

SECTION 02810
UNDERGROUND IRRIGATION SYSTEM

PART 1 GENERAL

1.1 SCOPE

- A. Provide all labor, material, equipment and services required for the installation of irrigation system as described in the specifications and on the plans.
- B. Specifications are intended to include everything required and necessary for proper installation of the irrigation system whether each item is mentioned or not, and Contractor is expected to provide for a complete working system.
 - 1. Size the irrigation zones so that the irrigation pumps are able to supply a full irrigation cycle (flow and volume) for the entire area within a 12 hour period.
 - 2. Coordinate closely with the Architect and the Florida Tech Project Representative for consideration as to the Irrigation System requirements due to the up-coming availability of the City of Melbourne Re-Use Water.
- C. Execute all work in accordance with all applicable, ordinances, laws, regulations, codes, and local conditions, changes or additions shall be at no additional cost to Owner.

1.2 BIDDING

- A. Bidders submitting a proposal for this contract shall be responsible to inspect site to acquaint themselves with nature of conditions, which may construction.
- B. Bidders shall make themselves aware of all existing and/or proposed utilities in area of work.

1.3 DIMENSIONS

- A. All dimensions indicated on the plans are approximate, it is the Contractor's responsibility to verify all dimensions and reporting any variations from the plan to the Architect in writing.

1.4 ORDINANCES, REGULATION, CODES, PERMITS, AND INSPECTIONS

- A. All work shall conform to all applicable regulations, ordinances and codes.
- B. Contractor shall acquire and pay for all required permits.
- C. Contractor shall arrange for and be present during all required inspections.
- D. Any additional work or materials required due to inspection by authorities having jurisdiction shall be at no additional cost to Owner.

1.5 GUARANTEE

- A. Contractor shall guarantee the underground irrigation system for one-year from date of final acceptance by Owner and Architect. This includes all material, workmanship, and performance of the system.

1.6 TRAINING OF OWNER'S PERSONNEL

- A. The Contractor shall commission the irrigation system according to the design watering schedule, label the controller for the proper valve stations and debrief the owner's representative on the proper operation and maintenance of the system.

- B. The Contractor shall furnish copies of all parts list, trouble shooting lists, manufactures' specification or catalog sheets to the Owner and the Architect as a prerequisite to final payment.

1.7 SUPERVISION

- A. Contractor shall provide a competent superintendent and any necessary assistants on the project when work is in progress.
- B. Contractor shall notify the Owner of any change in the job Superintendent's status on the job
- C. Superintendent shall supervise Contractor's employees and is responsible for their actions and conduct on job site.

1.8 PROTECTION OF WORK AND PROPERTY

- A. Contractor shall continuously maintain adequate protection of all his work from damage and shall protect Owner's property from injury or loss arising in connection with his work.
- B. Contractor shall avoid damage to any existing construction, equipment, piping, pipe coverings, electrical systems, sewers, sidewalks, landscaping, or any other above ground or underground installations or structures on Owner's or adjacent property and is responsible for any damage that occurs as a result of his work as provided and required by law.

1.9 CLEANING PREMISES

- A. Contractor shall keep the construction area of the system neat and orderly at all times, providing continual disposal of rubbish and waste material resulting from installation.
- B. Upon completion of the system, Contractor shall remove from property, at his own expense, all temporary structures, rubbish, and waste materials resulting from installation.

1.10 SUBMITTALS

- A. Provide submittals in accordance with section 01300.
- B. The Contractor shall submit shop drawings and product data to the Architect and Owner:
 - 1. Indicating the actual layout of the well, pump pad and pumping equipment, piping, control equipment, rain sensor, and other irrigation pump station accessories.
 - 2. All technical data and installation instructions for underground system components.
 - 3. The Owner and Architect shall approve the shop drawings prior to start of work.
- C. The Contractor shall maintain an up to date set of as-built drawings.
 - 1. Showing the location of well, pump, sprinkler heads, valves, controller, piping, and any other deviations from the original Architect plans.
 - 2. Show all mainline isolation valves, splice boxes, and remote control valve locations with accurate dimensions to identifiable reference points.
 - 3. Complete set of reproducible as-builts of the installed irrigation system upon completion.

1.11 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work in this section.
- B. Section 02200, Earthwork.

PART 2 PRODUCTS

2.1 GENERAL

- A. Use all new materials with out flaws or defects of any type in the system, having a minimum one-year guarantee against material defects or defects in workmanship.
- B. Owner shall approve any Contractor substitution of material prior to installation.
 - 1. Contractor shall supply product specifications/data sheets and material samples, and reason for proposed substitution.

2.2 PVC PIPE AND FITTINGS

- A. Provide continuous marking on all pipes indicating manufacturer, type, class, and size.
- B. **Plastic pipe shall be designed to reflect the up-coming connection to the City of Melbourne Re-Use Water and shall be color coded (purple) Schedule 40 polyvinyl chloride (PVC) solvent weld type.**
- C. Fittings to be Schedule 40 color coded purple when available, or standard white if not available in purple.

2.3 SWING JOINTS AND RISERS

- A. All ½" swing joints shall be flexible thick-walled polyethylene pipe, with inside diameter of approximately 0.490" and outside diameter of approximately 0.700", and withstand a 400 psi burst test. All fitting shall be barbed and for use with the installed polyethylene pipe.
- B. All ¾ and larger swing joints shall be schedule 80 nipples and street elbows of the same size inlet of the sprinkler head threaded together with Teflon (TFE) tape or liquid Teflon.
- C. All swing joints nipples and elbows shall be the same size as the inlet of the irrigation head.

2.4 ELECTRIC WIRING

- A. All electrical work shall conform to applicable building and electric codes.
- B. All electrical components shall be UL listed.

2.5 CONTROL LINES

- A. Electrical control wiring:
 - 1. All control and ground wire shall be irrigation control cable of size as per manufacturer's requirements, except pulse wire min. 14-ga and common wire min. 12-ga.
 - 2. Wiring for connecting the automatic remote control valves to the automatic controllers shall be type UF 600 volt copper single conductor wire with PVC insulation with UL approval for direct underground burial feeder cable.
- B. Insulation shall be 4/64" thick minimum covering for positive waterproof protection of sizes AWG 14 to 10, and 5/64" thick for sizes AWG 8 to 00.
- C. Pulse circuit wires shall be a different color for each controller.
 - 1. Extra control line wire shall be a different color than all pulse circuit controller wire.
- D. All common wire shall be white.

2.6 SPRINKLER HEADS

- A. Irrigation heads and nozzles are specified on the Architect plans.
 - 1. Acceptable substitutes for Toro 570Z series irrigation mist heads are Rainbird 1800 series or Hunter Institutional Spray series.

2. Acceptable substitutes for K Rain Proplus series heads are Toro S700C series or Hunter PGP series.
- B. The head type and performance of all nozzles shall be similar to those shown on the plans.
- C. All sprinkler nozzles shall perform to the manufacturer's specifications concerning diameter of throw and gallon-age at given pressure.
- D. Unless noted, adjustable pattern nozzles are not allowed.

2.7 GATE VALVES AND VALVE BOXES

- A. Gate valves and isolation valves shall be AWWA brass body 125-pound wedge disc gate valves with non-rising stems as manufactured by Nibco, Matco Products Inc, or Grinnell.
- B. Provide a rigid injection molded polyefin valve box of 3.400 psi tensile strength approximately 10" deep x 12" diameter at base and have 9" diameter opening at the top with a purple twist lock cover fitting flush with top of box to mainline gate valve.

2.8 LIGHTNING PROTECTION

- A. Install lightning protection in accordance with the controller manufacturer's requirements to protect the automatic controllers.

2.9 CONTROL EQUIPMENT

- A. Automatic controller a Rainbird, model number ESP-24SITE-P, mounted on the pump station.
- B. Automatic control valves shall be Irritrol series 100.
 1. Remote control valves shall be electric and compatible with irrigation controller.
 2. Provide a rigid injection molded polyefin valve box of 3.400 psi tensile strength approximately 12" deep x 13¼" x 18½" at base and having a 10¼" x 15½" opening at the top with a green lockable cover fitting flush with top of box for each remote control valve. Locking mechanisms shall be two acetal spring locks requiring an unlocking device to open, but not close

2.10 RAIN SENSORS

- A. The rain sensors shall be "mini-clip II", Model 502 by Glen Hilton products, Inc., Aquamiser by Glen Hilton, or Toro Rainswitch.
- B. The Contractor shall provide all labor and materials required to install the rain sensing equipment.
- C. All materials used for mounting shall be corrosion resistant.
- D. The Contractor is responsible for the provision and installation of all electrical components required for the proper operation of the controller in conjunction with the rain interrupt switch, so that the installation fulfills its intended purpose

2.11 CHEMICAL INJECTION SYSTEM (RUST INHIBITOR)

- A. Chemical injection equipment shall be equal to Rust-master RM-55-7, as manufactured by Florida Water Processing, Inc., Ft. Lauderdale, Florida. Install the system when water contains iron level of 0.3 PPM or greater.
- B. The system shall have an adjustable rate positive displacement pump located inside the Pump Station enclosure connected to the pump system control panel and discharge pipe with a ball-valve to isolate the injector pump if necessary.

- C. The pump shall have a pumping capacity of 6 to 24 gallons per day at up to 100 psi.
- D. The pump motor shall be thermally protected and stop pumping if the system backpressure exceeds the pump capacity.
- E. Connect the supply pipe to the tank with a bulkhead connector.
- F. The tank will be made of polypropylene and have a capacity of 65 gallons with a refill hatch and shall be secured with two galvanized steel straps to the pump system skid with bolts or to a concrete pad with one quarter by one and one half inch long wedge anchors.
- G. All components will be resistant to iron precipitate chemicals.
- H. The injector pump will start via a relay wired to the irrigation controller master valve circuit.

2.12 IRON PRECIPITATE CHEMICALS

- A. The required iron precipitate chemicals shall be of a manufacturer whose product is readily and economically available in Brevard County.
- B. The chemicals shall prevent rust stains from forming on plants and other surfaces in all irrigation zones where the chemical injection unit is operating.
- C. All chemical precipitate chemicals shall be suitable for its intended purpose and shall not cause damage to piping, plant materials, buildings, or pavements.

2.13 PRESSURE RELIEF VALVE

- A. The pressure relief valve shall be a 2" Jayco 312, with 2 through 300 pound spring rating.

2.14 AIR RELIEF VALVE

- A. The air relief valve shall be a minimum 1" Bermad model number 4415.

2.15 PUMP STATION

- A. Submersible Pump: The submersible pump shall be a [Insert #] HP [Insert #] diameter pump, Goulds Model 225H, or equivalent, as accepted in writing by the Owner or the Architect. The pump shall be capable of supplying [Insert #] GPM at [Insert #] TDH and [Insert #] efficiency, and [Insert #] GPM at [Insert #] TDH and [Insert #] efficiency. The pump motor shall be [Insert #] volt and three phase. The pump station manufacturer shall coordinate the pump power requirements with the General Contractor. The pump motor shall be as supplied by the pump manufacturer. The pump and motor shall be suitable for its intended purpose.
- B. The pump magnetic starter shall be as per the pump motor manufacturer's recommendation, and include properly sized heaters and lightning arresters, with NEMA magnetic starter suitable for the intended purpose enclosed in a UL listed NEMA 4R aluminum enclosure.
 - 1. The pump shall operate and retire upon receiving start up and shut down signals from the irrigation controllers.
 - 2. The relays shall prevent the irrigation controllers from interconnecting with each other.
 - 3. The Contractor shall provide an appropriately sized transformer relay hookup to the irrigation controllers.
- C. The Contractor shall provide and install disconnect switches on a unistruct frame, provided by the Irrigation Contractor, for the pump motor, controllers, and rust inhibitor unit motor. Location coordinated between the Irrigation Contractor and the General Contractor.
- D. The automatic control valve shall be 3" diameter, flanged, globe type valve with pressure reducing and surge control pilots, fitted with oil filled pressure gauges on both the inlet and discharge sides of the valve as manufactured by Bermad or approved equal.

- E. The motor safety control for the submersible pump motor shall be Franklin Electric “Subtrol Plus” as recommended for three phase submersible pump protection, complete with all sensors, transmitters, receivers, etc., and sized and designed for the selected pump and motor.
- F. The water check valve shall be 4" diameter as manufactured by Flomatic, Model Number 888, or approved equal.
- G. The butterfly valve shall be a 3" diameter lever operated cast iron valve as manufactured by Kitz, Code Number 81 or approved equal.
- H. The pump drop pipe shall be threaded Schedule 40 galvanized steel.
- I. Securely mount all pump-equipment on a 6" thick concrete pad, sized as necessary to allow sufficient workspace between the system components. Reinforced the pad with 6" x 6", 10-ga x 10-ga, WWF, and meet all other applicable building codes.
- J. Assemble the pump station in a workman like manner with consideration given to convenience of use, maintenance, and future repairs with all intended features working properly and reliably. All components mountings shall be sturdy and solid, with sufficient clearance to safely access, operate, and repair without significant disassembly of other components.
- K. Perform all work in a professional manner utilizing sound and accepted practices using all components in conformance to their respective manufacturer’s recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all materials and equipment in a neat and workmanlike manner following the material manufacturers' recommendations.
- B. The Owner and Architect retain the right to order removal or replacement of any items, which, in their opinion, do not present a reasonably neat and workmanlike appearance.
- C. If any material required removal and replacing, Contractor shall be perform and complete without additional expense to the Owner.

3.2 SLEEVE INSTALLATION

- A. All PVC piping and all control lines that cross roadways or pavement more than 5' in width, shall be sleeved and when possible extend 3' beyond the payment edge.
- B. All sleeves underneath roadways shall be 24" below grade.
- C. All sleeves shall have a diameter equal at least 2.5 times the nominal diameter of the carrier pipe.

3.3 EXCAVATION

- A. The Contractor shall perform all necessary excavation and backfilling to install a complete system per section 02200.
- B. The minimum depth of cover for all piping and sleeves shall be:

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|------------------------------|--------------------------|
| 1. Vehicle traffic areas | |
| Pipe Size | Depth of Cover in inches |
| ½"-2½" | 18" |
| 3" & 4" | 24" |
| 6" & larger | 30" |
| 2. Non-Vehicle Traffic Areas | |
| Pipe Size | Depth of Cover in inches |
| ½"-2" | 12" |
| 2½" & 3" | 18" |

- 4" & larger
- 24"
- C. Excavate trenches to a sufficient depth and width to provide for a minimum of 6" of separation between parallel or crossing pipelines.
- D. It is the responsibility of the Contractor to determine exact location of existing underground utilities and to avoid damage to such during construction. In event of damage to existing utilities, the Contractor shall restore same to their original condition.

3.4 INSTALLATION OF PIPE AND EQUIPMENT

- A. Protect PVC pipe from direct sunlight during storage.
- B. Keep pipe clean and check for presence of organic or foreign material prior to installation.
- C. Lay the pipe in accordance with lines shown on the drawings, and in accordance with the manufacturer’s recommendations.
- D. Protect PVC pipe in trench prior to backfill, form direct sunlight by covering with a layer of clean sandy material.
- E. Pipe shall also be covered with fill material, or otherwise anchored, to prevent floating in event water enters trench prior to complete backfilling.
- F. Architect shall approve substantial deviations from the piping layout and the Contractor shall record the changes on the as-built plans as work progresses.
- G. Installation of system piping shall be in accordance with manufacturer’s instructions and shall proceed from point of connection of supply for system pumping station.
- H. All piping and equipment joints shall be watertight.
- I. Flush and pressure test the mainlines for a minimum of four hours after the installation of gate valves and remote control valves.
- J. Test the mainlines with remote control valves closed and gate valves open.
- K. Thoroughly flush all lateral lines prior to installation of sprinkler heads.
- L. Install concrete thrust blocks at any directional change in the main pipelines in accordance with the manufacturer’s instructions and the thrust block detail indicated on the drawing.
- M. Piping sizing: The size of all main and lateral piping (indicated in inside diameters) shall be as indicated on the plan. If the diameter of the pipe is not indicated on the plan, the following criteria shall be used to determine the pipe size:

| | |
|--------------------------------|---|
| 1. Accumulated Theoretical GPM | Pipe Size As Shown On The Head Schedule |
| 0 - 10 GPM | ¾" |
| 11 - 15 GPM | 1" |
| 16 - 25 GPM | 1¼" |
| 26 - 35 GPM | 1½" |
| 36 - 56 GPM | 2" |
| 57 - 85 GPM | 2½" |
| 86 - 125 GPM | 3" |
| 126 - 210 GPM | 4" |

3.5 SPRINKLER HEADS

- A. Install all sprinkler heads on swing joints as shown on drawings.
- B. Install the sprinkler head so that the top is in accordance with the manufacturer’s recommendation with respect to the finished grade level.
- C. Backfill around swing joints and sprinklers shall be clean sand fill materials free of rocks, significant organics, or other foreign debris.
- D. All rotor type sprinkler heads shall be located a minimum of 12" away from the edge of any bed line, building, curb, roadway or sidewalk.

- E. All mist type sprinkler heads shall be located a minimum of 6" away from the edge of any bed line, building, curb, roadway or sidewalk.
- F. Install all 12" pop up mist heads as shown on the drawings.
- G. Adjust head to prevent spray onto any building, structures, walks, or paved areas.

3.6 ELECTRIC CONTROL LINES

- A. Size all electric control wire as recommended by the controller and valve manufacturer, except as otherwise specified.
 - 1. Install wire in the piping trenches whenever possible and place underneath the piping, and maintain at least 6" vertical separation between the wire and the bottom of the pipe.
 - 2. Control wire shall be taped together with electrical tape not more than 5' O.C.
 - 3. Control wires shall be snaked into the trench as loosely as possible and with as much slack as possible to allow for expansion and contraction of the wire.
 - 4. When necessary to run control wire in a separate trench, encase the wire in a PVC sleeve and provide a minimum cover of 12".
 - 5. Encase all wire between the bottom of the main or lateral piping and the bottom of the controller in a PVC sleeve.
- B. Provide sufficient slack of the wire at all wire connections, remote control valves, and all wire splices, so that in case of repair the valve bonnet or splice may be brought to the surface without disconnecting the wires.
- C. All splicing of wire shall take place in valve boxes, and be of UL listed waterproof wire connectors as recommended by the wire manufacturer.
- D. Each remote control valve or group of remote control valves, connected to one station of the controller, shall have wire sizes as recommended by the manufacturer, except as noted.
 - 1. Connect all remote control valves, connected to the same controller, to a common ground wire of a size recommended by the manufacturer.
 - 2. Each individual controller shall have a separate common ground wire system entirely independent of the common ground wire system of all other controllers.
 - 3. Connect only those remote control valves controlled by one specific controller, to the controller's common ground wire system.
 - 4. Each control valve shall have an independent control line, which terminates at the controller.

3.7 CONTROLLERS

- A. Install all controllers per the equipment manufacturer's recommendations.
- B. Mount all controllers per the specifications and in accordance with all applicable building and electrical codes, at the locations indicated on the plans.
- C. Controllers shall engage the pump magnetic starter through external K-Rain, K-PRS-2-24 relays, or equivalent, so as not to interconnect with each other.
- D. Inside each controller, the Contractor shall mount a waterproof listing of each station of that controller, and a written description of the landscape areas irrigated by that station.
- E. The controller shall also operate the chemical injection pump.
- F. Ground the control as shown on the drawings.
- G. The contractor shall provide for a telephone line, through the 1" conduit installed by the others, between the controller location and the nearest EMC Terminal Cabinet, meeting all project specifications and applicable codes.

3.8 ELECTRICAL WORK

- A. A licensed electrical contractor having experience in the installation of similar equipment shall install all electrical work including but not limited rain sensors, automatic controllers, and pump starter per all applicable codes and regulations.

3.9 RAIN SENSORS

- A. The Contractor shall install the rain sensors as per the manufacturer's recommendations.
- B. Locate the rain sensors in a position where rain will freely fall on the equipment, and are not affected by irrigation water.
- C. The Contractor shall make adjustments to the rain sensing equipment as required to properly adjust for the newly installed plant materials and other site conditions. The adjustment of the rain sensing equipment shall be coordinated with the Landscape Contractor.

3.10 REMOTE CONTROL VALVES

- A. Install remote control valves as indicated on the drawings and per the manufacturer's recommendations, with a brass gate valve, equal to the size of the remote control valve, on the pressure side of all remote control valves.
- B. Adjust the flow control stem on all remote control zone valves downward to minimize any over pressurization before performing any individual nozzle adjustments on the sprinklers.

3.11 VALVE BOXES AND MARKERS

- A. Install all valve boxes, any other miscellaneous markers or access boxes as shown on the plans, so the top of said structure is at finished grade.
- B. Install all groups of valve boxes so that the tops of all boxes are level with each other, and the sides of all boxes are parallel to each other.

3.12 PRESSURE RELIEF AND AIR RELIEF VALVES

- A. Final location of the relief valves shall be coordinated with the Architect and Owner.
- B. Adjust the pressure relief valves to vent 10-psi higher than the discharge setting of the automatic control valve.

3.13 INSTALLATION OF THE PUMP STATION

- A. The pump shall be set in accordance with the well capacity testing to maintain a flooded suction under all operating conditions.
- B. Install the pump station in accordance with the drawings and specifications.
- C. Pump Station Testing:
 - 1. The complete pumping station shall operate without appreciable vibration throughout the range of operating conditions.
 - 2. Perform a running test of normal start and stop operations under load.
 - 3. During such tests, the pump station shall demonstrate the ability to operate without vibration, overheating and without question, its general fitness for service.
 - 4. The Contractor at his expense shall make any corrections and adjustments.
 - 5. Repeat the tests and make adjustments until system works properly.
- D. The Contractor shall adjust the automatic control valve as directed by the Architect.

3.14 CHEMICAL INJECTION EQUIPMENT

- A. The Contractor is responsible for the submittal to the Architect and Owner of a water analysis showing the amount of soluble iron present in the well. The Architect and Owner will make a determination as to the necessity of the installation of the rust inhibitor equipment.
- B. If required, install the rust inhibitor unit per the manufacturer's recommendations.
 - 1. The Contractor shall provide and install the proper amount of RC-100 rust inhibitor until the completion and acceptance of the project by the Owner and Architect.
 - 2. The Contractor is responsible for any damage caused by water not properly treated until the final acceptance of the work by the Architect and Owner.
- C. The Contractor shall fill the tank with RC-100 rust inhibitor immediately upon final acceptance of the work by the Architect and Owner.

3.15 TESTING, BALANCING AND ADJUSTMENTS:

- A. The Contractor shall test the irrigation system per the following:
 - 1. Test the irrigation system mainlines for proper operation upon completion of the mainline installation, (allow sufficient time for solvent weld joints to cure).
 - 2. Flush all air from the irrigation mainlines then test with 100-psi hydrostatic pressure for a minimum of 4 hours.
 - 3. After the pressure is stabilized in the mainlines, no more than 10-psi drop in pressure is allowed over the four-hour period.
 - 4. Repair or remove and replace any part of the system, not complying with the test, and repeat process until system works properly. In any case repair any visible leakage regardless of the test results.
 - 5. The Contractor is not required to pressure test any portions of the mainline not installed under this Contract, but is responsible for providing any necessary isolation valves required to separate the existing mainlines for the new mainlines
 - 6. Test the entire irrigation system upon completion, and after sufficient time passes for solvent weld joints to cure for proper operation.
 - 7. Flush all air from the irrigation system, and check all components for proper operation.
- B. The Contractor shall balance and adjust the various components of the sprinkler system so the overall operation of the system is effective.
 - 1. Balancing and adjustment shall include:
 - a. Synchronization of the controllers
 - b. Adjustments to the rain sensors
 - c. Adjustments to pressure relief valve, sprinkler heads, individual nozzles, automatic control valve, and remote control valves
 - d. Individual station adjustments on the controllers, and all other components of the system.
 - 2. The Contractor shall adjust all sprinkler nozzles so that there is minimal overthrow of water onto sidewalks and roadways, and no overthrow onto buildings or automobile parking areas.

END OF SECTION