring Products:
 - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
 - 2. Stranded conductors for control circuits.
 - 3. Conductor not smaller than 12 AWG for power and lighting circuits.
 - 4. Conductor not smaller than 16 AWG for control circuits.
 - 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
- B. Wiring Methods:
 - 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 5. Exterior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 6. Underground Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
 - 7. Cable Tray Locations: Use only Tray cable Type TC.
 - 8. Other Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
- C. Raceway and boxes are located as indicated on Drawings, and at other locations where required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- D. Raceway Products:
 - 1. Underground More than 5 Feet outside Foundation Wall: Use rigid steel conduit, thickwall nonmetallic conduit. Use cast metal boxes or nonmetallic handhole.
 - 2. In or Under Slab on Grade: Use rigid steel conduit, thickwall nonmetallic conduit. Use cast metal boxes.
 - 3. Outdoor Locations, Above Grade: Use rigid steel. Use cast metal outlet, pull, and junction boxes.
 - 4. In Slab Above Grade: Use rigid steel conduit, thickwall nonmetallic conduit. Use cast boxes.

- 5. Wet and Damp Locations: Use rigid steel conduit, thickwall nonmetallic conduit. Use cast metal or nonmetallic outlet, junction, and pull boxes. Use flush mounting outlet box in finished areas.
- 6. Concealed Dry Locations: Use electrical metallic tubing and nonmetallic tubing. Use sheetmetal boxes. Use flush mounting outlet box in finished areas. Use hinged enclosure for large pull boxes.
- 7. Exposed Dry Locations: Use rigid steel, thickwall nonmetallic conduit. Use sheet-metal boxes. Use flush mounting outlet box in finished areas. Use hinged enclosure for large pull boxes.
- E. Minimum Raceway Size: 1/2 inch unless otherwise specified.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog information for each wiring device.

1.4 NOT USED

1.5 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested according to NFPA 262.
- B. Perform Work according to Municipality of Miami Lakes Department of Public Works standards.

Include the following Paragraph only when cost of acquiring specified standards is justified.

C. Maintain one copy of each document on Site.

PART 2 PRODUCTS

2.1 BUILDING WIRE

- A. Manufacturer List:
 - 1. Aetna Insulated Wire, Inc., Southwire Co., General Cable Co., Encore Wire Co.
 - 2. Substitutions: Permitted.
- B. Description: Single-conductor insulated wire.
- C. Conductor: Copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation Temperature Rating: 75 degrees C.
- F. Insulation Material: Thermoplastic.

2.2 TERMINATIONS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression-type copper.
- B. Lugs for Wires 4 AWG and Larger: Color-keyed, compression-type copper, with insulating sealing collars.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Remove exposed abandoned raceway, boxes, wire, and cable, including abandoned raceway and cable above accessible ceiling finishes.
- B. Disconnect abandoned circuits and remove raceway, wire, and cable. Remove abandoned boxes when connecting wire and cable is abandoned and removed. Install blank cover for remaining abandoned boxes.
- C. Maintain access to existing boxes and wiring connections remaining active and requiring access. Modify installation.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

3.2 INSTALLATION

- A. Route raceway and cable to meet Project conditions.
- B. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

- C. Adjust box location up to 5 feet prior to rough-in when required to accommodate intended purpose.
- D. Do not install flush mounting box back-to-back in walls; install boxes with minimum 24 inches separation.
- E. Install wall plates on flush-mounted switches, receptacles, and blank outlets.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rod electrodes.
 - 2. Active electrodes.
 - 3. Wire.
 - 4. Mechanical connectors.
 - 5. Exothermic connections.

1.2 **REFERENCES**

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. IEEE 1100 Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
 - 1. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
 - 1. NFPA 70 National Electrical Code.
 - 2. NFPA 99 Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
 - 1. Metal underground water pipe.
 - 2. Metal building frame.
 - 3. Concrete-encased electrode.
 - 4. Ground ring
 - 5. Rod electrode.
- 6. Plate electrode.

1.4 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100.

1.5 SUBMITTALS

- A. Product Data: Submit data on grounding electrodes and connections.
- B. Manufacturer's Installation Instructions: Submit for active electrodes.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and grounding electrodes.

1.7 NOT USED

1.8 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing work of this section with minimum 5 years' experience.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.
- C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.11 COORDINATION

A. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.1 ROD ELECTRODES

- A. Product Description:
 - 1. Material: Copper.

2.2 ACTIVE ELECTRODES

- A. Product Description:
 - 1. Material: Metallic-salt-filled copper-tube electrode.

2.3 WIRE

- A. Material: Stranded copper.
- B. Foundation Electrodes: 4 AWG.
- C. Grounding Electrode Conductor: Copper conductor.
- D. Bonding Conductor: Copper conductor.

2.4 MECHANICAL CONNECTORS

A. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.5 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Install in accordance with IEEE 142 and 1100
- B. Install grounding and bonding conductors concealed from view.
- C. Install grounding well pipe with cover at [each rod location] [rod locations as indicated on Drawings]. Install well pipe top flush with finished grade.
- D. Bond together metal siding not attached to grounded structure; bond to ground.
- E. Install grounding and bonding in patient care areas to meet requirements of NFPA 99.
- F. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Bond to lightning protection system.
- H. Install continuous grounding using underground cold-water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.
- I. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

- J. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.
- K. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.
- L. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.
- M. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground resistance testing in accordance with IEEE 142.
- D. Perform leakage current tests in accordance with NFPA 99.
- E. Perform continuity testing in accordance with IEEE 142.
- F. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

END OF SECTION

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
 - 4. Sleeves.
 - 5. Mechanical sleeve seals.
 - 6. Firestopping relating to electrical work.
 - 7. Firestopping accessories.
 - 8. Equipment bases and supports.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 3. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - 4. ASTM E1966 Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
 - 1. FM Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. National Fire Protection Association:
 - 1. NFPA 70 National Electrical Code.
- D. Underwriters Laboratories Inc.:
 - 1. UL 263 Fire Tests of Building Construction and Materials.
 - 2. UL 723 Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 Fire Tests of Through-Penetration Firestops.
 - 4. UL 2079 Tests for Fire Resistance of Building Joint Systems.
 - 5. UL Fire Resistance Directory.
- E. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH Certification Listings.

1.3 **DEFINITIONS**

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

- A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Design Data: Indicate load carrying capacity of hangers and supports.
- E. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Firestopping Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.7 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
 2)Regional materials
 3)Low-emitting adhesives.
 4)Low-emitting sealants.
 5)Low-emitting insulation.
 6)Low-emitting coatings and paints.
 7)Enviromental Product Declarations (EPD): For each product.
 8)Health Product Declaration (HPD): For each product.
 9)Laboratory tests for the products used.

1.8 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Through Penetration Firestopping of Non-Fire Rated Floor Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
 - 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing work of this section three years' experience.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- D. Conduit clamps general purpose: One-hole malleable iron for surface mounted conduits.
- E. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

A. Product Description: Mounting hole and screw closure.

2.4 SLEEVES

A. Sleeves for Non-fire Rated Floors: 18 gage thick galvanized steel.

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- B. Sleeves for Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Single or Multiple component silicone elastomeric compound and compatible silicone sealant.
 - 2. Foam Firestopping Compounds: Single or Multiple component foam compound.
 - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
 - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
 - 7. Firestop Pillows: Formed mineral fiber pillows.

2.7 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- C. General:
 - 1. Furnish UL listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- D. Non-Rated Surfaces:

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
- 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Do not drill or cut structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors and preset inserts.
 - 2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
 - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
 - 5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
 - 6. Sheet Metal: Provide sheet metal screws.
 - 7. Wood Elements: Provide wood screws.
- B. Inserts:
 - 1. Install inserts for placement in concrete forms.
 - 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut.
- C. Install conduit and raceway support and spacing in accordance with NEC.

- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Install multiple conduits runs on common hangers.
- F. Supports:
 - 1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 - 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 - 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
 - 4. Support vertical conduit at every floor.

3.4 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
- E. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1-inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 - 2. Install escutcheons, floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 - 3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

4. Interior partitions: Seal pipe penetrations at laboratories, hospital spaces, computer rooms and telecommunication rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

3.6 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install escutcheons at finished surfaces.

3.7 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

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Bid 12523-113

END OF SECTION

PROJECT 12509

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 Aluminum Rigid Conduit (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

1.4 SUBMITTALS

- A. Product Data: Submit for the following:
 - 1. Flexible metal conduit.
 - 2. Liquidtight flexible metal conduit.
 - 3. Raceway fittings.
 - 4. Conduit bodies.
 - 5. Surface raceway.
 - 6. Pull and junction boxes.
 - 7. Handholes.

B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
 2)Regional materials
 3)Low-emitting adhesives.
 4)Low-emitting sealants.
 5)Low-emitting insulation.
 6)Low-emitting coatings and paints.
 7)Enviromental Product Declarations (EPD): For each product.
 8)Health Product Declaration (HPD): For each product.
 9)Laboratory tests for the products used.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

1.7 COORDINATION

A. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.1 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1.

2.2 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked aluminum construction.
- B. Fittings: NEMA FB 1.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked aluminum construction with PVC jacket.
- B. Fittings: NEMA FB 1.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel type.

2.5 SURFACE METAL RACEWAY

- A. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
- B. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.

2.6 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.

2.7 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Concrete composite Handholes: Die-molded, concrete composite hand holes:
 - 1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
 - 2. Cover: concrete composite, weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 INSTALLATION

A. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.3 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- E. Do not attach raceway to ceiling support wires or other piping systems.
- F. Route exposed raceway parallel and perpendicular to walls.
- G. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- H. Route conduit in and under slab from point-to-point.
- I. Maintain clearance between raceway and piping for maintenance purposes.
- J. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- K. Bring conduit to shoulder of fittings; fasten securely.
- L. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- M. Install conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- N. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams.
- O. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- P. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- Q. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

- R. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- S. Close ends and unused openings in wireway.

3.4 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights.
- B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- C. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- D. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- E. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- F. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- G. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- H. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- I. Install adjustable steel channel fasteners for hung ceiling outlet box.
- J. Do not fasten boxes to ceiling support wires or other piping systems.
- K. Support boxes independently of conduit.
- L. Install gang box where more than one device is mounted together. Do not use sectional box.
- M. Install gang box with plaster ring for single device outlets.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- B. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.6 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.7 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

PROJECT 12509

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Remote control lighting relays.
 - 2. Lighting contactors.
 - 3. Switches.
 - 4. Switch plates.
 - 5. Occupancy sensors.
 - 6. Photocells.
 - 7. Photocell control unit.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
 - 1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches or devices.
 - 2. Include typical wiring diagrams for each component.
- B. Product Data: Submit manufacturer's standard product data for each system component.
- C. Manufacturer's Installation Instructions: Submit for each system component.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 NOT USED

LIGHTING CONTROL DEVICES

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record the following information:
 - 1. Actual locations of components and record circuiting and switching arrangements.
 - 2. Wiring diagrams reflecting field installed conditions with identified and numbered, system components and devices.
- B. Operation and Maintenance Data:
 - 1. Submit replacement parts numbers.
 - 2. Submit manufacturer's published installation instructions and operating instructions.
 - 3. Recommended renewal parts list.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Municipality of Miami Lakes Public Work's standard.
- B. Where indicated on drawings or required by applicable code, provide automatic shutoff for lighting inside building larger than 5000 square feet (465 square meters). Control shutoff by method conforming to ICC IECC.
- C. Where indicated on drawings or required by applicable code, provide automatic shutoff for lighting outside building. Control shutoff by method conforming to ICC IECC.
- D. Maintain one copy of each document on site.

1.6 WARRANTY

A. Furnish 5 year manufacturer warranty for components.

PART 2 PRODUCTS

2.1 REMOTE CONTROL LIGHTING RELAYS

- A. Manufacturers:
 - 1. Douglas Lighting Controls, General Electric Co.
 - 2. Substitutions: Permitted.
- B. Product Description: Heavy duty, single-coil momentary contact mechanically held remote control relays.
- C. Contacts: Rated 20 amperes at 120 volts. Rated for lighting applications with high intensity discharge (HID), fluorescent, LED lamps.
- D. Line Voltage Connections: Clamp type screw terminals.

- E. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

2.2 SWITCHES

- A. Manufacturers:
 - 1. Hubbell Inc., Leviton Manufacturing Co., Lutron, Legrand.
 - 2. Substitutions: Permitted.
- B. Wall Switch: Specification Grade unlighted momentary pushbutton type for overriding relays.
 - 1. Material: Plastic.
 - 2. Color: As specified by Architect

2.3 OCCUPANCY SENSOR

- A. Manufacturers:
 - 1. Cooper Industries Inc., Leviton, Hubbell Building Automation Inc., Lutron.
 - 2. Substitutions: Permitted.
- B. Compatible with modular relay panels. Capable of being wired directly to Class 2 wiring without auxiliary components or devices.
- C. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 30 seconds to 12 minutes.
- D. Furnish with manual override.
- E. Operation: Silent.
- F. Room Sensors: As indicated on Drawings.
- G. Corridor and Hallway Sensors:
 - 1. Capable of detecting motion 14 feet (4 m) wide and 80 feet (24 m) long with one sensor mounted 10 feet (3 m) above floor.
 - Capable of detecting motion in warehouse aisle 10 feet (3 m) wide and 60 feet (18 m) long or 100 feet (30 m) long when mounted 22 feet (7 m) above floor.
 - 3. Capable of being wired in master-slave configuration to extend area of coverage.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Mount switches and occupancy sensors as indicated on Drawings.
- B. Install wiring in accordance with Section 26 05 19.

LIGHTING CONTROL DEVICES

- C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings. Install wire in conduit in accordance with Section 26 05 19.
- D. Label each low voltage wire clearly indicating connecting relay panel. Refer to Section 26 05 00.
- E. Mount relay as indicated on Drawings. Wire numbered relays in panel to control power to each load. Install relays to be accessible. Allow space around relays for ventilation and circulation of air.
- F. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.
- G. Label each low voltage wire with relay number at each switch or sensor.

3.2 FIELD QUALITY CONTROL

- A. Furnish services for minimum of one day for check, test, and start-up. Perform the following services:
 - 1. Check installation of panelboards.
 - 2. Test operation of remote controlled devices.
 - 3. Repair or replace defective components.
- B. Test each system component after installation to verify proper operation.
- C. Test relays, and switches after installation to confirm proper operation.
- D. Confirm correct loads are recorded on directory card in each panel.

3.3 SCHEDULES

LIGHTING RELAY SCHEDULE									
Panel Name and									
Location									
Panel Number									
Relay Number	R1	R2	R3	R4	R5	R6	R7	R8	R9
Panel and Circuit									
Description									
Switch or Sensor									
Switch or Sensor									
LIGHTING CONTACTOR SCHEDULE									
Panel Name and									
Location									
Panel Number									
Contactor	C1	C2	C3	C4	C5	C6	C7	C8	C9
Number									
Panel and Circuit									
Description									

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LIGHTING RELAY SCHEDULE									
Panel Name and									
Location									
Panel Number									
Relay Number	R1	R2	R3	R4	R5	R6	R7	R8	R9
Switch or Sensor									
Switch or Sensor									

END OF SECTION

LIGHTING CONTROL DEVICES

PROJECT 12509

SECTION 260943

RELAY BASED LIGHTING CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Networked lighting control system and components.

1.2 SYSTEM DESCRIPTION

- A. Provide networked lighting control system consisting of components manufactured by single source.
- B. Provide networked lighting control system consisting of:
 - 1. Multiple relay panels linked over network wiring using open protocol for communications.
 - 2. Multiple relay panels linked over network wiring using open protocol for communications, and be fully compliant with EIA 709.1.
 - 3. Relay panels and programmable switches connected together by networked wiring system extending from panel locations with single communications bus to allow switches to communicate with panels.
 - 4. System connected to single time clock mounted in interior of relay panel.

SUBMITTALS

- C. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
 - 1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches, data line, and network time clock.
 - 2. Drawings for each panel showing hardware configuration and numbering.
 - 3. Panel wiring schedules.
 - 4. Include typical wiring diagrams for each component.
- D. Product Data: Submit manufacturer's standard product data for each system component.
- E. Manufacturer's Installation Instructions: Submit for each system component.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements. Submit in writing system has been installed, adjusted, and tested in accordance with manufacturer's recommendations.
- G. Manufacturer's Field Reports: Submit system startup report indicating date of completion and acknowledgment of programming completion. Indicate acceptance of component and equipment installation, interconnecting wiring, and start-up of system software.

1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record the following information:
 - 1. Wiring diagrams reflecting field installed conditions with identified and numbered, system components and devices.
 - 2. Drawings for each panel showing hardware configuration and numbering.
- B. Operation and Maintenance Data:
 - 1. Submit manufacturer's published installation instructions, operating instructions, programming instructions, and operator's guide.
 - 2. System user's guide and programmer's guide.
 - 3. Instruction books and manufacturer's printed materials.
 - 4. Recommended renewal parts list.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
 2)Regional materials
 3)Low-emitting adhesives.
 4)Low-emitting sealants.
 5)Low-emitting insulation.
 6)Low-emitting coatings and paints.
 7)Enviromental Product Declarations (EPD): For each product.
 8)Health Product Declaration (HPD): For each product.
 9)Laboratory tests for the products used.

1.5 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Comply with NFPA 70 as applicable to electrical wiring work.
- C. Comply with NEMA 250 for type of electrical equipment enclosures.
- D. Provide panelboards with UL listing in accordance with UL 50, UL 67, and UL 916.
- E. Provide equipment complying with FCC emissions' standards in part 15 subpart J for Class A application.
- F. Perform Work in accordance with Municipality of Miami Lakes Public Work's standard.

RELAY LIGHTING CONTROLS

G. Maintain one copy of each document on site.

1.6 WARRANTY

A. Furnish five-year manufacturer's warranty for each system component.

1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of system for one year from Date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including checkout and adjustments.
- B. Furnish 24-hour emergency service on breakdowns and malfunctions for this maintenance period.
- C. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, with maximum 4-hour response time.
- D. Perform maintenance work using competent and qualified personnel under supervision and in direct employ of manufacturer or original installer.
- E. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

PART 2 PRODUCTS

2.1 NETWORKED LIGHTING CONTROL SYSTEM

- A. <u>Manufacturers</u>:
 - 1. General Electric Co., Hubbell Building Automation Inc., Leviton.
 - 2. Substitutions: Permitted.
- B. Product Description: Networked lighting control system consisting of the following components: relay panels, network wiring, programmable network wired switches, programmable clock, software, and capability of integration into building automation system.

2.2 RELAY PANELS

- A. UL listed, NEMA 250 Type 1 enclosure sized to accept up to 16 relays.
- B. Power Supply: Transformer assembly with two 40 VA transformers with separate secondaries. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes.
- C. Voltage: 120 VAC, 60 Hertz, plus or minus 10 percent.

- D. Mounting: Surface.
- E. Cover: Hinged, locking configuration with wiring schedule directory card.
- F. Interior: Bracket and intelligence board backplane with factory mounted and tested relays.
- G. Furnish with integral DIN rail mounting bar to allow for installation of system components. Furnish terminals to accept network wiring for connection of switches to system, or to allow network wiring to be run between multiple panels for network communications between panels.
- H. Furnish with individual on-off switches for both panel and network wiring power.
- I. Furnish 16 channels in each interior regardless of size, each with associated pushbutton to toggle channel on-off, and terminal block for separate dry contact input. Each relay in panel capable of being assigned to each channel, with overlapping allowed. Furnish each channel pushbutton with LED state indication.

2.3 NETWORK WIRING

- A. Material: 18/4 twisted conductor with shield meeting Class 2 requirements. Data line can be run in loop, serial, or star configuration. Minimum 1 turn for each 3 inches (76 mm); 50 picofarads/foot (0.17 picofarads/mm) maximum.
- B. Maximum length: 1,500 feet (460 m).
- C. Maximum number of devices: 127.

2.4 PROGRAMMABLE NETWORK WIRED SWITCHES

- A. Function: Allow individual overrides. Switches terminated to network wiring of each panel.
- B. Configuration: single.
- C. Switch module buttons capable of being individually programmed and assigned to each of the following four functions:
 - 1. Control each individual relay in single panel.
 - 2. Control each group of relays in single panel.
 - 3. Control each of 8 channels in single panel.
 - 4. Control similar channel letter in each chosen group of panels in system.
- D. For applications requiring pattern switching, each button performs function using "on-offnot controlled" pattern of relays instead of normal "all on-all off."
- E. Features:
 - 1. Equipped with bi-color LED pilot light for individual buttons to indicate status of controlled relay or group of relays.

RELAY LIGHTING CONTROLS

- 2. Equipped with locator light.
- 3. Furnish individual buttons with removable clear cover for labeling controlled loads.
- 4. Furnish single switches with single master button capable of overriding every relay controlled by individual buttons to off position or capable of restoring them to their original state. Each switch unit master button function is capable of being configured to perform desired function.
- 5. Furnish dip switches on back of module prevent switch from turning off lights accidentally.
- 6. Each module available locking version. When key is inserted, individual buttons function for five minutes.

2.5 PROGRAMMABLE CLOCK

- A. From each plug-in point on network wiring, time clock can be used to:
 - 1. Schedule each 8 channel groups in relay panel network.
 - 2. Program network wired switches.
- B. Includes user selectable functions to handle standard lighting control functions for each channel independently. Selectable functions include:
 - 1. Scheduled on and scheduled off.
 - 2. Manual on and scheduled off.
 - 3. Astronomical on and astronomical off with optional offset.
 - 4. Astronomical on and scheduled off with optional offset.
- C. Each channel capable of being assigned the following:
 - 1. Time delay from 1 to 256 minutes.
 - 2. Automatic blinking of lights before turning off to allow occupants opportunity to enter override. Time interval configurable.
- D. Features:
 - 1. Furnish clock with display and user interface.
 - 2. Capable of being adjusted for leap year, daylight savings dates, and holidays.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Mount switches, occupancy sensors as indicated on Drawings.
- B. Label each low voltage wire clearly indicating connecting relay panel. Refer to Section 26 05 00.
- C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings.
- D. Mount relay panels as indicated on Drawings. Wire numbered relays in panel to control power to each load.

- E. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to clearly indicate originating panel's designation.
- F. Terminate communication conductors and associated conduits external to factory supplied equipment.
- G. Test relays and switches after installation to confirm proper operation.
- H. Label each low voltage wire with relay number at each switch or sensor.
- I. Install wiring schedule directory card affixed to rear of panel cover to identify circuits, relays, and loads controlled.

3.2 FIELD QUALITY CONTROL

- A. Test relays and switches after installation to confirm proper operation and confirm correct loads are recorded on directory card in each panel.
- B. System Startup:Furnish manufacturer trained, factory authorized technician to confirm proper installation and operation of system components.
- C. Furnish services of factory trained representative for minimum of one day for factory check, test, and start-up supervision. Perform the following services:
 - 1. Check installation of panelboards.
 - 2. Test operation of remote-controlled devices.
 - 3. Test operation of telephone override phone lines.
 - 4. Test operation of network connections.
 - 5. Test operation of central operator's station and associated printer.
 - 6. Repair or replace defective components.
- D. Programming: Furnish services of factory trained representative to perform programming of system. Assist Owner's personnel in developing control scenario for each application. Program Owner furnished control scenario.
 - 1. Explain operation of control programs to Owner and conduct demonstration of project.
 - 2. Provide programs on CD Rom.
 - 3. Maintain copy of programmed information at factory.
- E. Furnish factory trained technicians to functionally test each system component after installation to verify proper operation.
- F. Demonstrate operation of the following system components:
 - 1. Index system to occupied cycle and unoccupied cycle.
 - 2. Operation of switches.
 - 3. Operation of each type of occupancy sensors.
 - 4. Operation of each type of photocell.

G. Furnish services of manufacturer's technical representative for 4 hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least 7 days' notice to Architect/Engineer of training date.

3.3 SCHEDULES

A. Lighting Relay Panel Schedule:

Panel Name and Location <						_>				
Panel Number <				>						
Relay Number	R1	R2	R3	R4	R5	R6	R7	R8	R9	
Panel and Circuit										
Description										
Switch or Sensor										
Other Controls										

END OF SECTION

PROJECT 12509

SECTION 262213

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Enclosed switches and circuit breakers.
 - 2. Enclosed controllers and contactors.
 - 3. Panelboards
 - 4. Fuses.

1.2 SUBMITTALS

A. Product Data: Submit catalog data showing products with specified features.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts
 - 1. Furnish three spare fuses of each Class, size, and rating installed.
- B. Extra Stock Materials
 - 1. Furnish two of each panelboard key.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

Regional materials
Low-emitting adhesives.
Low-emitting insulation.
Low-emitting coatings and paints.
Enviromental Product Declarations (EPD): For each product.
Health Product Declaration (HPD): For each product.

PROJECT 12509

PART 2 PRODUCTS

2.1 ENCLOSED FUSIBLE SWITCH

A. Manufacturers:

- 1. Square D
- 2. Substitutions: Not Permitted.
- B. Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Materials:

- 1. Fuse clips: Designed to accommodate NEMA FU 1, Class R, J fuses.
- 2. Enclosure: NEMA KS 1, Type to meet conditions.

2.2 ENCLOSED NONFUSIBLE SWITCH

- A. Manufacturers:
 - 1. Square D
 - 2. Substitutions: Not Permitted.
- B. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Materials:
 - 1. Enclosure: NEMA KS 1, Type to meet conditions.

2.3 MOLDED CASE CIRCUIT BREAKER

A. Manufacturers:

- 1. Square D
- 2. Substitutions: Not Permitted.
- B. Description: Enclosed, molded-case circuit breaker conforming to UL 489.
- C. Materials:
 - 1. Enclosure: UL 489, Type to meet conditions.

2.4 DISTRIBUTION PANELBOARDS

- A. Manufacturers:
 - 1. Square D
 - 2. Substitutions: Not Permitted.
- B. Description: NEMA PB 1, circuit breaker type panelboard.
- C. Operation:

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

- 1. Minimum integrated short circuit rating: 22,000 amperes rms symmetrical.
- 2. Controllers:
 - a. Control Voltage: 120 volts, 60 Hertz.
 - b. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty type.
 - c. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
- D. Materials:
 - 1. Panelboard bus: Copper.
- E. Assembly or Fabrication:
 - 1. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class R, J fuses.
 - 2. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
 - 3. Controllers: NEMA ICS 2, AC general-purpose Class A controller for induction motors rated in horsepower.
 - 4. Enclosure: NEMA PB 1, Type to meet conditions.
 - 5. Cabinet Front: Surface type, fastened with screws, metal directory frame.
- F. Finishes
 - 1. Cabinet Front: Manufacturer's standard gray enamel.

2.5 BRANCH CIRCUIT PANELBOARDS

- A. Manufacturers:
 - 1. Square D
 - 2. Substitutions: Not Permitted.
- B. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- C. Operation:
 - 1. Minimum Integrated Short Circuit Rating: 22,000 amperes rms symmetrical.
- D. Material:
 - 1. Panelboard Bus: Copper.
- E. Assembly or Fabrication
 - 1. Molded Case Circuit Breakers: UL 489, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Provide UL Class 760 arc fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
 - 2. Enclosure: NEMA PB 1, Type to meet conditions.
 - 3. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike.

- F. Finishes
 - 1. Cabinet Front: Manufacturer's standard gray enamel.

2.6 FUSES

- A. Manufacturers:
 - 1. Cooper Bussmann Inc.
 - 2. Substitutions: Not Permitted.
- B. Description:
 - 1. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- C. Operation:
 - 1. Voltage: Rating suitable for circuit phase-to-phase voltage.
- D. Materials:
 - 1. Main Service Switches Larger than 600 amperes: Class L fast-acting.
 - 2. Main Service Switches: Class J non-time-delay
 - 3. Power Load Feeder Switches Larger than 600 amperes: Class L time delay.
 - 4. Power Load Feeder Switches: Class J non-time-delay
 - 5. Motor Load Feeder Switches: Class RK1 (time delay).
 - 6. Lighting Load Feeder Switches Larger than 600 amperes: Class L fast-acting.
 - 7. Lighting Load Feeder Switches: Class RK1 non-time-delay
 - 8. Other Feeder Switches Larger than 600 amperes: Class L fast-acting.
 - 9. Other Feeder Switches: Class RK1 non-time-delay
 - 10. General Purpose Branch Circuits: Class RK1 non-time delay
 - 11. Motor Branch Circuits: Class RK1 (time delay).
 - 12. Lighting Branch Circuits: Class G.

PART 3 EXECUTION

3.1 **DEMOLITION**

- A. Disconnect abandoned distribution equipment. Remove abandoned enclosures and boxes.
- B. Maintain access to existing distribution equipment remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

- A. Install distribution equipment plumb.
- B. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- C. Install panelboards in accordance with NEMA PB 1.1.

- D. Install recessed panelboards flush with wall finishes.
- E. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard.

3.3 ADJUSTING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Torque bolted bus connections in accordance with manufacturer's instructions after placing switchgear.
- C. Adjust settings in accordance with recommendations of Section 26 05 73 Overcurrent Protective Device Coordination Study, and as directed by Engineer.

3.4 **DEMONSTRATION**

A. Demonstrate operation of switches, circuit breakers.

END OF SECTION

PROJECT 12509

SECTION 262413

SWITCHBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes main and distribution switchboards.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C12.1 Code for Electricity Metering.
 - 2. ANSI C39.1 Requirements, Electrical Analog Indicating Instruments.
- B. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C57.13 Standard Requirements for Instrument Transformers.
 - 2. IEEE C62.41 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- C. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 Low Voltage Cartridge Fuses.
 - 2. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 3. NEMA PB 2 Deadfront Distribution Switchboards.
 - 4. NEMA PB 2.1 General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less.
- D. International Electrical Testing Association:
 - 1. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- E. Underwriters Laboratories Inc.:
 - 1. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - 2. UL 891 Dead-Front Switchboards.

1.3 SUBMITTALS

A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; and switchboard instrument details.

B. Product Data: Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations, configurations, and ratings of switchboards and their components on single line diagrams and plan layouts.
- B. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
 2)Regional materials
 3)Low-emitting adhesives.
 4)Low-emitting sealants.
 5)Low-emitting insulation.
 6)Low-emitting coatings and paints.
 7)Enviromental Product Declarations (EPD): For each product.
 8)Health Product Declaration (HPD): For each product.
 9)Laboratory tests for the products used.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept switchboards on site. Inspect for damage.
- B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with NEMA PB 2.1. Lift only with lugs provided. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

SWITCHBOARDS

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 SEQUENCING

A. Sequence Work to avoid interferences with building finishes and installation of other products.

PART 2 PRODUCTS

2.1 DISTRIBUTION SWITCHBOARDS

- A. Product Description: NEMA PB 2, enclosed switchboard with electrical ratings and configurations as indicated on Drawings.
- B. Bus:
 - 1. Material: Copper, standard size.
 - 2. Connections: Bolted, accessible for maintenance.
 - 3. Insulation: Fully insulate bus bars.
- C. Ground Bus: Insulated, extend length of switchboard.
- D. Minimum Short Circuit Rating: 65,000 symmetrical amperes rms, fully rated.
- E. Line and Load Terminations: Accessible, suitable for conductor materials and sizes as indicated on Drawings.
- F. Utility Metering Compartment: Furnish metering transformer compartment for Utility Company's use, in accordance with Utility Company requirements.
- G. Pull Box: Removable top and sides, same construction as switchboard, furnish insulating, fire-resistive bottom with separate openings for each circuit to pass into switchboard.
- H. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, insulated and braced for short circuit currents. Furnish continuous current rating.
- I. Enclosure: Type 1 General Purpose.
- J. Align sections.

- K. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
- L. Mimic Bus: Show bussing, connections and devices in single line form on front panels of switchboard.

2.2 FUSIBLE SWITCH ASSEMBLIES

- A. Product Description: NEMA KS 1, Type HD, load interrupter knife switch. Handle lockable in OFF position.
- B. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.

2.3 MOLDED CASE CIRCUIT BREAKER

- A. Product Description: UL 489, molded-case circuit breaker.
- B. Current Limiting Circuit Breaker: Circuit breaker indicated as current-limiting have automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.
- C. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; instantaneous trip; and adjustable short time trip.
- D. Current Limiter: Designed for application with molded case circuit breaker.
 - 1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
 - Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

2.4 INSULATED CASE CIRCUIT BREAKER

- A. Product Description: UL 489, enclosed, insulated-case circuit breaker.
- B. Trip Unit: Electronic sensing, timing, and tripping circuits for adjustable current settings; instantaneous trip; and adjustable short time trip.

2.5 GROUND FAULT DEVICES

- A. Ground Fault Sensor: Zero sequence or Ground return type.
- B. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes. Furnish monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

2.6 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Product Description: IEEE C62.41, factory-mounted transient voltage surge suppressor, selected to meet requirements for exposure and to coordinate with system circuit voltage.

2.7 AMMETERS AND VOLTMETERS

- A. Ammeters: ANSI C39.1; direct-reading, full range, indicating ammeter with 4.5 inch (115 mm) square recessed case and 250-degree scale, white dial with black figures and pointer, 5 ampere, 60 Hertz movement, 1 percent accuracy.
- Voltmeters: ANSI C39.1; direct-reading, full range, indicating voltmeter with 4.5 inch (115 mm) square recessed case and 250-degree scale, white dial with black figures and pointer, 120 volt, 60 Hertz movement, 1 percent accuracy.

2.8 METER TRANSFER SWITCHES

- A. Ammeter Transfer Switch: Rotary multistage snap-action type with 600-volt AC-DC silver plated contacts, engraved escutcheon plate, and four positions including OFF.
- B. Voltmeter Transfer Switch: Rotary multistage snap-action type with 600-volt AC-DC silver plated contacts, engraved escutcheon plate, and multiple positions including OFF.

2.9 POWER METERS

- A. Watt-hour Meters and Wattmeters: ANSI C12.1; three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz. Meter suitable for connection to 3- and 4-wire circuits. Furnish potential indicating lamps; adjustments for light and full load, phase balance, and power factor; four-dial clock register; ratchets to prevent reverse rotation; removable meter with draw-out test plug; semi-flush mounted case with matching cover.
- B. Impulse-Totalizing Demand Meter: ANSI C12.1; suitable for use with switchboard watthour meter, including two circuit totalizing relays; cyclometer; positive chart drive mechanism; capillary pen holding minimum one-month ink supply; and roll chart with minimum 31-day capacity.
- C. Furnish meters with appropriate multiplier tags.

2.10 METERING TRANSFORMERS

A. Current Transformers: IEEE C57.13; 5 amperes secondary, with secondary winding and secondary shorting device, primary/secondary ratio as indicated on Drawings, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

B. Potential Transformers: IEEE C57.13; 120-volt, disconnecting type with integral fuse mountings, primary/secondary ratio as indicated on Drawings, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify surface is suitable for switchboard installation.

3.2 INSTALLATION

- A. Install in accordance with NEMA PB 2.1.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- C. Install fuses in each switch and coordinate sizes with connected load.
- D. Install engraved plastic nameplates.
- E. Install breaker circuit directory.
- F. Ground and bond switchboards.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.1.

3.4 ADJUSTING

- A. Adjust operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Distribution and branch circuit panelboards.
 - 2. Electronic grade branch circuit panelboards.
 - 3. Load centers.

1.2 **REFERENCE STANDARDS**

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE C62.41 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 Low Voltage Cartridge Fuses.
 - 2. NEMA ICS 2 Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
 - 3. NEMA ICS 5 Industrial Control and Systems: Control Circuit and Pilot Devices.
 - 4. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
 - 5. NEMA PB 1 Panelboards.
 - 6. NEMA PB 1.1 General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

- 1. UL 50 Cabinets and Boxes
- 2. UL 67 Safety for Panelboards.
- 3. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
- 4. UL 1283 Electromagnetic Interference Filters.
- 5. UL 1449 Transient Voltage Surge Suppressors.
- 6. UL 1699 Arc-Fault Circuit Interrupters.

SPECIAL WORKING CONDITIONS

1.3 SUBMITTALS

- A. Product Data: Submit catalog data showing specified features of standard products.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 NOT USED

1.6 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker type or fusible switch type panelboard.
- B. Materials

- 1. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.
- Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class [R] [J] fuses.
- 3. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- 4. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
- 5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.
- 6. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic or solid-state controller for induction motors rated in horsepower.
 - a. Two-speed Controllers: Include integral time delay transition between FAST and SLOW speeds.
 - b. Full-voltage Reversing Controllers: Include electrical interlock between FORWARD and REVERSE rotation.
 - c. Overload Relay: NEMA ICS 2.
 - d. Auxiliary Contacts: NEMA ICS 2.
 - e. Cover Mounted Pilot Devices: NEMA ICS 5.
 - f. Pilot Device Contacts: NEMA ICS 5, Form Z.
 - g. Selector Switches: Rotary type.
 - h. Relays: NEMA ICS 2.
- 7. Circuit Breaker Accessories: Trip units and auxiliary switches.
- 8. Enclosure: NEMA PB 1.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Materials:

- 1. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard
- 2. Molded Case Circuit Breakers: UL 489, thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Provide UL class 760 arc-fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.
- 3. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating

SPECIAL WORKING CONDITIONS
100,000 symmetrical amperes, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

- 4. Enclosure: NEMA PB 1.
- C. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finishes:

2.3 ELECTRONIC GRADE PANELBOARD

- A. Description:
 - 1. Integral Surge Suppresser: Component recognized in accordance with UL 1449 and UL 1283.
 - 2. Panelboard: UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.

B. Performance:

- 1. Integral Surge Suppressers:
 - a. Meet or exceed the following criteria:
 - 1) Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
 - 2) Clamping voltage not exceeding the following:

Voltage	L-N	N-G	L-G
208Y/120	500 V	500 V	500 V
480Y/277	1000 V	1000 V	1000 V

C. Fabrication:

- 1. Integral Surge Suppresser:
 - a. Furnish copper bus bars for surge current path.
 - b. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.
 - c. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.
 - d. Furnish response time no greater than five nanoseconds for individual protection modes.
 - e. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
 - f. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.
 - g. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50: 1 using Mil Std. 220A methodology.
- 2. Panelboards

SPECIAL WORKING CONDITIONS

- a. Top or bottom feed as indicated on Drawings. Furnish circuit directory inside door.
- b. Construct box of galvanized steel. Box size as indicated on Drawings.
- c. Main bus constructed of copper and rated for load current.
- d. Furnish interior with branch circuit breakers. Furnish circuit breaker, with appropriate number of poles, as dedicated disconnect for TVSS.
- e. Furnish neutral assembly with neutral bus.
- f. Furnish with insulated ground bus and safety ground bus.
- g. Furnish wiring gutters in accordance with NEC.
- h. Field connections to panelboard: main lug or main breaker type.
- i. Construct with flush mounted trim and NEMA Type 1 enclosure.
- j. Furnish with branch breaker positions and nominal current rating as indicated on Drawings.

2.4 LOAD CENTERS

- A. Description: Circuit breaker load center, with bus ratings as indicated on Drawings.
- B. Performance:
 - 1. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.
- C. Materials:
 - 1. Molded Case Circuit Breakers: UL 489, plug-on type thermal magnetic trip circuit breakers, with common trip handle for poles, listed as Type SWD for lighting circuits, Class A ground fault interrupter circuit breakers. Do not use tandem circuit breakers.
 - 2. Enclosure: General Purpose.
- D. Box: Flush type.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards and load centers in accordance with NEMA PB 1.1.
- B. Install panelboards and load centers plumb.
- C. Install recessed panelboards and load centers flush with wall finishes.
- D. Height: 6 feet to top of panelboard and load center; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- E. Install filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard and load center. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.

- G. Install engraved plastic nameplates.
- H. Ground and bond panelboard enclosure.

3.2 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.
- C. Perform switch inspections and tests listed in NETA ATS, Section 7.5.
- D. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.3 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.4 CLEANING

A. Clean existing panelboards and load centers to remain or to be reinstalled.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes wall switches; wall dimmers; receptacles; multioutlet assembly; and device plates and decorative box covers.

1.2 **REFERENCES**

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 1 General Requirements for Wiring Devices.
 - 2. NEMA WD 6 Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
2)Regional materials
3)Low-emitting adhesives.
4)Low-emitting sealants.
5)Low-emitting insulation.
6)Low-emitting coatings and paints.
7)Enviromental Product Declarations (EPD): For each product.
8)Health Product Declaration (HPD): For each product.
9)Laboratory tests for the products used.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

WIRING DEVICES

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Product Description: NEMA WD 1, AC only general-use snap switch.
- B. Ratings: Match branch circuit and load characteristics.

2.2 WALL DIMMERS

- A. Product Description: NEMA WD 1, semiconductor dimmer.
- B. Power Rating: As indicated on Drawings.
- C. Accessory Wall Switch: Match dimmer appearance.

2.3 RECEPTACLES

- A. Product Description: NEMA WD 1, general use receptacle.
- B. Configuration: NEMA WD 6.
- C. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.4 MULTIOUTLET ASSEMBLY

- A. Multi-outlet Assembly: Sheet metal channel with fitted cover, suitable for use as multi-outlet assembly.
- B. Receptacles: Furnish covers and accessories to accept receptacles specified in this Section.
- C. Receptacles: NEMA WD 6, type 5-15R, single receptacle.
- D. Fittings: Furnish manufacturer's standard couplings, elbows, and connectors

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify outlet boxes are installed at proper height.
- B. Verify wall openings are neatly cut and completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

WIRING DEVICES

3.2 PREPARATION

A. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on bottom.
- F. Install wall plates on flush mounted switches, receptacles, and blank outlets.
- G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- H. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.
- I. Use jumbo size plates for outlets installed in masonry walls.
- J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

WIRING DEVICES

3.6 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

WIRING DEVICES

SECTION 262813

FUSES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fuses.

1.2 **REFERENCE STANDARDS**

A. National Electrical Manufacturers Association:1. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

A. Product Data: Submit data sheets showing electrical characteristics, including timecurrent curves.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
2)Regional materials
3)Low-emitting adhesives.
4)Low-emitting sealants.
5)Low-emitting insulation.
6)Low-emitting coatings and paints.
7)Enviromental Product Declarations (EPD): For each product.
8)Health Product Declaration (HPD): For each product.
9)Laboratory tests for the products used.

1.6 QUALITY ASSURANCE

A. Qualifications:

FUSES

1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

- A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.
- B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

2.2 FUSES

- A. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.3 CLASS RK1 (TIME DELAY) FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.4 CLASS RK1 (NON-TIME-DELAY) FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.5 CLASS RK5 FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.6 CLASS J (TIME DELAY) FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.7 CLASS J (NON-TIME-DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

FUSES

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.8 CLASS T FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.9 CLASS L (FAST-ACTING) FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.10 CLASS L (TIME DELAY) FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.11 CLASS G FUSES

- A. Dimensions and Performance: NEMA FU 1.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fuse with label oriented so manufacturer, type, and size are easily read.

END OF SECTION

SECTION 265213

EMERGENCY AND EXIT LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes emergency lighting units.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SYSTEM DESCRIPTION

A. Emergency lighting to comply with requirements.

1.4 SUBMITTALS

A. Product Data: Submit dimensions, ratings, and performance data.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
2)Regional materials
3)Low-emitting adhesives.
4)Low-emitting sealants.
5)Low-emitting insulation.
6)Low-emitting coatings and paints.
7)Enviromental Product Declarations (EPD): For each product.
8)Health Product Declaration (HPD): For each product.
9)Laboratory tests for the products used.

PART 2 PRODUCTS

2.1 EMERGENCY LIGHTING UNITS

A. Product Description: Self-contained emergency lighting unit.

EMERGENCY AND EXIT LIGHTING

- B. Battery: 1.5-hour capacity.
- C. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
- D. Lamps: Compact fluorescent or LED
- E. TEST switch: Transfers unit from external power supply to integral battery supply.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended exit signs using pendants supported from swivel hangers. Install pendant length required to suspend sign at indicated height.
- B. Install surface-mounted emergency lighting unitsplumb and adjust to align with building lines and with each other. Secure to prevent movement.
- C. Install accessories furnished with each emergency lighting unit.
- D. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within unit.
- E. Install specified lamps in each emergency lighting unit.
- F. Ground and bond emergency lighting units.

3.2 FIELD QUALITY CONTROL

A. Operate each unit after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust lamp fixtures.

3.4 PROTECTION OF FINISHED WORK

A. Relamp emergency lighting units having failed lamps at Substantial Completion.

END OF SECTION

SECTION 265619

LED EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes exterior luminaries, poles, and accessories.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C82.1 American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
 - 2. ANSI C82.4 American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
 - 3. ANSI O5.1 Wood Poles, Specifications and Dimensions.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire not standard Product of manufacturer.
- B. Product Data: Submit dimensions, ratings, and performance data.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Sustainability certification required for the project is Florida Green Building Council Silver, administered by the Florida Green Building Council, Inc., Select products and implement measures to achieve the required certification with the intent of reducing energy consumption, maximizing performance, minimizing waste, and encouraging increased sustainability:

1)Recycled content.
2)Regional materials
3)Low-emitting adhesives.
4)Low-emitting sealants.
5)Low-emitting insulation.
6)Low-emitting coatings and paints.
7)Enviromental Product Declarations (EPD): For each product.
8)Health Product Declaration (HPD): For each product.
9)Laboratory tests for the products used.

LED EXTERIOR LIGHTING

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

1.6 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Product Description: Complete exterior luminaire assemblies, with features, options, and accessories as scheduled.

2.2 METAL POLES

A. Material and Finish: Aluminum or Concrete with exposed aggregate finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify foundations are ready to receive fixtures.

3.2 INSTALLATION

- A. Install poles plumb.
- B. Install lamps in each luminaire.
- C. Bond and ground luminaire.

3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
- B. Measure illumination levels to verify conformance with performance requirements.
- C. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.4 ADJUSTING

A. Aim and adjust luminaries to provide illumination levels and distribution.

LED EXTERIOR LIGHTING

3.5 CLEANING

- A. Clean photometric control surfaces as recommended by manufacturer.
- B. Clean finishes and touch up damage.

3.6 PROTECTION OF FINISHED WORK

A. Relamp luminaries having failed lamps at Substantial Completion.

END OF SECTION

LED EXTERIOR LIGHTING

SECTION 310000 EARTHWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide labor, materials, equipment and transportation necessary to complete the Earthwork, as indicated on the Drawings, as specified herein or both. This shall include, but not be limited to, bringing the building sites, paved areas and open areas to the lines and grades shown on the Drawings.
- B. Including but not necessarily limited to the following:
 - 1. Excavation
 - 2. Backfilling
 - 3. Filling
 - 4. Rough Grading
 - 5. Compaction
- C. There shall be no classification of excavation regardless of materials encountered.

1.2 RELATED WORK

- A. Section 023000 Subsurface Investigation
- B. Section 311000 Site Clearing
- C. Section 312333 Trenching, Backfill, and Compact Utility Systems

1.3 SITE INSPECTION

A. Visit the site and become acquainted with existing conditions. Make subsurface investigation for site and subsurface conditions. Perform subsurface investigations under time schedules and arrangements approved in advance by the City.

1.4 TOPOGRAPHIC INFORMATION

A. The existing grades shown on the drawings are approximate only and no representation is made as to their accuracy or consistency. Verify existing grades to the extent necessary to construct the work to the proposed grades indicated.

1.5 DISPOSAL OF SURPLUS OF UNSUITABLE MATERIAL

A. Dispose of undesirable material off site. Materials which may be disposed of on site will be indicated by the City and the appropriate location identified.

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1.6 BENCHMARKS AND MONUMENTS

A. Employ a registered surveyor to lay out lines and grades as indicated and to establish permanent benchmarks. Make benchmarks easily accessible and maintain and replace if disturbed or destroyed.

1.7 UTILITIES

- A. Before starting site operations, disconnect or arrange for the disconnection of utility services designated to be removed, performing such work in accordance with the requirements of the utility company or agency having jurisdiction.
- B. Locate existing active utility lines traversing the site and provide for their protection. Preserve in operating condition active utilities adjacent to or traversing the site and/or designated to remain.
- C. Observe rules and regulations governing respective utilities. Adequately protect utilities from damage, remove or replace as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of utilities.

1.8 QUALITY ASSURANCE

- A. A soil engineer may be retained by the City to observe performance of work in connection with excavating, filling, grading, and compaction. Re-adjust work which the soils engineer finds that does not meet technical or design requirements. Make no deviations from the Contract Documents without specific and written acceptance of the City.
- B. Give primary emphasis to the aesthetic appearance and functioning of berming and swales for both rough grades and fine grades. Employ skilled personnel and use adequate equipment to provide finish grading to be smooth, aesthetically pleasing, well drained, and ideal for receiving seed, sod and plant materials.
- C. Meet requirements of building codes and public agencies having jurisdiction upon the work.

PART 2 - PRODUCTS

2.1 EMBANKMENT

A. The maximum sizes of rock which will be permitted in the completed fill areas are as follows:

Depth Below	Maximum
Allowable Finish Grade	Diameter
Top 12 inches	1 inch
12 inches to 2 feet	2 inches

2 feet to 4 feet	6 inches
4 feet to 8 feet	12 inches
Below 8 feet	36 inches

- B. Do not use fill material containing debris, sod, and biodegradable materials as fill in construction areas.
- C. Soil used for fill and fine grading shall have sufficient percolation and surface drainage to support grass and plant materials.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Prevent dust from construction operations from interfering with other site operations or with adjacent property. Methods used for dust control are subject to acceptance by the City prior to use.
- B. Protect existing objects and vegetation. In the event of damage, immediately make repairs, and replacements necessary to restore the objects or vegetation.

3.2 EXCAVATION

- A. Excavate where indicated and necessary to obtain subgrades.
- B. Remove existing obstructions after acceptance by the City.
- C. Remove from site and dispose of debris and excavated material not required or acceptable for fill.

3.3 BACKFILL, FILLING & GRADING

- A. Cut, backfill, fill and grade-to-grade lines indicated. The proposed grades shown on the drawings are for establishing a smooth and even finished grade over the site. Playing fields are to be laser-graded.
- B. Place fill material in horizontal layers and spread to obtain a uniform thickness.
- C. After compaction, layers of fill are not to exceed twelve (12) inches for cohesive soils or eight (8) inches for noncohesive soils.

3.4 COMPACTION

- A. Compact each layer of fill to achieve the following maximum density at optimum moisture, AASHTO T 180 latest edition.
 - 1. Roadway, curbs, walks and other paved areas: a minimum of 98%.
 - 2. Under landscaped area, 95%.

- B. Do not place backfill against masonry or other exposed building surface until permission has been given by the City, and in no case until the masonry has been in place seven days.
- C. Do not permit construction equipment within ten (10) feet of masonry or other exposed building surface.
- D. Obtain compaction in limited areas by the use of mechanical tampers or approved hand tampers. When hand tampers are used, deposit material in layers not more than four inches thick. Use hand tampers suitable for this purpose and having a face area of not more than 100 square inches. Prevent wedging action against masonry, or other exposed building surfaces.
- E. Compaction Requirements: The following compaction test requirements shall be in accordance with AASHTO T-180. Where agency or utility company requirements govern, the highest compaction standards shall apply.

	Percentage of
Location or Use of Fill	Maximum Density
Pipe zone backfill portion above bedding	
for flexible pipe.	98
Pipe zone backfill bedding and over- excavated zones under bedding/pipe	
for flexible pipe, including trench plugs.	98
Pipe zone backfill portion above bedding for rigid pipe.	98
Pipe zone backfill bedding and over-	
excavated zones under bedding/pipe for rigid pipe.	98
Final backfill, beneath paved areas or structures	98
Final backfill, not beneath paved areas or structures	95

Trench zone backfill, not beneath paved		
areas of structures, including trench plugs	30	
Embankments	98	
Embankments, beneath payed areas		
or structures	98	
Backfill beneath structures, hydraulic		
structures	98	
Backfill around structures	98	

	Percentage of
Location or Use of Fill	Maximum Density
Topsoil (Type K material)	80
Aggregate base or subbase	
Type G or M material)	98

3.5 CORRECTION OF GRADE

- A. Bring to required grade levels areas where settlement, erosion or other grade changes occur.
- B. Adjust grades to carry drainage away from buildings and to prevent ponding around the buildings and on pavements.

3.6 MAINTENANCE AND PROTECTION OF WORK

A. Protect the public, workers, or other contractors from injury or from causing damage to the works in progress through maintenance and protection of the work.

3.7 AS-BUILT SURVEY

A. At the completion of the work and prior to final inspection of the area, provide the City with an as-built topographic survey made by a registered Surveyor.

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- B. The surveyor is to certify on the survey whether or not the as-built conditions conform to the contours shown on the Drawings to within plus or minus one-tenth (0.1) of a foot and what the variation is if over one-tenth of a foot.
- C. Provide one reproducible copy and five prints of the survey to the City.

END OF SECTION 023000

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SECTION 311000 SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing site utilities.
 - 7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 **PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from City and authorities having jurisdiction.
 - Provide alternate routes around closed or obstructed traffic ways if required by City or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation- control measures are in place.
- D. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.

- 6. Excavation or other digging unless otherwise indicated.
- 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 **PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
- D. Restore damaged improvements to their original condition, as acceptable to the City.

3.2 TEMPORARY EROSION AND SEDIMENTATIOIN CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

SITE CLEARING

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Construction manager not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Construction manager's written permission.
- C. Removal of underground utilities to be done under utility owner's guidelines.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 - 2. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 m), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth indicated on Drawings in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

SITE CLEARING

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Exhibit 2B

3.8 **DISPOSAL OF SURPLUS AND WASTE MATERIAL**

- Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, Α. and waste materials including trash and debris, and legally dispose of them off Owner's property.
- Separate recyclable materials produced during site clearing from other nonrecyclable Β. materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

TEMPORARY FIRE STATIONS #54

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade walks, pavements, turf and grasses, and plants.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for concrete slabs-on-grade.
 - 4. Subbase course for concrete walks, pavements.
 - 5. Subbase course and base course for asphalt paving.
 - 6. Excavating and backfilling for utility trenches.

1.2 **DEFINITIONS**

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.

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- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot- mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 QUALITIY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.

1.4 **PROJECT CONDITIONS**

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing

a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2- inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture ofcrushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 **PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost.

Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches (300 mm) each side of pipe or conduit. As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

Remove projecting stones and sharp objects along trench subgrade.

- 1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material, 4 inches (100 mm) deeper elsewhere, to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect, engineer or construction manager.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

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- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 18 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase Course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- E. Place and compact initial backfill of subbase material free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact

to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm)
 - 2. Walks: Plus or minus 1/2 inch (25 mm)
 - 3. Pavements: Plus or minus 1/2 inch (13 mm)
- C. Grading inside Building Lines: Finish subgrade to a tolerance of [1/2 inch (13 mm)] when tested with a 10-foot (3-m) straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements

and walks as follows:

- 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
- 2. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
- 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 ASTM D 1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

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

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312216 FINE GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.2 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Fine Grading work, as indicated on the drawings, as specified herein or both.

1.3 RELATED WORK

A. Section 310000 – Earthwork

1.4 SITE INSPECTION

A. The Contractor shall visit the site and become acquainted with all existing conditions. The Contractor shall be responsible for his own subsurface investigations, as necessary, to satisfy requirements of this Section. All subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the City.

1.5 EXISTING CONTOURS

A. Verify that contours and grades established in Plan Sheets are as required. Make whatever corrections and/or repairs necessary to make finish grades consistent with the requirements of the grading drawings and specifications.

1.6 UTILITIES

- A. Before starting site operations verify that the earlier Contractors have disconnected all temporary utilities which might interfere with the fine grading work.
- B. Locate all existing, active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or traversing the site that are designated to remain.
- C. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or relocate as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of active utilities.

1.7 QUALITY ASSURANCE

- A. Requirements of all applicable building codes and other public agencies having jurisdiction upon the work.
- B. Primary emphasis should be given to the aesthetic appearance and functioning of berming and swales, and to true and consistent grades on playing fields. The Contractor shall employ skilled personnel and any necessary equipment to insure that finish grading is smooth, aesthetically pleasing, drains well, and is ideal for receiving sod and plant materials.
- C. The Contractor shall employ laser turf leveling as a means to assure proper playfield grading.
- D. The allowable tolerance for the fine grading shall not exceed 1/4 inch over 10 feet.

1.8 SUBMITTALS

A. The contractor shall provide a complete list of equipment and methods to be used in laser grading and leveling.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Dust control:

Use all means necessary to prevent dust from construction operations from being a nuisance to adjacent property owners and from damaging finish surfaces on adjacent buildings, paving, etc. Methods used for dust control are subject to approval by the City.

B. Burning:

On-site burning will not be permitted.

C. Protection:

Use all means necessary to protect curbs, gutters, sprinklers, utilities and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary to the approval of the Landscape Architect. Contractor shall incur all cost for the replacement of damaged objects and vegetation.

3.2 SCHEDULING

- A. All rough grading and underground utilities shall be completed and approved by the City prior to finish grading.
- B. Coordinate all trades to avoid conflicts with work.

FINE GRADING
3.3 EXCAVATION

- A. Excavate where necessary to obtain subgrades, percolation and surface drainage as required. Excavate existing clay and silt from grass field areas.
- B. Materials to be excavated are unclassified.
- C. Remove entirely any existing obstructions after approval by the City.
- D. Remove from site and dispose of debris and excavated material not required.

3.4 GRADING

- A. The Contractor shall establish finished grades as shown on the Engineers grading plans and as directed by the City, including areas where the existing grade has been disturbed by other work.
- B. Finished grading shall be smooth, aesthetically pleasing, drain well and ready to receive sod and other plant material to full satisfaction of the City.
- C. Playfields grades shall be laser graded and shall be true to plane as indicated on drawings within 0.05'.

3.5 COMPACTION

A. Compaction and backfill requirements are specified in Section 310000 – Earthwork.

3.6 CORRECTION OF GRADE

- A. Bring to required grade levels areas where settlement, erosion or other grade changes occur. Adjust grades as required to carry drainage away from buildings and to prevent ponding around the buildings and on pavements.
- B. Remove all rock or objectional material larger than 1" any direction prior to commencing landscaping.
- C. Contractor shall be responsible for stabilizing grades by approved methods prior to landscaping, and shall be responsible for correction of grades as mentioned above, and cleanup of any wash outs or erosion.

END OF SECTION 312216

SECTION 312319 DEWATERING

PART 1 - GENERAL

- A. This Section includes all labor, materials, necessary equipment and services to complete the dewatering.
- B. The contractor shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.
- C. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.
- D. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- E. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- F. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with pearock.
- G. The water level shall be maintained below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
- H. Flotation shall be prevented by maintaining a positive and continuous removal of water.
- I. Well points and wells shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be conducted to ensure that the subsurface soil is not being removed by the dewatering operation.
- J. The water shall be disposed of a suitable manner without damage to adjacent property. The necessary dewatering permits shall be obtained. No water shall be drained into work built or under construction. Water shall be filtered using a silt box or another approved method to re- move sand and fine-sized soil particles before disposal into any drainage system. Storm drains used for dewatering shall be cleaned by a jet vac or other method approved after de- watering is complete.
- K. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

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L. A dewatering plan, prepared by a State of Florida licensed Professional Engineer or Registered Professional Geologist shall be submitted to the CONSTRUCTION MANAGER & CITY and approved prior to issuance of a dewatering permit. Contractor shall be responsible to pull all necessary permits in order to perform all dewatering activities.

1.1 SUMMARY

A. Section includes construction dewatering.

1.2 PERFORMANCE REQUIRMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, discharge lines, piezometers, and flow-measuring devices; and means of discharge, control of sediment, and disposal of water.
- B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Preinstallation Conference: Conduct conference at Project site.

1.5 **PROJECT CONDITIONS**

- A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Construction Manager if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

A. Dewatering, where required, may include the use of temporary reservoirs and diking, well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment must be maintained on the jobsite and operate within any local noise ordinance limits. All safety requirements, fencing, etc. shall be installed and maintained as necessary by the contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide temporary grading to facilitate dewatering and control of surface water.
- B. Monitor dewatering systems continuously.
- C. Protect and maintain temporary erosion and sedimentation controls, which are specified in and/or Division 31 Section "Site Clearing" during dewatering operations.
- D. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- E. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- F. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- G. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 1. Maintain piezometric water level a minimum of 24 inches (600 mm) below surface of excavation.
- H. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

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1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

END OF SECTION 312319

DEWATERING

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SECTION 312333

TRENCHING, BACKFILLING AND COMPACTING FOR UTILITY SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work included under this Section consists of clearing, excavating, grading and backfilling as required for the construction of the utility systems consisting of piping and appurtenances as shown on the Drawings and specified herein.

1.2 REQUIRED SAFTEY REGULATION

A. The Contractor shall be required to comply with chapter 90-96 of the Laws of Florida (The Trench Safety Act) and OSHA Standard 29 CFR, Section 1926.650 Subpart P. The Contractor shall submit with his contract, a signed and notarized copy of the Trench Safety Act compliance statement.

PART 2 - PRODUCTS

2.1 BEDDING MATERIAL

A. Bedding material for use below the water table or in wet trenches shall be peat rock, drainfield limerock or similar material as approved by the City. Pipe bedding material for use in dry trenches shall be limerock screenings, sand or other fine inorganic material as approved by the City.

2.2 ADDITIONAL BACKFILL MATERIAL

A. Additional backfill material shall be classified as A-I, A-3 or A-2-4 in accordance with AASHTO Designation M 145 and shall be free from vegetation and organic material. No stones or rocks shall be larger than six inches in diameter, and when placed within one foot of piping and appurtenances stones or rocks shall be no larger than two inches in diameter (one inch for PVC).

2.3 FILL BROUGHT FROM OFFSITE

B. All fill brought from offsite sources shall be tested and certified that they do not contain any hazardous materials, i.e. heavy metals, petroleum products, etc. Submit certifications to City prior to placing imported fill.

PART 3 - EXECUTION

3.1 CLEARING

A. The Contractor shall perform all clearing necessary for the proper installation of all piping and appurtenances in the locations shown on the Drawings. Plantings, shrubbery, trees, utility poles, or structures subject to damage resulting from the excavation shall be transplanted, relocated, braced, shored, or otherwise protected and preserved unless otherwise directed

by the City.

3.2 EXCAVATION

- A. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the Drawings, or as directed. All excavations shall be made by open cut. All existing utilities such as pipes, poles and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the **CITY**.
- B. Trench walls shall be kept vertical, and, if required to protect the safety of workmen, the general public, this or other work or structures, or to maintain trench widths within the limits hereinafter specified, shall be properly sheeted and braced. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting is used, it may be removed providing removal can be accomplished without disturbing the bedding, pipe or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the affected portion of the work. Not more than 100 feet of trench shall be opened ahead of pipe laying operations at one time unless a greater length of open trench is approved by the City.
- C. In areas where trench widths are not limited by right-of-way and/or easement widths, property line restrictions, existing adjacent improvements, including pavements, structures and other utilities, and maintenance of traffic, the trench sides may be sloped to a stable angle of repose of the excavated material. A substantially and safely constructed movable shield, "box" or "mole" may be used in place of sheeting when the trench is opened immediately ahead of the shield and closed immediately behind the shield as pipe laying proceeds inside the shield.
- D. Ladders or steps shall be provided for and used by workmen to enter and leave trenches.
- E. Pipe trenches for utility lines shall be excavated to a width within the limits of the top of the pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation or sheeting, if used, of 8 inches to 12 inches. Manhole excavations shall be carried to sufficient depth to permit their construction on the undisturbed bottom of the excavation.
- F. Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to convenient places of storage.
- G. All materials suitable for use as backfill shall be hauled to and used in areas where not enough suitable material is available from the excavation.
- H. Excess suitable material shall remain the property of the **CITY** and shall be disposed of within the limits of the project as directed by the City. The disposal area shall be finish graded upon completion of the work.

3.3 REMOVAL OF WATER

- A. It is a basic requirement of these specifications that excavations shall be free from water before pipe or structures are installed. However, it is realized that in certain sections of the work this cannot be accomplished economically and the Contractor may elect to use the Method of Construction noted under Section 3.10.
- B. The Contractor shall provide all necessary pumps, underdrains, well-point systems, and other means for removing water from trenches and other parts of the work. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench and so that it is above the natural water table.
- C. Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public. The Contractor shall submit his proposed methods of handling trench water and locations at which the water will be disposed of to the City for approval and shall receive approval before starting the excavation.

3.4 PIPE BEDDING

- A. As described above, all pipe trenches shall be excavated to a level eight inches below the outside bottom of the proposed pipe barrel. The resulting excavation shall be backfilled with approved pipe bedding material, up to the level of the lower one-third of the proposed pipe barrel. This backfill shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting. Bedding material for piping shall be pea rock, drainfield limerock, or similar materials as approved by the City. Limerock screenings, sand or other fine inorganic material from the excavation may be used for bedding material when pipe is installed above the natural water table.
- B. Any excavation below the levels required for installation of the pipe bedding, except for "Additional Excavation," as hereinafter specified, shall be backfilled with approved bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe, at no additional cost to the CITY.

3.5 BACKFILL UNDER MANHOLES, INLETS, AND METER VAULTS

A. Any excavation below the levels required for the proper construction of manholes or meter vaults shall be filled with Class C concrete. The use of earth, rock, sand or other materials for this purpose will not be permitted.

3.6 TRENCH STABILIZATION

A. No claim for extras, or additional payment will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the **CITY**.

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3.7 BACKFILL

- A. Backfilling of utility trenches will not be allowed until the work has been approved by the City, pressure tested if required, and the City indicates that backfilling may proceed. Any work which is covered or concealed without the knowledge and consent of the City shall be uncovered or exposed for inspection at no cost to the **CITY**. Partial backfill may be made to restrain the pipe during pressure testing.
- B. Backfill material shall be non-cohesive, nonplastic material free of all debris, organic material, lumps, clods and broken paving. Backfill material placed within one foot of piping and appurtenances shall not contain any stones or rocks larger than two inches in diameter (one inch for PVC) and no stones or rocks larger than six inches in diameter will be permitted in any backfill.
- C. If a sufficient quantity of suitable backfill material is not available from the trench or other excavations within the site of the work, the Contractor shall provide additional material suitable for this purpose. The additional material shall be installed as specified herein.
- D. Selected backfill material containing no stone or rocks larger than two inches shall be placed in six-inch layers and thoroughly tamped to a depth of 12 inches over the top of the pipe. Particular attention and care shall be exercised in obtaining thorough support for the branch of all service connection fittings. Care shall be taken to preserve the alignment and gradient of the installed pipe.
- E. After the backfill has been placed to a level 12 inches over the waterline or force main pipe, the remainder of the backfill shall be placed in layers, not to exceed nine inches, and compacted with mechanical vibrators or other suitable equipment to obtain a density of the backfilled material of not less than 95 percent of its maximum density as hereinafter defined for landscaped areas and 98 percent of maximum density for paved areas. Provide density tests for each lift.
- F. After selected backfill has been placed to a depth of 12 inches over the sewer pipe, backfilling shall proceed to a depth of 30 inches over the pipe by placing the backfill material in twelve-inch layers and thoroughly compacting it with mechanical vibrators. Backfill in this portion of the work shall be compacted to 95 percent of maximum density of the material as hereinafter defined for landscaped areas and 98 percent of maximum density for paved areas. Provide density tests for each lift.
- G. After the backfill has been placed to a level 30 inches over the sewer pipe, the remainder of the backfill shall be placed in layers, not to exceed twelve inches, and compacted with mechanical vibrators or other suitable equipment to obtain a density of the backfilled material of not less than 95 percent of its maximum density as hereinafter defined for landscaped areas and 98 percent of maximum density for paved areas. Provide density tests for each lift.
- H. Within paved areas of trench excavation, the base and surfacing shall be reconstructed as specified on the Roadway Restoration Detail shown on the plans.
- I. No more than 800 feet of trench with pipe in place shall be partially backfilled at any time.

3.8 COMPACTION AND DENSITIES

A. Methods of control and testing of backfill construction to be employed in this work are:

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- 1. Maximum density of the material in trenches shall be determined by AASHTO Designation T 180.
- 2. Field density of the backfill material in place shall be determined by AASHTO Designation T 238.
- B. Laboratory and field density tests which, in the opinion of the City, are necessary to establish compliance with the compaction requirements of these specifications, will be conducted at the **CITY**'s expense at intervals indicated in the Compaction Test Schedule on the plans. Tests will be made at depths and locations selected by the City.
- C. Trench backfill which does not comply with the specified densities, as indicated by such tests, shall be reworked and recompacted until the required compaction is secured, at no additional cost to the **CITY**. The costs for retesting such work shall be paid for by the Contractor.

3.9 ADDITIONAL EXCAVATION AND BACKFILL

- A. Where organic material, such as roots, muck, or other vegetative matter, or other material which, in the opinion of the City, will result in unsatisfactory foundation conditions, is encountered below the level of the proposed pipe bedding material, it shall be wholly or partially removed as directed by the City and wasted. Sheeting shall be installed if necessary to maintain pipe trenches within the specified limits. The resulting excavation shall be backfilled with suitable backfill material, placed in six-inch layers, tamped and compacted up to the level of the bottom of the proposed pipe bedding material. Sufficient compaction of this material shall be performed to protect the proposed pipe against settlement. Construction shall then proceed in accordance with the provisions of Article 3.4 Pipe Bedding.
- B. Additional excavation shall be performed only when ordered by the City. Where organic or other unsuitable material is encountered in the excavation, the Contractor shall bring the condition to the attention of the City and obtain his determination as to whether or not the material will require removal, prior to preparing the pipe bedding.
- C. Additional backfill material, if required, shall be furnished in accordance with the provisions therefore in Article 3.7

3.10 TRENCHING IN EXTREME WATER CONDITIONS

- A. General:
 - 1. A combination of conditions in the substrata, water table, or method of disposal may be encountered during the course of the work which make dewatering impossible, or only possible through the use of unusual methods, the cost of which is excessive. When such conditions are encountered, but only after all reasonable means to dewater the excavation have been employed without success, the Contractor, with the concurrence of the City, may elect to employ the following method of construction. The concurrence of the City shall be obtained in writing and shall limit the use of this method of construction to such specific portions of the work as the City shall determine.
 - 2. The construction specifications contained in the preceding parts of this section shall establish the required standards of construction quality for this work. Use of this method of construction described hereinafter shall in no way be construed as relieving the

Contractor of his basic responsibility for satisfactory completion of the work. No additional payment will be made to the Contractor for excavation, backfill, sheeting or any costs incurred for work or materials, or any other costs incurred as a result of the use of this method of construction.

- 3. Subject to all of the requirements stated herein above, including written approval of the City, construction will be permitted in accordance with the following specifications. All requirements of Article 3.1 through Article 3.9, inclusive, of these specifications shall apply to this construction unless otherwise specifically modified herein.
- B. Removal of Water: The installation of pipe, manholes and appurtenances under water will be permitted and the requirements of Article 3.3 Removal of Water will be waived.
- C. Excavation:
 - 1. Excavation of pipe trenches to the level of the bottom of the proposed pipe bedding shall be performed in accordance with Article 3.2 Excavation. If rock, such as limerock or other similar hard, cemented material providing firm, unyielding trench bottoms is encountered at the level of the bottom of the proposed pipe bedding, no additional excavation will be required. If material such as sand, marl, or other material which cannot be classified as rock as herein above defined, is encountered at the level of the bottom of the pipe trench shall be excavated to an additional depth of 10 inches minimum, below that level. This additional excavation, and the additional backfilling made necessary thereby, is an essential part of this alternate construction method and no additional payment will be made for this work, regardless of the type of material encountered.
 - 2. Excavation for manholes to be installed under water shall be continued to a depth, below the outside bottom of the proposed structure, which will provide a minimum space of 12 inches in rock, or 24 inches in sand, as the same are defined herein above, for the placement of drainfield limerock as herein after specified.
 - 3. The excavation of pipe trenches at their junction with excavations for manholes shall be modified in the following manner: A longitudinally sloping plane bottom surface, for the placement of pipe bedding material, shall be provided from the bottom of the manhole excavation, at its extremity, to a line of intersection with the bottom of the typical excavation of 10 feet measured horizontally, from the vertical plane of the manhole excavation.
- D. Pipe and Manhole Bedding: The pipe trench or manhole excavation shall be backfilled to receive the pipe or manhole with drainfield limerock as the same is commonly referred to in this area, up to the level of the lower one-third of the proposed pipe barrel, or to the outside bottom of the proposed manhole as applicable. This backfill shall be tamped and compacted to provide a proper bedding for the pipe or manhole, as also specified herein. Under no circumstances will material other than drainfield limerock be considered satisfactory for use as bedding material for underwater construction.
- E. Backfill:
 - 1. After the pipe is installed, backfilling shall proceed in accordance with the provisions of Article 3.7 Backfill, except that drainfield limerock shall be used to backfill around the pipe and to a level even with the top of the pipe bell. Under no circumstances will material other than drainfield limerock be considered satisfactory for this purpose.

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2. If this Method of Construction is used, all backfill material, including drainfield limerock, shall be carefully lifted into the trench and released to fall freely therein when the bucket or container is at or just above water level. Under no circumstances shall backfill material be dumped or pushed into trenches containing water. Below the existing water level, backfill material shall be carefully rammed into place in uniform layers. Above the water level, backfill material shall be placed and compacted as specified in Article 3.7 Backfill and Article 3.8 Compaction and Densities.

3.11 RESTORATION OF EXISTING SURFACES

A. Paved and grassed areas disturbed by the operations required under this Section shall be restored as indicated on the Drawings and/or specified herein.

END OF SECTION 312333

SECTION 321000 BASES, BALLASTS, AND PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Florida Department of Transportation "Standard Specifications for Road and Bridge Construction" (2000 or the latest edition) together with "Supplemental Specifications to the Standard Specifications for Road and Bridge Construction" (2000 or the latest edition) shall be used where applicable for the paving work, and where such wording therein refers to the State of Florida and its Department of Transportation and personnel, such wording shall be replaced with the wording which would provide proper terminology; thereby making such "Standard Specifications for Road and Bridge Construction" as the "Standard Specifications" for this project. If within a particular section, another section, article, or paragraph is referred to, it shall be part of the standard specifications also. The Contractor shall abide by all local and state laws, regulations and building codes, which have jurisdiction in the area.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, materials and equipment and perform all operations required to complete the construction as shown on the plans, and specified herein, or both.
- B. Provide a complete and operating facility in accordance with these specifications and the construction drawings. The material and equipment shown or specified shall not be taken to exclude any other incidentals necessary to complete the work. Work shall include, but not necessarily be limited to the following:
 - 1. Preparation, installation and compaction of subgrade
 - 2. Installation and compaction of limerock base
 - 3. Installation of Prime and Tack Coats
 - 4. Installation of asphalt surface course
 - 5. Installation of Concrete Curbing
 - 6. Installation of Concrete Sidewalk
 - 7. Installation of Reinforced and Non-Reinforced Concrete Flatwork
 - 8. Pavement Markings and Stripes
- C. The work included in this Section consists of cutting, removing, protection and replacing existing pavement of the various types encountered, driveways, sidewalks, curb and combination curb and gutter.
- D. Permits: The Contractor shall obtain the necessary permits, prior to any roadway work. Additionally, the Contractor shall provide advance notice to the appropriate authority, as required, prior to construction operations.

1.3 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements, shall govern the work under this section.

1.4 RELATED WORK

Section 310000 - Earthwork Section 312333 – Trenching and Backfilling

PART 2 - EXECUTION

2.1 SUBBASE

A. Subbase shall be prepared compacted and graded and shall be in accordance with Section 160 of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction, latest Edition".

2.2 BASE COURSE

A. Limerock base shall be prepared, compacted and graded and shall be in accordance with Section 200 of the Florida Department of Transportation "Standard Specifications" for Road and Bridge Construction, latest Edition". Limerock must be witnessed and approved by the Engineer of Record prior to placement of prime/tack coats.

2.3 PRIME AND TACK COATS

A. The City shall inspect the completed base course and the contractor shall correct any deficiencies and clean the base course prior to the placement of the prime coat. Tack coat will also be required if the City finds that the primed base has become excessively dirty or the prime coat has cured to the extent of losing bounding effect prior to placement of the asphaltic concrete surface course. The prime and tack coats shall be in accordance with section 300 of the "Standard Specifications".BACKFILL UNDER MANHOLES, INLETS, AND METER VAULTS

2.4 SURFACE COURSE

A. Asphaltic concrete surface course shall be constructed to the limits shown on the plans. The surface course shall consist of Type S-III asphaltic concrete. All asphaltic concrete shall be in accordance with Sections 320 and 330 of the "Standard Specifications." Type S-II asphaltic concrete shall be in accordance with Section 333 of the "Standard Specifications".

2.5 CONCRETE CURBING

A. Concrete curb shall be constructed to the limits shown on the plans. The concrete shall have a minimum compressive strength of 4000 psi at 28 days.

2.6 CONCRETE SIDEWALK

A. Concrete sidewalk shall be constructed to the limits shown on the plans. The concrete shall have a minimum compressive strength of 3000 psi at 28 days. The concrete shall have a minimum thickness of 6 inches unless indicated otherwise on the plans.

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2.7 REINFORCED AND NON-REINFORCED COCNRETE FLATWORK

A. Concrete Flatwork shall be constructed to the limits shown on the plans. The concrete shall have a minimum compressive strength of 3000 psi at 28 days. The concrete shall have a minimum thickness of 6 inches unless indicated otherwise on the plans.

2.8 PAVEMENT MARKINGS AND STRIPES

A. Pavement Markings and Stripes shall be placed as shown on the plans. Pavement Marking and Striping work shall be in accordance with Section 710 and 711 of the "Standard Specifications" and in accordance with the MUTCD (latest Edition) and City of Fort Lauderdale Construction Standards and Specifications.

END OF SECTION 321000

SECTION 321216 BASES, BALLASTS, AND PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold milling of existing hot-mix asphalt pavement.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving.
 - 4. Hot-mix asphalt paving overlay.
 - 5. Pavement-marking paint.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.
 - 1. The mixing plant shall be an automatic or semiautomatic controlled commercially manufactured unit designed and operated to consistently produce a mixture within the job-mix formula (JMF). Drum mixers shall be prequalified at the production rate to be used during actual mix production. The prequalification tests will include extraction and recovery of the asphalt cement in accordance with ASTM D 2172 and ASTM D 1856. The penetration of the recovered asphalt binder shall not be less than 60 percent of the original penetration, as measured in accordance with ASTM D 5.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of City of Fort Lauderdale standards and Broward County Standards as indicated in drawings for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- C. Preinstallation Conference: Conduct conference at Project site

1.4 **PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073 [or] [AASHTO M 29], sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a
- B. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILLIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
 - 1. Color: As indicated

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- C. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
 - 1. Color: As indicated
- D. Glass Beads: AASHTO M 247, Type 1.
- E. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, as indicated in drawings.] Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 10-inch (254-mm) minimum length.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.
- C. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a depth of 1 inches (25 mm)

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise

indicated. Cut excavation faces vertically. Recompact existing unboundaggregate base course to form new subgrade.

- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hotmix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.4 SUBSURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted- aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 SUBSURFACE PREPARATION

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

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- 1. Clean contact surfaces and apply tack coat to joints.
- 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
- 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
- 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory- plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch (13 mm).
 - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

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- 1. Base Course: 1/4 inch (6 mm)
- 2. Surface Course: 1/8 inch (3 mm)
- 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.9 PAVEMENT MARKINGS

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 2. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.10 WHEEL STOPS

- A. Install wheel stops in bed of adhesive as recommended by manufacturer.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 323113 CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work included in this Section consists of furnishing all labor, equipment and materials and in performing all operations necessary for installing chain link fencing, locks, and accessories. Extent of chain link fences and gates is indicated on Drawings and described in these Specifications. In addition, all electrical conduits and motors shall be provided by the contractor.

1.2 RELATED WORK

- 1. Section 310000 Earthwork
- 2. Section 312216 Fine Grading

1.3 QUALITY ASSURANCE

- A. Chain link fencing shall be manufactured in accordance with the requirements of the CLFMI Manual. Fence manufacturer shall me a CLFMI member.
- B. Fence manufacturer shall have at least ten years of experience in the manufacture of vinyl-coated steel chain link fencing.
- C. The fence fabric, posts, gates, and all hardware shall be manufactured and supplied by a single manufacturer, to ensure compatibility of all the fence elements and to define a single source responsibility.

1.4 SUBMITTALS

- A. Shop Drawings: Show fence layout, post locations, gates, gate operator (including keypad locations), electrical conduit & wiring, details illustrating fence height, gate width, size of posts, rails, braces, fittings, and hardware.
- B. Product Data: Submit catalog cuts and manufacturer's detail specifications.
- C. Warranty: Vinyl coated chain link fence systems shall be supplied with minimum fifteen (15) year factory warranty.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Dimensions indicated for pipe are outside dimensions, exclusive of coatings. All posts and rails shall be Schedule 40 pipe.
- B. CONTRACTOR shall provide 30' Wide Automatic Rolling Gate, Gate Operator shall be Manufactured by LIFTMASTER, Model Number CSL24UL, 1 HP for a minimum of 1,500 lbs. Gate Operator to be provided and installed by CONTRACTOR, including concrete pad and all required conduit & wiring for electrical service and connection to Wireless Keypad base, Wireless Keypad with Structural Base (Manufactured by

LIFTMASTER Wireless Keypad Model Number KPW250), & Internet Gateway (Manufactured by LIFTMASTER Model Number 828LM).

2.2 FENCE FABRIC

- A. Fabric shall be PVC coated thermally fused and bonded to a primer which is thermally cured onto galvanized steel core wire conforming to ASTM F 668, Class 2. Minimum coating thickness shall be 0.007 in.
- B. Fabric shall be woven into 1-3/4 in. mesh of 9 gauge and 6 gauge (o.148) galvanized wire core with a minimum breaking strength of 1,290 lbs./ft. in accordance with ASTM F 668, Class 2. Coated wire size shall be 8 gauge (0.165 in.). Other gauges may be required as noted on the plans.
- C. Zinc for galvanized coating shall conform to ASTM b 6, galvanized by hot dipped method AISI Type 1, before vinyl coating; coating shall be smooth. Minimum weight of zinc coating shall be 1.2 oz. per sq. ft. (0.30 oz./ft.).
- D. Polyvinyl chloride coating shall meet the following requirements:
 - 1. Specific gravity shall be 1.30 maximum, tested in accordance with ASTM D 792.
 - 2. Hardness shall be a minimum Durometer reading of A 95 in accordance with ASTM D 2240. Ultimate elongation shall be 275% in accordance with ASTM D 412.
 - 3. Tensile strength shall have a test minimum of 3,300 p.s.i. in accordance with ASTM D 412.
 - 4. Vinyl shall be a dense and impervious covering free of voids, having a smooth, lustrous surface without pinholes, bubbles, voids, or rough or blistered surface.
 - 5. Fabric shall be furnished with salvages knuckled on both the top and bottom edges.
 - 6. Furnish one-piece fabric widths up to 12 ft. in height.
- E. Fence fabric color shall be black

2.3 FENCE POSTS, HARDWARE, AND FITTINGS-GENERAL

- A. All posts, fittings, etc. shall be PVC coated same as all fence fabric. Fittings shall be of best quality malleable iron casting, wrought iron forgings, or pressed steel and provided with pin connections. Equipment shall be designed to carry 100% overload. All fittings and accessories shall be vinyl coated with color to match fence fabric.
 - 1. Malleable iron castings shall be hot-dipped galvanized in accordance with ASTM A 153.
 - 2. Wrought iron forgings or pressed steel fitting and appurtenances shall be hotdipped galvanized in accordance with ASTM A 123.
 - 3. Fence hardware coating shall match fence fabric coating.

- B. Piping shall be steel conforming to ASTM A 569 (SS40).
- C. Galvanized items shall be galvanized in accordance with ASTM A 123, A 153, or A 385, as applicable.
- D. Bolts which are installed 6 ft. or less above grade shall not protrude more than ¼ in. beyond the nut after tightening. Rough edges shall be filed smooth. All fittings and accessories shall be vinyl coated with color to match fence fabric.
- E. Contractor shall provide all gate motors, belts, key/swipe pads on goosenecks (w/ bollard protection), underground conduit, and all electrical required for a complete system. Gates shall be motorized with both remote and key/swipe controls. See drawings.

2.4 POSTS

- A. End, Corner and Pull Posts: minimum sizes and weights as follows:
 - 4. Up to 6' fabric height, 2.5" OD steel pipe, 3.65 lbs. per LIN ft.
 - 5. Over 6' fabric height, 3" OD steel pipe, 5.79 lbs. per LIN ft.
- B. Line Posts: Space uniformly at approximately 10' o.c. maximum, unless otherwise indicated, of following minimum sizes and weights.
 - 6. Up to 6' fabric height, 2" steel pipe, 2.70 lbs.per LIN ft.
 - 7. 6' to 8' fabric height, 2.5" OD steel pipe, 3.654 lbs. per LIN ft.
 - 8. Over 8 fabric height, 3" OD steel pipe, 5.79 lbs. per LIN ft.

2.5 RAILS

A. TOP RAIL; Manufacturer's longest length, with expansion type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate corner, pull and end post.

1-5/8" OD pipe, 2.70 lbs. per ft.

B. MID RAIL: Provide means for attaching fabric securely to each gate corner, pull and end post.

1-5/8" OD pipe, 2.70 lbs. per ft.

C. BOTTOM RAIL: Provide means for attaching bottom rail securely to each gate corner, pull and end post.

1-5/8" OD pipe, 2.70 lbs. per ft.

2.6 GATES

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal

and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members a maximum of 8' apart unless otherwise indicated.

Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.

Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

- B. SWING GATES: Fabricate perimeter frames of minimum 2" OD Schedule 40 pipe, weighing 1.9 lb./ft.
- C. SLIDING/ROLLING GATES: See drawing sheets for location and type. Contractor to provide all required power, control, and tie-ins to complete system. Contractor to provide 10 pin control per Fire Dept. requirements
- D. GATE HARDWARE: Provide hardware and accessories for each gate, galvanized per ASTM a 153, and in accordance with the following:
 - 1. Hinges: Provide 1 pair of hinges for each leaf. Size and material to suit gate size, nonlift-off type, offset to permit 180 degree gate opening. Provide 1 extra hinge for each leaf cover over 6" nominal height.
 - 2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
 - 3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
 - 4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
- E. GATE POSTS: Furnish posts for supporting single gate leaf, or one leaf of double gate installation, for nominal gate widths as follows:

Leaf Width	Gate Post	lbs./LIN ft.
Up to 6'	3"	5.79
Over 6' to 13'	4.000" OD pipe	9.11
Over 13' to 18'	6.625" OD pipe	18.97
Over 18'	8.625" OD pipe	28.55

2.7 POST CAPS

A. POST CAPS: Provide weathertight closure cap with loop to receive tension wire or top rail; one cap for each post.

2.8 TENSION WIRE

A. TENSION WIRE: 6-ga. Coated coil spring wire, metal and finish to match fabric. Locate at bottom of fabric.

2.9 TENSION WIRE

- A. WIRE TIES: 11-ga. Galvanized steel or 11 ga. Aluminum wire, to match fabric core material.
- A. WIRE TIES: 11-ga. Galvanized steel or 11 ga. Aluminum wire, to match fabric core material.

2.10 TENSION BARS

A. TENSION BARS: One-piece lengths equal to full height of fabric, with minimum cross- section of 3/16" x ³/₄" Provide one tension bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into post.

2.11 POST BRACE ASSEMBLY

A. POST BRACE ASSEMBLY: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

2.12 CONCRETE

A. CONCRETE: Provide concrete consisting of portland cement, ASTM C 150 aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3,500 p.s.i., ³/₄" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

3.1 INSTALLATION

Do not begin installation and erection before final grading is completed, unless otherwise permitted.

EXCAVATION: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
If not indicated on drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross-section of post.

Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

- B. SETTING POSTS: Center and align posts in holes 4" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Unless otherwise indicated, extend concrete footings ½" above grade and trowel to a crown to shed water.
- C. TOP RAILS: Run rail continuously through post caps bending to radius for curved

runs. Provide expansion couplings as recommended by fencing manufacturer.

- D. CENTER/MID RAILS: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.
- E. BRACE ASSEMBLIES: Install braces so posts are plumb when diagonal rod is under proper tension.
- F. TENSION WIRE: Install tension wires through post cap loops before stretching fabric and tie to each post cap. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.
- G. FABRIC: Leave approximately 2" between finish grade and bottom salvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- H. TENSION BARS: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15"o.c.
- I. GATES: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- J. TIE WIRES: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
 - 1. Tie fabric to line posts, with wire ties spaces 12" o.c.
 - 2. Tie fabric to rails and braces, with wire ties spaced 24" o.c.
 - 3. Tie fabric to tension wires, with hog rings spaced 24" o.c.
- K. FASTENERS: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- L. TOUCH UP:
 - 1. Following installation, scratches and marred spots in galvanized surfaces shall be power wire brushed and painted with a cold-applied galvanized paint at a rate of 2 oz. zinc per sq. ft. of surface.
 - 2. Following installation scratches and marred spots in vinyl coated surfaces shall be field coated with a vinyl coating supplied by the fence manufacturer.

END OF SECTION 323113

SECTION 32 84 00

IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Piping
 - 2. Backflow
 - 3. Manual Valves
 - 4. Automatic control valves
 - 5. Sprinklers
 - 6. Controller
 - 7. Control Wiring
 - 8. Valve Boxes

1.2 PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be automatic operation with controller and automatic control valves.
- B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.
- C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
 - 1. Irrigation Main Piping: 200 psi
 - 2. Circuit Piping: 200 psi

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. All Irrigation Equipment and installation must meet City of Ft. Lauderdale Irrigation Design and Installation Specifications.
- C. Wiring Diagrams: For power, signal, and control wiring.
- D. Delegated-Design Submittal: For irrigation systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Controller Timing Schedule: Prepare controller charts; one per controller. Indicate on each chart the area controlled by a remote control valve (using a different color for each zone. Coordinate schedule of proposed zones with existing zones on site.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Final inspection
- C. Punch List inspection
- D. Florida Building Code (FBC) Appendix F and the Florida Irrigation Society Standards and Specifications for Turf and Landscape Irrigation Systems, 4th edition.
- E. Approval by owner
- F. Completion and acceptance of 'as built' drawings
- 1.6 QUALITY ASSURANCE
 - A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

- 2.1 PIPES, TUBES, AND FITTINGS
 - A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
 - B. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40 and 80.
 - 1. PVC Socket Fittings: ASTM D 2466, Schedules 40 and 80. Fittings in first subparagraph below are available in NPS 1/2 to NPS 2 (DN 15 to DN 50).
 - 2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
 - 3. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.
 - C. PVC Pipe, Pressure Rated: ASTM D 2241, PVC 1120 compound, SDR 21.
 - 1. PVC Socket Fittings: ASTM D 2467, Schedules 40 and 80.

2. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.2 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 BACKFLOW

- A. Reduced Pressure Zone Assembly
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Febco 765 Pressure Vacuum Breaker assembly, per plans.

2.4 MANUAL VALVES

- A. Bronze Gate Valves
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Nibco T-113 mainline isolation gate valve per plans

2.5 AUTOMATIC CONTROL VALVES

- A. Plastic, Automatic Control Valves:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Rain Bird PEB series with a Nibco T-113 bronze isolation valve upstream, per plans.
 - 2. Description: Molded-plastic body, normally closed, diaphragm type with manualflow adjustment, and operated by 24-V ac solenoid.

2.6 SPRINKLERS

- A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
- B. Plastic, Pop-up Sprinklers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Rain Bird 1806/1812-SAM-PRS with Hunter MP Rotator nozzles, and 1804-SAM with PA-80 adapter with Rain Bird 1401 bubbler nozzle per plans

2.7 AUTOMATIC IRRIGATION CONTROLLER

- A. Pedestal mounted irrigation controller.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide a Hydropoint WeatherTRAK LC+, 12 station, irrigation controller with a cold-rolled steel pedestal mount.
- B. Rain Sensor

1. Basis-of-Design Product: Subject to compliance with requirements, provide a Hunter Rain/Freeze CLIK sensor on a pole mount.

2.8 CONTROL WIRING

- 1. Control Wiring:
 - a. Low-Voltage, UF rated: see plans
 - b. Splicing/Connectors: 3M DBY/R-6
- Install control cable in same trench as irrigation piping and at least 2 inches below piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate 2 inch sleeve under paved areas and through walls where required.
- 3. Install control cable in same trench as irrigation piping and at least 2 inches below piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate 2 inch sleeve under paved areas and through walls where required.

2.9 PLASTIC VALVE BOXES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Carson 1220 Jumbo Valve Box with bolt down lid for automatic control valves, Carson 1419 for gate valves and Carson 1017 box for splices, per plans.

EXECUTION

2.10 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."
- B. Provide minimum cover over top of underground piping according to the following:
 - 1. Irrigation Main Piping: Minimum depth of 24 inches
 - 2. Circuit Piping: Minimum depth of 18 inches
 - 3. Sleeves: Minimum depth dependent upon pipe type/size per plans.

2.11 PIPING INSTALLATION

- A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.
- B. Install piping free of sags and bends.
- C. Install groups of pipes parallel to each other, spaced to permit valve servicing.

- D. Install fittings for changes in direction and branch connections.
- E. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.
- F. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
- G. Install expansion loops in control-valve boxes for plastic piping.
- H. Lay piping on solid subbase, uniformly sloped without humps or depressions.
- I. Install PVC piping in dry weather when temperature is above 40 deg F (5 deg C). Allow joints to cure at least 24 hours at temperatures above 40 deg F (5 deg C) before testing.

2.12 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. PE Piping Fastener Joints: Join with insert fittings and bands or fasteners according to piping manufacturer's written instructions.
- E. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.

2.13 VALVE INSTALLATION

A. Underground Valves: See plans.

2.14 SPRINKLER INSTALLATION

- A. Install sprinklers after hydrostatic test is completed.
- B. Install sprinklers at manufacturer's recommended heights.

2.15 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks per plan requirements. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Any irrigation product will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

2.16 ADJUSTING

- A. Adjust settings of controllers.
- B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with finish grade.

2.17 PIPING SCHEDULE

- A. Install components having pressure rating equal to or greater than system operating pressure.
- B. Underground irrigation main piping shall be the following:
 - 1. Schedule 40 PVC pipe; socket-type Sch. 40 PVC fittings; and solvent-cemented joints.
- C. Circuit piping shall be the following:
 - 1. SDR 21 PVC, Schedule 40 PVC socket fittings; and solvent-cemented joints.
- D. Underground Offsets at Sprinklers:
 - 1. Rain Bird SP Model 100 swing pipe

END OF SECTION 328400

SECTION 32 91 00

PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 WORK INCLUDED

- A. The WORK included in this section consists of furnishing all labor, supplies equipment and materials necessary to complete the installation of all landscaping as shown on the Plans as base bid including the installation of sod and seeding as shown, as well as all other related responsibilities as described in these Specifications and accompanying plans.
- B. Installation: All plant materials included shall be of the specific size and quality indicated on the plans and in these specifications and shall be installed in strict accordance with sound nursery practices and shall include maintenance and watering for all WORK outlined on the plans and specifications until final acceptance.
- C. Quantities and Locations: The ENGINEER reserves the right to adjust the number and locations of the designated types and species to be used at any of the locations shown in order to provide for any modifications which might become necessary.

1.03 <u>RELATED WORK</u>

- A. Section 31 22 00 Site Grading
- B. Section 32 91 13 Soil Preparation
- C. Section 32 92 23 Sodding

1.04 QUALITY ASSURANCE

A. Responsibility for Assuring Quality WORK: The CONTRACTOR'S Superintendent shall be well versed in Florida plant material, planting operations, plan reading, and coordination with other performing contracts or services in the job area.

All employees shall be competent and highly skilled in their particular job in order to properly perform the WORK assigned to them. The CONTRACTOR shall be responsible for maintaining the quality of the material on the job throughout the duration of his responsibility.

- B. Correct Grade of Plants: In the event that it becomes apparent that any nursery supplying plants for this WORK has knowingly and consistently represented the grade of plants as being higher than their actual grades as determined under these provisions, all plants already delivered from such sources shall be removed from the job at the CONTRACTOR'S expense, and no further plants will be accepted from such nursery until written evidence is submitted and confirmed that all material for delivery has been inspected and approved by inspectors of the State Plant Board as being of the grade as represented.
- C. Authority for Nomenclature, Species, Etc.: All plant material shall conform to the names given in Hortus Third, 1976 edition. Names of varieties not included therein conform generally with names accepted in the nursery trade.
- D. Grade Standards: All plant materials shall be nursery grown except where specified as collected material, and shall comply with all required inspections, grading standards and plant regulations as set forth by the Florida Department of Agriculture's "Grades and Standards for Nursery Plants" revised 1998, or with any superseding specifications that may be called for on the Plans or in the Specifications. ALL PLANTS NOT LISTED IN THE GRADES AND STANDARDS FOR NURSERY PLANTS, shall conform to a Florida No. 1 as to: (1) Health and Vitality, (2) Condition of Foliage, (3) Root System, (4) Freedom from Pest or Mechanical Damage, (5) Heavily Branched and Densely Foliated according to the accepted normal shape of the species, or sport, (6) Form and branching habit.
- E. Balled and Burlapped (B&B) and Wire Balled and Burlapped (WB&B) Plants: These plants shall be properly protected until they are planted. The plant shall be handled only by the earth ball and not be the plant itself.

Any (B&B) or (WB&B) plant which shows evidence of having handled by a method other than the method outlined above, and resulting in a cracked or broken ball or of the roots being loosened within the ball shall be rejected.

For plants grown in soil of loose texture, which does not readily adhere to the root system, (especially in the case of large plant material), WB&B plants may be specified. For WB&B plants, before plant is removed from the hole, sound hog wire shall be placed around the burlapped ball and looped and tensioned until the burlapped ball is substantially packaged by the tightened wire netting, such as to prevent disturbing of the loose soil around the roots during handling. Any wire, synthetic material or chemically treated material will be removed from the rootball at planting time, all ties shall be removed from the rootball and around the trunk at planting.

F. Container Grown Plants (CG): Any Container Grown (CG) plants, which have become "pot bound" or for which the top system is out of proportion (larger) to the size of the container, will not be acceptable.

With metal containers, unless the root-ball system slips easily and unbroken from the can, a nursery can-cutter shall be used to slit the can in such a way that the can may be opened fully.

CG plants shall not be removed from the can until immediately before planting, and with all due care to prevent damage to the root system.
- G. Submit to the ENGINEER the names and locations of nurseries proposed as sources of acceptable plant material. The ENGINEER reserves the right to visit the nursery to inspect and/or select the specified material.
- H. The CONTRACTOR shall submit pictures of all plant material to the ENGINEER for approval prior to delivery to the project site. The pictures shall provide the following information for each plant type.
 - 1. Plant name/description in the file name or labeled on the image.
 - 2. Measuring pole or tape to show size representation.
 - 3. Each Tree/Palm type shall provide (3) three separate image examples that are representative of the size and quality of all of the material that will be provided.
 - 4. Each plant/shrub type shall provide an image containing a minimum of (3) three plants with their specified spacing that are representative of the size and quality of all of the material that will be provided.
 - 5. Any plant material that is installed on site prior to this approval will be rejected at the CONTRACTOR'S expense.
 - 6. Any plant material installed that does not meet the size, spec and quality from the approved submittal will be rejected at the CONTRACTOR'S expense.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspection and Transporting: Movement of nursery stock shall comply with all Federal, State, and local laws and regulations. Therefore, required inspection certificates shall accompany each shipment, and shall be filed with the ENGINEER.

Wrap root balls with burlap. Wire wrap burlap if root ball is not sufficiently compacted. Palms will not require burlap wrapping if the following requirements are met:

- 1. Dug from marl or heavy soil that adheres to roots and retains shape without shattering.
- 2. Moistened material used to cover ball and roots not exposed to wind and sun.
- 3. Transport material on vehicles large enough to allow plants not to be crowded. Plants shall be covered to prevent wind damage during transit and shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period which the plants are in transit, being handled, or are in temporary storage.
- B. All plant material shall not remain on the WORK site longer than two (2) days prior to being installed.

1.06 <u>SUBSTITUTIONS</u>

- A. Substitutions of plant types or change in the size of plant material will only be permitted upon submission of documented proof that the particular plant type and size specified is not obtainable. The CONTRACTOR shall provide a credit to the CLIENT when a substitution results in a substantial reduction in material cost.
- B. Where B&B or WB&B plants are specified, CG plants of the same species, etc., will not be accepted. Where a B&B or WB&B is not specified on a particular plant material, B&B, WB&B or CG plants may be used provided they meet all specifications.

1.07 GUARANTEE

All plant material shall be guaranteed for a minimum of one (1) calendar year from the time of final acceptance. Any plant material that is replaced within the one-year warranty period will carry an additional one (1) calendar year warranty from the time of replacement.

1.08 <u>REPLACEMENT</u>

- A. The guaranteeing of plant material shall be construed to mean the complete and immediate replacement of plant material if it is:
 - 1. Not in a healthy growing condition.
 - 2. There is a question to its survival ability at the end of the guarantee period.
 - 3. It is dead.

1.09 SIZE, QUALITY AND GRADE OF REPLACEMENT

Replacement plant material shall be of the same species, quality and grade as that of the plant to be replaced. The size of the replacement shall not necessarily be the same size as the original specified plant at its initial planting but shall closely match specimens of the same species. Replacements shall be guaranteed for a period equal to the originally specified guarantee. This guarantee period shall begin at time of plant replacement.

1.10 GUARANTEE NULL AND VOID

The guarantee shall be null and void for plant material which is damaged or dies as a result of "Act of God" limited to hail, freeze, lightening, winds which exceed hurricane force, providing the plant was in a healthy growing condition prior to these "Acts of God".

PART 2 - MATERIALS

- 2.01 PLANT MATERIAL
 - A. Florida No. 1: Except where another grade is specifically called for in the Plans, all plant material shall be no less than Florida No. 1 at the time of final inspection immediately prior to the acceptance by the OWNER.
 - B. Habit of Growth: All plant material shall have a habit of growth that is normal for that species and shall be sound, healthy, vigorous and free from insects, plant diseases, injuries, and dead limbs.