TECHNICAL SPECIFICATIONS

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SECTION 02 22 00

EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 - GENERAL

1.01 General

A. The Plans depict the approximate location of the existing utilities. The locations of the facilities (horizontal and vertical) were obtained from survey information, field observations, plans, and record drawings.

1.02 Contractor's Responsibilities

A. Call Sunshine 811 and locate the cables, ducts, conduit, pipeline, and all infrastructure and features within project limits etc. in advance of any construction activities.

B. Notify Engineer of any substantial changes and/or conflicts that would require a deviation in the plans. Late discovery of existing underground utilities does not constitute “required” deviations if earlier discovery and/or discovery prior to Contractor’s activities could have prevented such deviations.

C. Notify Owner immediately of damage done to existing utilities and repair and or replace and/or restore to existing conditions to the satisfaction of the Owner at no additional expense to the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 13 30 00

PRECAST BUILDING

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

1. A modular Precast Concrete Building.

1.02 References

A. American Concrete Institute (ACI), Building Code Requirements for Reinforced Concrete, ACI 318-95".

B. American National Standard Institute (ANSI):

1. A156 – Specifications for Door and Frame Preparation.
2. A156.4 – Standards for Door Controls – Closer.
3. A156.13 – Standards for Mortise Locks and Latches.

C. American Society of Engineers (ASCE), Minimum Design Loads for Buildings and Other Structures, ASCE 7-95.

D. American Society of Testing and Materials (ASTM): D1752 – Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

E. Federal Specifications (Fed. Spec.): TT-S-00227: Sealing Compound; Elasto-meric Type, Multi Component.

F. Standard Building Code (SBCCI) Per State requirements.

1.03 Submittals

A. Submit as specified in SECTION 01 33 00.

B. Submit as required per DIVISIONS 2, 3, and 16 for materials to be incorporated in the work.

C. Submit manufacturer's product data and certification that the proposed modular precast concrete building, steel doors and exhaust fan/ air-conditioning and other components conform to the specified requirements.

D. Submit manufacture's standard design data and calculations for components of modular precast concrete building, together with detailed layout drawings showing all reinforcement and concrete cover, and indicating all block-outs and penetrations, that bear the seal and signature of a Registered Professional Engineer licensed to practice by the State of destination state.

E. Submit manufacturer's standard design for form liners for selection of manufacturer's standard textures.

F. Submit manufacturer's product data sheets, for the steel insulated doors and hardware, exhaust fan, louvers, air-conditioner, interior finishes, floor coating, paint products and any other required building components.

G. Submit detail fabrication and erection shop drawings for placement of components and manufactured material.

H. Product/Code Certification: Provide written verification that the precast building and associated exterior components provided and installed as a system or assembly in this Project meet or exceed requirements of local code amendments of SBCCI Standard Building Code and ASCE 7-95 for wind resistance of components and classing. Products shall be designed and tested to be impact resistant in accordance with SBCCI STD 12-99. Provide design data and verification documentation signed and sealed by a professional engineer registered in the State of Florida including, but not limited to, the following:
   1. Manufacturer's written certification indicating the type, grade, and size unit provided meets requirements.
   2. Manufacturer's test data and engineering data developed indicating that requirements have been met.
   3. Independent testing laboratory reports and certifications verifying that products meet requirements.
   4. Calculations and definition of the code required loading for each unit in the Project.
   5. Installation requirements describing types of fasteners and spacing.
   6. Submit certification prior to or in conjunction with other submittals required herein. Other submittals received prior to receipt of this certification will be rejected.

1.04 Quality Assurance

A. Modular precast concrete building shall be designed and manufactured by a manufacturer having not less than three (3) years experience in the design and manufacture of similar facilities. Building design and drawings shall be prepared under the direct supervision of a Registered Professional Engineer. Acceptable Manufacturers:
   1. Concrete Modular Systems, Inc., St. Petersburg, Florida Ph:1-727-945-1864, Fx 1-727-945-9756.
   2. Engineer approved equal.

B. The manufacturer shall warrant its work against leakage for a period one year following installation. Leakage shall constitute proof of noncompliance with this specification and shall be repaired at the Contractor's expense.

C. Precast Concrete Building envelope shall be resistant to 308 caliber (steel jacketed) rifle bullets, fired from a distance of 50-ft.

1.05 Design Criteria

A. The modular precast concrete building shall be constructed of reinforced concrete, and shall be designed to meet the following requirements using the most restrictive:
   1. ASCE 7-20.
   2. Florida Building Code FBC2020.

B. The building shall be designed for the following minimum loadings, unless the above reference codes are more restrictive:
   1. Roof Live Load – 60 psf.
   2. Roof Dead Load – 50 psf (minimum).
   3. Floor Live Load – 100 psf.
   4. Floor Dead Load – 63 psf (minimum).
   5. Wind Speed – 130 mph / Exposure C / Importance Factor – 1.15.
   6. Earthquake – Zone 1.

C. The building shall be designed to provide a factor of safety of at least 1.50 against overturning when subjected to the specified design wind loading. Provide additional concrete structure dead weight or soil anchors as required to ensure building's stability against overturning and sliding.

D. The building shall be designed in accordance with AI 318. The floor and roof slabs shall be designed for 20-foot clear span without the use of interior supporting

members. The interior finished ceiling height shall be not less than 11’-1”. Concrete floor to concrete ceiling.

E. The building shall be constructed of precast concrete panel sections which are plant assembled using structural steel connections. Joints shall be caulked with a material selected by the building manufacturer to maintain a permanent seal under severe weather and handling conditions. Consult drawings for building sizes and layouts.

F. Roof shall be pitched to prevent standing water ¼” per foot.

G. Roof joints in modular buildings shall be sealed with EPDM membrane roofing strips of a thickness and width selected by the building manufacturer for the application proposed. Strips shall be cemented to the concrete with a compound designed for that purpose and shall be sloped for drainage.

H. Exterior walls shall be cast Flat and receive Sand Finish and chamfered strip type extension at base, edges, seams and roof line to prevent unnecessary spalling.

I. Interior of building shall have a light broom finish and ceiling shall have a form finish. With R-11 insulation on walls and ceiling. 1/2" Plywood with Fiberglass laminate and ceiling shall be 5/8” Type "X” gypsum board with knockdown texture. Painted white or color by owner.

J. The building shall be equipped with 1 each pair 3’-0”x7’-0” RHR Active, 18ga Steel Door and 1 each single 18ga Steel Door with door hardware approved during Florida Notice of Acceptance testing.

K. The building shall have two (2) 3-Ton Air-Conditioner Single Zone Mini Split Mitsubishi# PKA-A30KA7 Air Handler and PUZ-A30NHA7-BS Condensing Unit mounted on building.

L. The building shall be assembled, sealed, waterproofed, and tested for watertightness at the building manufacturer’s plant. All joints shall be caulked, and concrete interior surfaced smoothed to remove projections.

M. Interior and exterior surfaces shall be painted as specified herein. Concrete floor slab shall receive a non-skid sealed broom finish.

N. Coordinate the location of all openings for mechanical and electrical equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 33 31 50

PIPING AND VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install all piping, fittings, and valves as shown on the drawings and specified herein. In general, include all piping from tie-ins to and from equipment as shown on the drawings, including all piping appurtenances for a complete, operating piping system as specified herein.

1.02 SUBMITTALS

A. Product Data: Provide data on pipe fittings, valves, and accessories.

B. Manufacturer's Certificate: Certify that pipe, fittings, and valves meet or exceed respective ANSI and AWWA standards.

1.03 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.04 QUALITY ASSURANCE

A. Fabricated piping shall meet all ASME code requirements as specified herein.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.01 GENERAL

A. Although they may not be specifically shown on the drawings or called for elsewhere in the Technical Provisions, the Contractor shall include the cost of all fittings, piping supports, and miscellaneous appurtenances needed to provide a secure, workable pipe and valve system. Equipment suction and discharge piping and other exposed piping shall be supported by reinforced concrete pedestals, piers, adjustable pipe supports, thrust restraints, hangers, and tie rods as necessary to insure a stable installation. Adjustable pipe supports or piers shall be arranged to relieve attached equipment of all strain due to the weight of the pipe, fittings, valves, and the contents of the pipe.

2.02 PIPE

A. Ductile Iron Pipe: Ductile iron pipe and fittings shall conform to AWWA C150, C151 and C153.

1. Joints: Buried pipe shall be AWWA approved push-on or mechanical joint pipe (AWWA/ANSI C111/C21.11) with a minimum 250 psi working pressure. Exposed joints shall be AWWA approved flanged joint pipe, in accordance with ANSI/AWWA C115, or as detailed on the drawings.

2. Fittings: Buried fittings shall be AWWA approved mechanical joint fittings with a minimum 250 psi working pressure. Exposed fittings shall be flanged fitting or as detailed on the drawings. Conform to AWWA C153.

3. The internal surface of all piping and fittings shall be cement mortar lined and seal coated in accordance with AWWA C104, A21, unless other noted on plans or in Table 15100-1.

4. Special linings: Pipe, joints, and fittings designated to be lined shall have an 8.0 – 10.0 mil (DFT) coating on all wetted surfaces. Lining shall be cement-mortar in accordance with AWWA C104/A21.4.

5. Restrained joint pipe shall be ductile iron Class 53, American Cast Iron Pipe Co., Lok-Fast or approved equal. Restrained joint pipe shall be constructed on all new watermains adjacent to all bends, crosses, tees, etc., where a change in direction occurs. All fittings 16-inch and larger shall be restrained and shall include 3 full pipe lengths of restrained pipe and beyond fittings.

6. Victaulic fittings shall be ductile iron AWWA cast fittings with rigid radius grooves in accordance with AWWA C110 for center-center dimensions and AWWA C153 or ANSI 21.1 for wall thickness. Fittings which need to be tapped shall meet ANSI B16.1- dimension locations.

7. Couplings shall be ductile iron grooved end couplings suitable for performance on steel, stainless steel, and PVC schedule pipe. Couplings shall be galvanized style 77 flexible couplings, as manufactured by Victaulic, or equal.

8. Gaskets shall be 1/8-inch-thick, homogeneous black rubber (EPDM), hardness 60 (Shore A), rated to 275 degrees F, conforming to ASME B16.21 and ASTM D2000 4CA 415 A25 B35 C32 EA14 F19.

B. Stainless Steel Tubing: Tubing for sizes 1-inch and smaller shall be seamless austenitic stainless, grade TP 316L conforming to ASTM MA-632. Furnish Swagelok 316 stainless compression fittings, or equal.

C. Black Iron Pipe: Extra heavy, schedule 80 black iron pipe with screwed joints and fittings.

D. Steel Pipe: ASTM A53, Schedule 20, 40

1. Steel pipe shall conform to ASTM A53, Grade B, seamless or electric resistance welded and shall be pickled and passivated. Pipe shall meet the requirements of ASME B31.3-2020 Process Piping code edition.
2. Pipe flanges and fittings shall meet ASME B16.5-2020.
3. Flanges to be Class 150, raised face, serrated finish, forged steel, slip-on with 150-lb. drilling.
4. Unions 2-Inches and smaller shall be threaded forged conforming to ASTM A182/A182M, Grade F316, 2,000-pound or 3,000-pound WOG, integral ground seats, AAR design meeting the requirements of ASME B16.11, bore to match pipe.
5. All pipe sizes up to 12-inch nominal pipe size (NPS) shall be schedule 40, 12-inch can be schedule 20 at minimum.

E. STAINLESS STEEL PIPE, SCHEDULE 10S, 10, 40

1. Stainless Steel Pipe: ANSI/ASTM A312, Schedule 10S, 10, 40
2. Stainless steel pipe shall conform to ASTM A312, Austenitic steel pipe, welded, seamed, grade TP 316L.
3. Size shall be NPS designation as shown with Schedule 10S, 10, or 40-wall thickness as indicated on the drawings or specified herein.
4. Pipe flanges and fittings to meet ASME B16.5-2020.
5. Flanges to be Class 150, Class 300, or Class 600 depending on service, raised face, serrated finish, forged A182 Grade F316L, slip on type. Dimensions shall meet ANSI/ASME B16.5-2020.
6. Flange bolts and nuts shall be ASTM A193 and ASTM A194, Type 316, respectively. Never Seize shall be used on all stainless-steel threaded fasteners. Flange gaskets shall be full faced, elastomeric type rubber (neoprene or EPDM), and meet the requirements of ANSI/AWWA C207.

F. Victaulic Joints, Fittings, Valves and Couplings

1. All fabricated fittings shall be A403WP type, with dimensions meeting ANSI B 16.9.
2. All victaulic style joints shall be grooved in accordance with ANSI/AWWA C606. All steel joints for schedule 10 pipe shall be roll grooved, whereas steel joints for schedule 40 pipe may be roll or cut grooved. All stainless-steel pipe with Victaulic couplings shall have sch 40, cut groove nipples, 6-inches long, welded to sch 10 ss pipes, for all pipe sizes 8-inches and above.

3. Gaskets shall be suitable for their intended service. Gaskets shall be clearly marked with colored striping to indicate material compound.
4. Bolts shall be 316-stainless steel on all Victaulic couplings.
5. RO train header shall be designed per pressure class, have all side ports installed off of header using the pull-tee method and be counter-bored, sch 40 nipples. All nipples 1-inch and smaller shall be 3000# rated FNPT, thredolet type.
6. All nipples 1½-inch and smaller shall be seamless.

G. PVC PIPE

1. AWWA C900
    a. All PVC pipe shall meet AWWA C-900 Standards for a raw wastewater application. PVC pipe 4-inch in diameter and larger shall be class 150, DR 18 pipe or better conforming to AWWA C900.
    b. Fittings used in conjunction with the C900 PVC pipe shall be ductile iron coated with fusion bonded epoxy, or PVC push-joint pressure rated fittings (SDR-35 min) as detailed on pipe schedule, mechanical joint.
    c. PVC for wastewater shall be green in color.
2. Schedule 80 PVC Pipe
    a. Rigid PVC (polyvinyl chloride) compound used in the manufacturer of schedule 80 pipe shall be Type I, grade 1 as identified in ASTM D1784.
    b. PVC schedule 80 shall meet the requirements of ASTM standard D1785 for physical dimensions and tolerances.
    c. The marking on PVC Schedule 80 pipe shall meet the requirements of ASTM D1785 and state the material designation code, nominal pipe size, schedule of pipe, pressure rating in psi for water at 73°F., the ASTM designation number D1785.
    d. Fittings used shall be PVC Schedule 80 and solvent welded in accordance with ASTM D1785.
    e. Small Diameter PVC Pipe: PVC pipe smaller than 4-inch shall be Schedule 80 PVC plastic pipe with solvent weld fittings in accordance with ASTM D-1785.
    f. PVC Drainpipe: PVC drainpipe shall be PVC sewer pipe and fittings, ASTM D-2729.

I. HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

1. High Density Polyethylene Pipe and Fittings - HDPE pipe

a. This specification covers requirements for high-density polyethylene pipe and fittings for potable water distribution and concentrate transmission mains as manufactured by JM Eagle, or equal.

b. Materials used for the manufacture of polyethylene pipe and fittings shall PE 3408, Class B high density polyethylene meeting cell classification 345464C per ASTMD 3350 and material classification Type III, Category 5 per ASTM D-12485. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements. Resin shall be PE 4710.

c. Polyethylene pipe shall be manufactured and tested in accordance with AWWA C906 and shall be so marked.

d. Polyethylene fittings and custom fabrications shall be molded or fabricated by the approved pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness and tolerances as the mating pipe. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe. Reduced pressure-rated (de-rated) fabricated fittings are prohibited.

e. Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

f. The manufacturer must certify that samples of the manufacturer's production pipe have been tested, in accordance with ASTMS D-2837, and validated in accordance with the latest revisions of PPI TR-3 2020.

2.03 Valves

A. Plastic Ball Valves

1. Ball valves 1/2-inch through 2-inch shall be double true union type, CPVC, or PVC (same material as pipe) fitted for intended service. Valves shall be solvent welded to piping system unless otherwise noted. Valves shall be Nibco, Chemtrol, Spears, or Asahi with True Union style.

2. Multiport ball valves shall be Chemtrol MP type, with line unions and threaded branch.

3. Ball check valves - Chemtrol BC series, double true union.

B. Stainless Steel Valves (less than 2-inch size)

1. Regulating valves for throttling service for air, CO2, and other gases shall be Whitey Forged body regulating and shutoff valve, 316 stainless steel.

2. Ball valves for gas services shall be, Whitey Series 60, swing out style, 316 stainless steel body and ball, Viton fitted cadmium plated handle.

3. Shut off cocks for seal water, gages, instruments, etc. shall be Nupro plug valve, 316 stainless.

4. Check valves for ammonium sulfate service shall be spring loaded in-line check valve, similar to Nupro 16C series, 316 stainless steel

C. Gate Valves

1. Resilient seated gate valves shall be non-rising stem (NRS) type, conforming to the latest revision of AWWA Standard C-515. The gate valves shall be mechanical joint type, fully enclosed, and suitable for buried service complete with a ductile iron 2-inch operating nut that is independent of the stem and wedge. The body shall be of ductile iron and fully encapsulated inside and outside with a fusion bonded epoxy coating conforming to the latest revision of AWWA Standard C-550. The wedge shall be ductile iron and completely encapsulated with a resilient EPDM elastomer permanently bonded to the wedge and have a rubber-tearing bond that meets ASTM D429. The stem shall be cast bronze and have an integral thrust collar with a Delrin thrust bearing above and below the collar. The gate valve shall have two O-rings set in machined grooves in the seal plate. The stem seal plate shall have an O-ring gasket to seal against the bonnet secured with bolts and nuts. The body, bonnet, and seal plate shall have a factory-applied thermoplastic epoxy coating on all interior and exterior surfaces. All internal parts shall be accessible for repair or maintenance without removing the body from the line. Valve shall be Style 4067 as manufactured by M&H Valve Co., Metroseal 250 as manufactured by U.S. Pipe, American-Darling, Clow Valve Company or approved equal.

2. Valves utilized for corrosive service shall be manufactured of materials compatible with the fluid. All materials shall be submitted for review by the Engineer. Fusion Bonded Epoxy (FBE) acceptable for DI valves as specified in Table 15100-1 – Piping Schedule.

D. Swing Check Valves

1. The valve body shall be designed and constructed per AWWA Standard C508 “Swing Check Valves for Waterworks Service” and shall have a full waterway. Valves with globe, wye or angle style bodies or any style of valve that does not have straight-through full waterway are not acceptable.

2. Valve disc design shall be internally pressure balanced to ensure positive closure upon emergency flow reversal. Valves that expose one end of the shaft to atmosphere such that the valve is biased to open when pressure is applied to the entire disc are not acceptable. Valve designs incorporating springs to facilitate stop check closing action are not acceptable. Limiting the open disc position to ensure closure is not acceptable.

3. The valve disc shall be securely connected to the ductile iron disc arm by a rugged double clevis hinge that eliminates pivoting and assures even load distribution

during closing. The double clevis hinge shall include a minimum of two stainless steel pins that secure the disc to the disc arm and provide a controlled connection. Single point disc connections are not allowed.

4. The disc seat shall be renewable ultra-high molecular weight polyethylene (UHMW-PE), retained by a stainless-steel follower ring and stainless-steel screws. The replaceable body seat shall be ASTM A276 Type 316 stainless steel. The disc seat shall seal against the body seat by compression. Interference seating is not acceptable.
5. Pivot shaft shall be heavy duty one-piece ASTM 564 Type 630, 17-4PH stainless steel. The pivot shaft shall have an integral retainer to prevent axial shaft movement. The pivot shaft shall have O-ring seals on both ends. An adjustable external lever and weight shall be provided to accelerate disc closure upon loss of pumping pressure.
6. A lever and weight with an air cushion cylinder shall be provided to minimize slam upon emergency closure. The air cushion shall be totally enclosed. The cylinder shall have an anodized aluminum alloy cap, head and barrel. The bottom cylinder head shall be hinged to follow the change of angular force as the lever rises and lowers. The primary closing speed of the air cushion cylinder is to be field adjustable by means of a color-coded micrometer type control valve. Control valve to have a set screw lock to secure final setting accuracy.
7. The valve body, disc and cover shall be constructed of 316SS with integral flanges faced and drilled to ANSI B16.1 Class 250. The body shall be one piece. Valves with multiple body pieces are not acceptable. Valve shall be inherently self-cleaning and have a flow area of not less than 100% of its nominal pipe size. Valve bodies shall be pickled and passivated.
8. The valve shall have a top access cover to allow inspection, repair or replacement of internal parts without removing the actuator from the valve, without removing the valve from the line or disturbing the adjacent piping.
9. The valve shall be equipped with a limit switch actuated by the valve shaft lever assembly to signal when the valve disc has moved to the closed position. Limit switch shall be DPDT, with contacts rated at 10 amps (continuous) and NEMA 4, 13 and IP67 enclosure. Limit switch shall be Allen-Bradley 802T-DTP or equal. Valves which do not have direct limit switch indication of the disc position, independent of the electric operator, are not acceptable.

⚠3 E. Plug Valve

1. Eccentric Plug Valves 3-inch to 36-inch shall meet or exceed the latest revision of AWWA Standard C517 and shall meet or exceed the requirements of this specification.

2. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanges shall be per the ANSI B16.1 125 lb. standard. End-to-end length of flanged valves shall be per AWWA C517, Table 1. Mechanical joint ends shall be to the AWWA Standard C111-64.
3. Bodies shall be of ASTM A126 Class B cast iron. Port area shall be 100% of standard pipe area. Published and/or calculated Cv flow data will not be accepted in lieu of 100% port area requirement. The body shall have minimal pooling and provide complete flushing of the valve every time it cycles. Port of valve shall be rectangular. Round ported valves will not be accepted. Only VE option that will be considered is rectangular seated non 100% port valves. VE option of round port valves will not be accepted. The term “full port” shall represent 100% port.
4. Seats shall be rectangular ported, 1/8-inch thick welded overlay of not less than 95% pure nickel. Seat area shall at least ½-inch wide and raised, with the raised surface completely covered with weld to ensure that the plug face contacts only nickel.
5. Plugs shall be solid one-piece castings of ASTM A536 ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The plug shall not contact the seat prior to 90% closed. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be Chloroprene (CR), or other resilient facing suitable for the application.
6. Bearings shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF8M. Non-metallic bearings shall not be acceptable.
7. Grit Excluders in the form of PTFE washers at the upper and lower journals shall be provided to prevent the entry of grit and foreign solids into the bearing areas.
8. Shaft seals shall be of the multiple V-ring type with a packing gland follower. Shaft seals shall be externally adjustable and repackable under pressure without removing the actuator or bonnet from the valve. An air gap shall exist between shaft packing and bottom of actuator for visual inspection, adjustment or complete replacement of packing without disturbing any portion of the valve or actuator except the packing gland follower. Valves utilizing O-ring seals or non- adjustable packing shall not be acceptable.
9. Pressure ratings shall be 175 psi (1,207 kPa) on sizes 3-inch to 12-inch (80-300mm) and 150 psi (1,034 kPa) for 14-inch to 36-inch (350-900mm). Every valve shall be given a hydrostatic and seat test, with test results being certified when required by the specifications.

10. Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floor stands, etc., as specified. Valves 6-inch and larger shall be equipped with worm gear actuators in the horizontal position. Non-buried actuators shall clearly indicate valve position.

11. Worm Gears shall be constructed in accordance AWWA C517. Actuators shall be enclosed in a cast iron housing with outboard seals to protect the bearings and other internal components. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Input shaft and fasteners shall be made of stainless steel.

12. Externally adjustable open and closed position stops shall be provided. The adjustable closed position stop shall be used to set closing torque and provide adjustment to compensate for change in pressure differential or flow direction.

13. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuators shall be 90% grease filled. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals.

14. Eccentric plug valves shall have a two-year warranty from date of shipment. Manufacturer's name shall be casted in body of valve and a metal tag containing a serial number shall be riveted to the valve for future parts identification.

15. Valves and actuators shall be DeZurik PEF, Val-matic 5600R, or Clow F5400.

F. Air Release Valve

1. Air release valves shall be the type to automatically exhaust large quantities of air during filling and allow air to re-enter when draining or subject to a negative pressure.

2. Valve shall be 2-inch with N.P.T. threaded inlet and outlet. The valve body shall be cast iron for potable services and 316 Stainless Steel for corrosive service. The float, internal float guides and trim shall be 316 stainless steel. The seat shall be BUNA-N.

3. Valve shall be manufactured by Crispin, Valmatic or approved equal.

G. Air/Vacuum Release Valve

1. Air/Vacuum Release Valves shall be the type to automatically exhaust large quantities of air during filling and allow air to re-enter when draining or subject to a negative pressure.

2. Valve shall be 2-inch with N.P.T. threaded inlet and outlet. The valve body shall be cast iron. The float, internal float guides and trim shall be 316 stainless steel. The seat shall be EPDM.

3. Valve shall be manufactured by Crispin, Valmatic or approved equal.

H. Mud Valves, 4 Inches through 24 Inches:

1. Mud valves shall be rising stem with flanged end, unless otherwise shown in the Drawings. Materials of construction shall be as follows:

    i. Cast iron body in accordance with ASTM A48 or A126.

    ii. Stem, nut, disc ring, and seat ring or bronze in accordance with ASTM B62 or B584 of alloy C83600.

    iii. Type 316 stainless steel extension stem.

2. Provide extension stem, stem guides, and AWWA operating nut. Mud valves shall be Clow Figure F 3088, Waterman Industries, or equal.

2.04 Piping, Fittings & Miscellaneous Materials

A. Pipe Couplings

1. Couplings shall be EPDM gasketed, sleeve-type, with diameter to fit existing pipe. Coupling shall include a steel middle ring, follower rings, wedge-section gaskets and truck head type steel bolts. Couplings shall be manufactured by Dresser, or equal.

B. Tapping Sleeve & Valve

1. Tapping sleeves for potable services shall be 316 stainless steel with flanged outlet and 316 stainless steel bolts. Tapping sleeves for corrosive service shall be 316 Stainless Steel as necessary to be compatible with the fluid. Sleeve shall be JCM #432, Smith/Blair (Rockwell) #662, Ford Fast, or equal. All sleeves shall have a minimum working pressure of 150 psi. All taps shall be machine drilled; no burned taps will be allowed.

2. Tapping valves shall be resilient seat type with a flanged joint on the inlet side and a mechanical joint on the discharge side of the valve. Tapping valves shall have a 2-inch operating nut. Working pressure rating shall not be less than 200 psi. Gaskets between the flange faces of the tapping sleeve and tapping valve shall be 1/8” minimum thickness of neoprene rubber. Tapping valves shall be M&H Style #3751, American #865, Mueller #687, Clow or equal.

C. Thrust Restraint

1. All bends, tees, crosses, reducers and dead ends shall be restrained through an approved means of mechanical joint restraint. All branch valves shall be restrained with MEGALUG or approved equal or anchor tees. Any line terminated as a construction phase that is a known future extension shall have a lug valve placed at the end and restrained with MEGALUG or approved equal. Thrust restraints shall be placed in accordance with the detail shown in the construction plans.

D. Locator for Pipe

1. On all pipe construction 10 gauge, THHN insulated, solid copper wire shall be laid and secured on top of pipe. Wire shall be continuous from valve box to valve box, wrapped two (2) times around each joint of pipe and extended inside each valve box to enable location devices to be attached without digging up the valve box.
2. Service wire shall be laid in the trench with all services, connected to the main wire and wrapped around the service piping or tubing. Wire for waste mains shall be green in color.
3. All wire connections shall be made with Dry-Splice wire connectors, Imperial Snip-Snap fittings filled with waterproof silicone sealant or approved equal. All splices shall be inspected and tested before burial.

E. Corporation Stops

1. Units shall be brass, equipped with connections compatible with the connecting service pipe-type; must have pack joint type connections for polyethylene tubing with locking collars and stainless steel inserts.

F. Valve Boxes

1. All valve boxes shall be cast iron construction with 5-inch shafts, equal to Tyler pipe 6850 series. Valve box lids shall have a 1-inch-deep skirt and shall have the appropriate words (e.g. “SEWER” for wastewater) where appropriate, cast in the top. Valve operating nuts shall be brought to within 30-inch of the surface using valve extension rods if required.

G. Tapping Saddles

1. Tapping Saddles shall be double strap saddles for ductile iron. If pipe is PVC, use stainless steel wide band. Saddles shall have a heavy-duty gasket. Saddles to be by Ford Meter Box, or equal.

H. Hose Bibbs

1. Hose bibbs for potable water shall be ¾-inch hose thread, similar to NIBCO, with screw on backflow or vacuum breaker device.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location and invert are as indicated.

3.02 PREPARATION

A. Where applicable, ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate trench and install pipe bedding as specified in Section 312333 – Trenching and Backfilling.

3.04 SURFACE CONDITIONS

A. Inspection

1. Prior to all Work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this work may properly commence.

2. Verify that all equipment may be installed in accordance with all pertinent codes and regulations, the original design, shop drawings, and the reference standards.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Engineer.

2. Do not proceed with installation in area of discrepancy until all such discrepancies have been fully resolved.

3.05 STEEL PIPE FABRICATION

A. See Section 055000 – Metal Fabrications.

B. Stainless steel pipe shall be fabricated by Aerex Industries, Fort Pierce, Florida, or equal, which shall be the minimum standard of fabrication quality for this project. The shop shall carry ASME certifications for performing pipe fabrication and be able to provide pickling of all piping systems.

C. Flanged joints shall be provided at all connections to valves, equipment, and specialties, and at the locations indicated on the Drawings. To facilitate installation, additional field welded joints may be provided. Additional field joints shall be kept to a minimum and their location shall be acceptable to the Engineer.

1. The diameter and drilling of flanges furnished in the piping shall be coordinated with the flanges for the valves and other equipment to be installed in the piping and conform to the standards specified herein. Blind flanges shall conform in diameter, drilling, and thickness to the flanges to which they attach and shall be reinforced as required to produce an airtight joint.

D. Threaded joints

1. Pipe threads shall conform to ANSI/ASME B1.20.1 2013, NPT, and shall be full and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed, after threading and before assembly, to remove all burrs.

2. Threaded joints shall be made up with Teflon threaded tape applied to all male threads.

E. Welded joints

1. All welds shall be sound and free from embedded scale or slag, shall have tensile strength across the weld not less than that of the thinner of the connected sections, and shall be airtight. Butt welds shall be used for all welded joints in line pipe assemblies.

2. All welding shall be in accordance with the Process Piping Code ASME B31.3-2020.

3. Welders for all piping shall be qualified per ASME Code Section IX for welding carbon steel and stainless steel piping, positions 2G and 5G. All welders will be required to present current qualification papers.

4. The Engineer shall have the right to perform any additional inspection of shop or field welds, at no additional cost to the Contractors, provided the welds pass the inspection. The Contractor shall repair all welds that fail inspection and burden the cost of retesting of any failed welds.

F. Pickling

1. After shop fabrication, all stainless-steel pipe, fittings, and appurtenances shall be completely immersed for a minimum of 15 minutes in a pickling solution of six percent nitric acid and three percent hydrofluoric acid at 140 degrees Fahrenheit. Parts shall be free from iron particles or other foreign material. A complete neutralizing operation, by immersion in a continuous freshwater bath, shall be required after the pickling operation. Passivate to uniform finish free of defects and scratches or pipe will be rejected. Electropolishing is not required.

G. Inspection and Testing

1. Inspection and testing by an independent laboratory will not be required at the fabricating or coating shop; however, the pipe manufacturer shall furnish an affidavit of compliance certifying that all materials used, and work performed comply with the specified requirements. Affidavits shall be furnished in accordance with the submittal section.

H. Cleaning

1. All pipelines shall be clean and free of dirt, rocks, debris, or other foreign material of any kind when placed in service.

2. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter, grease, oil, or other hydrocarbons before being installed and shall be kept clean until the work has been accepted.

I. Drawings and Data

1. Drawings, specifications, and other data showing complete details of the fabrication, construction, verification that pickling will be performed, weld locations,

and installation of pipe, fittings, specials, and connections, together with complete data covering all materials proposed for use, shall be submitted in accordance with the submittals section.

3.06 Pipe Installation - General

A. Take all precautions necessary to ensure that pipe, valves, fittings, and other accessories are not damaged in unloading, handling, and installation. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged material.

B. Exercise care to keep foreign material and dirt from entering pipe during storage handling and installation. Close ends of in-place at the end of any work period to preclude the entry of animals and foreign material.

C. All pipes shall be laid in a dry trench.

D. Use only those tools specifically intended for cutting the size and material and type pipe involved. Make cut to prevent damage to pipe or lining and to leave a smooth end at right angles to the axis of the pipe.

3.07 Valves and Valve Boxes

A. Install valves with operator stems in the vertical plane through the pipe axis and out of the plane of flow. Locate valves as shown on Drawings. Thoroughly clean before installation. Check valves for satisfactory operation.

B. Equip all underground valves without gearing or operator switch valve boxes. Set box in alignment with valve stem centered on valve nut. Set the valve box to prevent transmitting shock or stress to the valve. Set the box cover flush with the finished ground surface or pavement.

3.08 Pipe Penetrations

A. Use sleeves where pipes, valve stem extensions, or equipment parts pass through poured in place concrete or masonry walls or slabs. Sleeves shall be either cast iron or fabricated steel wall pipe with intermediate flange seep ring of sufficient size to allow sealing around pipe and clearance for valve stems or equipment. Extend vertical sleeves through slabs 1-inch above top surface.

B. Provide "Link Seal" pipe to wall closures manufactured by Thunderline Corporation, or Engineer approved equal, where shown on drawings or otherwise required. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to fill annular space between pipe and wall opening.

C. Where new pipe must penetrate existing concrete walls of water bearing structures or into the top slab of potable water bearing structures, core drill to smooth inside finish and install with Link Seal. Seal any rebar exposure.

D. Where new pipe must penetrate concrete wall on non-water bearing concrete structures, drill penetration in neat, workmanlike manner, install pipe, grout in place with non-shrink grout, and refinish surface to match adjacent.

3.09 Thrust Restraint

A. Provide reaction anchors of concrete blocking, metal harness, retainer gland type or restrained joint type at all changes in direction of pressure pipelines and as shown on drawings.

B. Concrete reaction anchors shall bear against undisturbed earth and shall be of the size and shape necessary to resist service conditions of the pipe.

C. Use metal harness restraints as shown on drawings.

D. Where retainer glands are used, extreme care shall be taken so that each set screw is tightened as recommended by the manufacturer before the pipe is backfilled and tested. Retainer glands shall not be used on non-metallic pipe, or on any pipe 10-inch or smaller.

3.10 Hydrostatic Testing

A. General:

1. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops. Air testing of pressure pipe shall not be permitted under any circumstance. The Contractor shall furnish all necessary equipment and materials, make all taps, and furnish all closure pieces in the pipe as required.

2. The Contractor's testing plan shall be submitted to the Owner and Engineer for review and approval prior to testing.

3. Hydrostatic testing shall be performed at a minimum pressure of 150 psi pressure or 1.5 times the working pressure (whichever is greater) for a period of not less than two (2) hours.

4. The Contractor shall supply a pump to apply the specified pressure to the test system. The pump suction shall be in a barrel/drum or similar device, or metered with a calibrated meter, so that the amount of water required to maintain the test pressure may be measured accurately.

5. The maximum length of pipe to be tested at one time is 2,600 linear feet. If more than 2,600 linear feet of pipe is tested during a single hydrostatic test, then the allowable leakage shall not exceed that which would be allowed for 2,600 linear feet of jointed ductile iron pipe.

6. No leakage shall be permitted for jointless pipe (i.e., fusion welded HDPE or FPVC pipe). If jointless pipe is included within a section being tested, then the length of jointless pipe shall not considered when calculating the allowable leakage.

B. Pre-Test Procedures:

1. The Contractor shall perform a hydrostatic pre-test to provide reasonable assurance of acceptance prior to performance of the witnessed test. Upon accomplishing a successful

pretest, the Contractor shall schedule testing to be conducted in the presence of persons required to witness the test.

2. Testing for acceptance shall be conducted in the presence of representatives of the Engineer of Record, the Owner, and the Contractor. All persons required to be present for testing shall be notified by the Contractor a minimum of two (2) business days prior to commencement of the test. Should any of the persons required to be present not be able to attend, the test shall be rescheduled.

3. Piping and appurtenance to be tested shall be within sections between valves, unless alternate methods have received prior approval. Testing shall not proceed until restraining devices are installed and all trenches have been completely backfilled in accordance with the Contract Documents. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

4. The Contractor shall ensure that all equipment such as pumps, gauges, blow-offs, and valves are in good working order.

5. The Contractor shall ensure that all valves within a section to be tested are fully open. At the request of the Owner or the Engineer of Record, the Contractor shall operate each valve to demonstrate that they are open.

6. One day prior to the hydrostatic test, slowly fill the pipe with water and allow it to stand for 24 hours.

C. Hydrostatic Testing for Acceptance:

1. The procedure for conducting the test shall be that each section of pipe to be tested shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Owner and the Engineer of Record. Prior to applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, the Contractor shall make taps and install appropriate valves to ensure all air is bleed from the test section.

2. If during the 2-hour test period the test pressure drops by 5 psi from the starting pressure, additional water shall be pumped into the test section to return the pressure to the starting pressure. The amount of water required to return the pressure to the starting pressure shall be recorded.

3. At the end of the 2-hour test period, additional water shall be pumped into the test section to return the pressure to the starting pressure. The amount of water required to return the pressure to the starting pressure shall be recorded.

4. Leakage shall be defined as the quantity of water added to hold the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$\frac{L = S \times D \times \sqrt{P}}{148{,}000}$$

L = allowable leakage (makeup water), in gallons per hour.

S = length of pipe tested, in feet.
D = nominal pipe diameter, in inches.
P = average test pressure, in psi (gauge).

5. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the Contractor with sound material and the test repeated until satisfactory results are obtained.

D. Connections to Existing Piping Systems

1. Approximate locations for existing piping systems are shown in the Plans. Prior to making connections into existing piping systems, the Contractor shall:

2. Field verify location, size, piping material, and piping system of the existing pipe.

3. Obtain all required fittings, which may include saddles, ductile iron sleeves or fittings, flanges, or others as shown in the Plans.

4. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.11 Field Quality Control

A. Compaction testing shall be performed in accordance with Section 312333 – Trenching and Backfilling.

B. If tests indicate Work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

C. Frequency of Tests: Minimum of one test per pipe branch.

END OF SECTION

SECTION 33 31 51

ELECTRIC ACTUATORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install all materials, equipment and incidentals required to completely install and put into operation, electric actuators as specified herein and shown on the plans.

B. Coordinate the plug valve installation with the electric actuators to insure a complete functional operation.

C. The Contractor shall cause all equipment specified under this section to be furnished by the valve and actuator manufacturers who shall be responsible for the adequacy and compatibility of their respective components. Any component of each complete unit not provided by the manufacturers shall be designed, fabricated, testing, and installed by factory-authorized representatives experienced in the design and manufacture of the valve and actuator equipment. This requirement, however, shall not be construed as relieving the Contractor of the overall responsibility for this portion of the work.

1.02 REFERENCES

A. American Water Works Association (AWWA)
   1. AWWA C542 – Electric Motor Actuators for Valves and Slide Gates

B. American Society for Testing and Materials (ASTM)

   1. ASTM A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings
   2. ASTM A536 – Ductile Iron Castings.

C. American National Standards Institute (ANSI) ANSI C50.41 – Polyphase Induction Motors for Power Generating Stations

D. National Electrical Manufacturer's Association (NEMA) NEMA MG1 – Motors and Generators.

1.03 SUBMITTALS

A. Product Data: Provide data on materials, valve, motor, product data.

B. Manufacturer's Certificate: Certify that valve, motor and materials meet or exceed respective standards.

1.04 QUALITY ASSURANCE

A. Quality Control Submittals:

1. The manufacturer shall submit product data and manufacturer's installation instruction under provisions of Section 01 33 00.
2. Three complete sets of certified assembly drawings showing the principal dimensions, construction details, and material used for all parts of the valve.The Drawings shall include a specific comprehensive elementary control schematic. The Drawings shall include a separate detailed point-to-point internal wiring diagram for each electrically operated or controlled valve and the associated electrical control equipment to include all external device connections.
3. One certified copies of the test record report including the Affidavit of Compliance.
4. Manufacturer's Certificate of Proper Installation.
5. Two copies of the Operation and Maintenance Manual.

1.05 ACCEPTED MANUFACTURERS

1. AUMA
2. Limitorque Flowserve
3. Rotork (IQ Series)

1.06 WARRANTY

A. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

PART 2 - PRODUCTS

2.01 VALVE ACTUATOR

A. Design: Valve actuators shall conform to the latest requirements of AWWA C507 and C542. The valve actuator shall be designed to hold the valve in any intermediate position between full open without creeping or fluttering. Valve actuators shall be of the worm gear design.

B. Position Indicator: Valve actuators shall be equipped with a travel indicator for valve position between full open and full close. The indicator shall be raised, clearly showing the legends "Open" and "Closed" at the end of a 90 degree arc with a pointer to show the disc position (Closed at 0 degrees and Open at 90 degrees) and the arc graduated in increments of ten degrees.

C. Direction of Operation: Clockwise direction shall close the valve and counter-clockwise direction shall open the valve. The valve actuator shall be located on the side of the valve, suitable for operations.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves and actuators shall be installed in accordance with instructions of the manufacturer and as shown on the plans.

B. Installation and adjustment shall be checked and approved by a manufacturer's direct factory representative. After acceptance, the representative shall address a letter to the Owner outlining all installation and start up procedures. The letter shall include a statement that the valves are installed per the manufacturer's recommendations. The manufacturer or his qualified representative shall conduct training session for the Owner's personnel in the operation and maintenance of the valves.

C. Plug valves and actuators shall be field tested and all deficiencies shall be corrected.

END OF SECTION