

## SECTION 02810

### IRRIGATION SYSTEM

#### PART 1 GENERAL

##### 1.1 Summary

- A. **General:** Furnish and install a complete underground sprinkler, emitter and bubbler system for all turf and landscaped areas. Work shall include furnishing and installing all plastic and copper pipe and fittings, automatic control valves, valve access boxes, electric computerized central controllers, electric wire, telephone access line (if required), etc., as required for a complete system as indicated in the Construction Documents. The Contractor is responsible for all costs of water used during construction. Work shall, also, include all required tests to ensure adequate pressurization and area coverage.
- B. **Irrigation line/component location:** Irrigation lines shown on the drawings are essentially diagrammatic. Actual locations of all heads, valves, piping, wiring, etc., shall be established by the Contractor at the time of construction with the approval of Florida State University Grounds Representative. Exact locations and type of component shall be field verified at project completion and documented in as-built drawings.
- C. **Water conservation:** In the interest of conserving water, University Grounds Department is requiring the use of drip irrigation systems for all shrubs as well as separation of zones, i.e. turf, ground covers, trees, shrubs, palms, etc. All spray head areas are to be designed and installed to minimize overspray onto other zones as well as any hardscape surfaces. All lateral lines shall be self draining, with flush plugs installed on all drip lines, and be designed to minimize runoff of irrigation water onto roadways, driveways and walks.
- D. The **final grade** shall be completed and shall have been approved by the Facilities Project Manager and a Grounds Department, Irrigation Division Representative before the Irrigation Contractor starts the irrigation layout.

1.2 –This section not used--

##### 1.3 System Description

- A. **System Design Requirements:**
  - 1. **Design pressures:** Pressure shall not exceed 85 psi unless specified otherwise. Provide an approved pressure reducing valve. Contact Landscape Architect of Record for adjustments in system if existing pressure is less than design pressure.
  - 2. **Location of heads:** Make minor adjustments as necessary to avoid plantings and other obstructions.
  - 3. **Metering:** Meter location shall be coordinated with the University Utilities Department.
  - 4. **Controller:** Provide Hunter ACC-1200/ACC-COM-HWR/RAD3/ANT#(RASREM). Location shall be coordinated with University Grounds Department and shall be proximate to the main building telecommunications room . Provide power to controller via independent circuit and install a ground rod per manufacturer's requirements 8' from the the controller.
- B. **Minimum Water Coverage (100% expected):**
  - 1. **Turf areas:** 100% head to head coverage.
  - 2. **Other planting areas:** 90%.

3. **Layout** may be modified, if necessary to obtain coverage, to suit manufacturer's standard heads. Do not decrease number of heads indicated unless otherwise acceptable to FSU representative. If modified, provide shop drawing showing changes that were necessary and present to FSU Representative.

**C. At Substantial Completion, provide the Owner with the following:**

1. Manufacturer's operating and maintenance instructions.
2. Project record Drawings of the system, hard copies and CAD.
3. Schedule showing the length of time each valve is to be open to produce a given amount of precipitation per season.
4. Six extra sprinkler heads of each size and type, six emitters of each type and six sprays and nozzles of each type.
5. Two valve keys for manual valves.
6. Wrench for each type head core.
7. Wrench for removing and installing each type head.
8. Two Quick coupler keys as required.
9. A permanent identification of valve stations and areas irrigated on the 8-1/2" x 11" chart to be placed on the inside door to the appropriate controller. The chart shall be plasticized and sealed for permanency. Xerox reduction of print, sealed in plastic will be acceptable.
10. Two valve keys for mainline gate valves when mainline gate valves are required per plans.

1.4 **Sequencing and Scheduling**

- A. **Maintain uninterrupted water service** to building during normal working hours. Arrange for temporary water shut-off with FSU during installation of irrigation system, if necessary.
- B. Review installation procedures under other sections and coordinate the installation of items that must be installed with the irrigation system.
- C. Do not begin work covered by this section until the landscape grading is complete and Utility location information has been verified by FSU. Utility locates should be scheduled through the Facilities Project Manager.

**PART 2 PRODUCTS**

2.1 **Manufacturers**

- A. **Provide:** Hunter ACC irrigation controller capable of communicating with the University's central control system.
  1. Model - ACC-1200/ACC-COM-HWR/RAD3/ANT3(RASREM)
  2. Model – PRO-C

2.2 **General**

- A. Unless otherwise specified or shown on the Drawings, the construction of sprinkler lines and installation of control wiring shall include excavation and backfill, the furnishing, installing and testing of sprinkler pipe and fittings, and the removal and/or restoration of existing improvements and all other work in accordance with the Plans and Specifications.
- B. In support of sustainable practices, the University supports reduction of potable water use for landscape irrigation. The source of irrigation water should be determined in consultation with the University Utilities Department Representative, Grounds Department Representative and the Facilities Department Project Manager.

1. Use of City of Tallahassee supplied potable water for Irrigation should be minimized when possible.
2. All projects should consider other options for irrigation water to include: existing University irrigation well, captured rainwater, and recycled wastewater.
3. If non potable water is used, contractor to use self scrubbing valves, purple pvc pipe and boxes and any other equipment required to identify the water source. All valve boxes must be lockable.

### 2.3 Pipe

- A. **Plastic pipe below ground:** Shall be rigid unplasticized PVC - Type I, 1120-1120 extruded from virgin parent material, Schedule 40 for all mains smaller than 4" and all lateral lines. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious materials, wrinkles, and dents.
- B. **Pipe 4" and larger:** Shall be Class 200 rubber - ring type with Ductile Iron fittings and thrust blocked per details on the plans.
- C. **Storage:** Make provisions for storing all irrigation PVC pipe out of sunlight throughout the installation period of the irrigation system.
- D. **All pipe shall be continuously and permanently marked with the following information:** Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation approval (N.S.F.).
- E. **Deliver:** Plastic pipe shall be delivered to the site in unbroken bundles or rolls, packaged in such a manner as to provide adequate protection for the pipe ends, either threaded or plain.
- F. **PVC below ground from backflow preventer to sprinkler system:** Provide type "K" hard copper above ground and from tap to meter to BFP. ANSI B16.22 wrought copper or cast brass, recessed solder joint type fittings. For assembly of backflow preventer.

### 2.4 Fittings

- A. Manufacturer's standard, of type and size necessary to construct automatic irrigation system as shown on Plans. **General fittings specs shall be as follows:**
  1. PVC plastic socket type, Schedule 40, ASTM D2466, typical.
  2. PVC plastic threaded and socket type where detailed, Schedule 40, ASTM D2467.
  3. Ring type applications, IPS Ductile Iron, grade 65-45-12, ASTM A536 & ASTM F477.
  4. Copper, wrought copper or cast brass, recessed solder joint, ANSI B16.22.

### 2.5 Reduced Pressure Backflow Preventer

- A. The backflow preventer shall be of the reduced pressure type provided with full flow resilient seated ball valve, (2) shut-off valves and test cocks for testing unit to insure proper operation. Provide Watkins or approved equal.
- B. The backflow preventer body shall be of bronze construction and corrosion resistant internal components. Manufacturer's standard, of type and size to suit sprinkler system, as shown on drawings.
- C. Include bronze filter, union downstream and brass test port plugs.

2.6 **Backflow Preventer Enclosure**

- A. Install BFP to minimize visual impact to the campus and provide green covers labeled "Irrigation". Screen BFP with plant material.

2.7 **Isolation Valves**

- A. Gate valves must be provided at all new branches of the main line. Manufacturer's standard, of type and size indicated on plans. Furnish 2 valve keys, 3 feet long with tee handles and key end to fit gate valves.
- B. Unless otherwise specified, the installation of all valves shall include the excavation and backfill, the furnishing, installing and testing of risers, nipples, fittings, valves, and valve boxes, and the removal and/or restoration of existing improvements and all other Work in accordance with the Plans and Specifications and as required for the completed installation.

2.8 **Automatic Controller**

- A. **Type:** Automatic controllers shall be installed where indicated on the Drawings and shall be as manufactured by HUNTER, model number PRO-C or ACC-1200. Additionally, the ACC-1200 controller shall include the following modules:
  - 1. ACC-COM-HWR
  - 2. RAD3
  - 3. ANT3 (RASREM)
- B. **Exterior Control Enclosure:** Manufacturer's standard weatherproof enclosure with locking cover.
- C. **Mounting:** Controller shall be wall mounted at 5' from bottom of the enclosure to finished grade below. Power connection for controller shall be on its own circuit and provided via steel electrical conduit. Provide ground rod to be installed 8" from controller unless specified otherwise by manufacturer.
- D. **Stations:** The basic controller shall have a minimum of 12 stations capable of being expanded to a maximum capacity of 42 stations.

2.9 **Automatic Remote Control Valves, Electric Solenoid Type**

- A. **Automatic remote control valves** to be installed where shown on the Drawings and shall be slow acting diaphragm type electric solenoid operated valves of sizes as indicated on the drawings, or approved equal. All valves shall be professional grade with min. 150 psi rating that provide flow control, dial setting pressure regulation and have internal and/or external bleed.
- B. **Installation:** Valves shall be installed one assembly per valve box unless approved by FSU Grounds Department, Irrigation Division Representative. Assemblies may include valve, "y" filter, and pressure regulator support appurtenances at detailed on the project plans.
- C. **Valve:** Hunter ICV Filter Sentry – 1" and up. Threaded type. All valve assemblies shall be equipped with line size shutoff ball valves.

2.10 **Filter & Pressure Regulator**

- A. Provide filter, pressure regulator, valve boxes, WYE strainer and other appurtenances required for the installation of a complete assembly/system.
  - 1. **Y-Filter:** Hunter HY-100 on drip and micro-spray zones.
  - 2. **Pressure Regulator:** Senninger 30 psi on drip and micro-spray zones.

## 2.11 Sprinkler Heads

- A. **General:** Sprinkler heads shall be manufacturer's standard unit, to suit sprinkler system, as shown on the Plans. If necessary, layout shall be adjusted in the field to provide uniform coverage over entire area of spray shown on the Drawings at the available water pressure.
- B. **Heads:** Shall be professional grade, heavy duty ABS construction including extra thick body and cap. Spray shall be adjustable from 1 to 360 degrees by a top adjustment screw on any spray watering an area less the 90 degrees.
- C. **Sprays and Rotors:**
  - 1. Hunter with 6" popup for turf. Pressure compensating bodies with check valve.
  - 2. Sprays: PRO PRS30, PRS40
  - 3. Rotors: PGJ, PGP and I Series
  - 4. Swing joints.

## 2.12 Emitters

- A. **Provide:** multi outlet drip emitters: Bowsmith 2 GPH threaded—ML220.
- B. **Locate:** emitter in access sleeve for ease of maintenance. Sleeve: SALCO – DAS8

## 2.13 Flush Plugs

- A. Provide flush plug at the end of each run for drip and micro-spray zones.

## 2.14 Bubbler Heads

- A. All bubbler heads shall be set perpendicular to finished grades unless otherwise designated on the Drawings, or otherwise specified. Bubblers shall be ½" pressure compensated adjustable flow up to 2.0 gpm, capable of fine tuning by top mounted stainless steel screw.
- B. **Hunter bubblers:** preset to desired GPM in access sleeve below grade.
- C. **Provide:** 4" diameter root zone watering system, (2 per tree) wrap in filter sock and fill with gravel. Size dependent on size of tree. Or construct watering system from 4" perforated PVC with cap, wrap in filter sock and fill with gravel.

## 2.14 Risers

- A. **Adjustable riser assembly:** All sprinkler heads and quick-coupling valves shall have an adjustable riser assembly (double swing joint riser) assembled by the use of at least three (3) Marlex street ells or PVC tees as recommended by the sprinkler manufacturer and/or as shown on the drawings. These double swing joint risers shall be of schedule 80 PVC plastic pipe and unless otherwise indicated, as shown on the Plans. The horizontal nipple connected directly into the side outlet of the main line shall be a minimum of 6" long.

**2.15 Quick-Coupler Valves**

- A. Cast bronze two piece bodies with swing joint riser, actuator key, swivel ell and plastic cover imprinted "Do Not Drink".
- B. Hunter with anti rotation wings, threaded key and hose swivel.
- C. If using reclaimed water, cap of quick-coupler devices shall be purple to denote non-potable water supply.
- D. Quick-coupling valve locations shown on the Drawings are essentially diagrammatic. It shall be the Contractor's responsibility to establish the location of all quick-coupling valves as directed by FSU Grounds Department, Irrigation Division Representative. In no case shall spacing of quick-coupling valves exceed distances shown on the Drawings and/or those specified.

**2.16 Control Cable**

- A. All **electrical control and common wire** shall be irrigation control cable. Wiring used for connecting the automatic remote control valve to the automatic controller shall be Type "UF" 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.
- B. **Insulation** shall be a minimum 4/64" thick covering of ICC-100 compound for positive waterproofing protection. Each controller shall have its own common wire to respective valves.
- C. Contractor verification of wire types and installation procedures shall be checked to make sure they conform to local codes. Where more than one wire is placed in a trench, the wiring shall be taped together at 10 foot intervals. All wiring is to be sleeved under paving and structures with a separate sleeve from any other utility or piping.
- D. **Color designations:** All control wire shall follow the below color designations and be a minimum 14 Gauge solid copper.

<u>Controller</u>	<u>Control Wire</u>	<u>Common Wire</u>	<u>Spare Wire</u>
A	Red	White	Yellow
B	Purple	White	Yellow
C	Orange	White	Yellow
D	Green	White	Yellow
E	Blue	White	Yellow
F	Pink	White	Yellow

All common wire shall be white.  
Under no circumstances may black wire be used.

- E. **Coil a minimum of 24" of wire in each valve box.** Pull 2 additional spare wires to each valve location. Tag each spare wire in the controller and in each valve box. Tag station wire in the controller and in each valve box with station number. The color of this extra wire shall be yellow in all cases unless approved otherwise by the FSU Grounds Department, Irrigation Division Representative. Sleeve wires below paved surfaces in separate sleeves from mains and laterals.

## **F. Flow Sensor/Master Valve**

- a. All irrigation systems shall come equipped with a flow sensor and master valve. These devices shall be installed 5' from the BFP. Components shall be as indicated on the plans and approved by FSU Grounds Department, Irrigation Division.
- b. Flow sensor: HFS with appropriate FCT Tee.

## **G. Rain Sensor**

- a. All irrigation systems shall come equipped with a rain sensor shut off. This device shall be as manufactured by HUNTER model Rain-Clik or Wireless Rain-Clik. Locations shall be approved by FSU Grounds Department, Irrigation Division.

## **PART 3 INSTALLATION**

### **3.1 General**

- A. The Contractor shall lay out the system using stakes or paint to indicate the location of the various components as well as the location of each run of pipe and phone line. Preliminary adjustments to conform to actual site conditions shall be accomplished at this time.
- B. Work shall be in accordance with the manufacturer's recommendations and shall be to the best standards of the industry. Spray back on buildings shall not be permitted. General arrangement and locations of piping, valves and equipment should be shown on Drawings. Make minor changes required by unforeseen conflict and Work of other trades. Connect to water source described in Drawings adapting as required.
- C. Automatic irrigation controller location shall be approved by the FSU Grounds Department prior to installation.
  1. Install irrigation controller per manufacturer's instruction manual, including proper grounding procedures.
  2. Clock shall be securely mounted at a height of 5' from the bottom of the controller to finish grade.
  3. Clock can be either pedestal or wall mounted as appropriate. Use mounting holes provided. **DO NOT DRILL INTO ANY CONTROLLER PARTS.**
  4. Power source shall be hardwired and enclosed in electrical box/conduit in a manner to allow attachment through the controller box knock-outs. Connection to an open electrical outlet is not allowed.
  5. Grounding shall be in accordance with ASIC specifications. Ground rod shall be located 8' from controller and connected by ground clamp to #6 AWG copper wire. Ground wire shall be enclosed in EMT separate from station and valve wires and installed 12" below grade.
- D. Where rain sensors are NOT exposed to elements install Hunter Wireless Rain-Clik sensors at locations approved by FSU Grounds Department, Irrigation Division.
- E. Separate zones shall be established for irrigation of trees, shrubs, turf, ground covers, annuals and palms. Wire electric valves to promote sequential testing of the individual zones. Connection to controller modules shall be one wire per station.

### **3.2 Trenching**

- A. **General:** Excavate straight and true. In areas subject to freezing bottom must slope uniformly to low points. Protect existing lawns and plantings. Remove and replant as necessary to complete

installation. Replace damaged lawn areas and plants with new to match existing. Notify FSU Grounds Department prior to cutting roots 1-1/2" or larger.

- B. **Trench Depth:** Excavate to provide minimum cover and required pipe bedding.
- C. **Minimum Cover:**

1.	Backflow Preventer Assembly	24"
2.	Mainline Beyond Backflow	18"
3.	Laterals	12"
4.	Under Vehicle Ways	30"
5.	Control Wire	18"
- D. **Bedding:** Bed pipe in 1" minimum of loose friable soil, free of rocks and deleterious material.
- E. **Backfill:** Backfill with clean material from excavation. Remove organic material as well as rock and debris larger than 1" diameter. Place and compact material in 6" lifts, to 85% density planted areas or 90% elsewhere.
- F. Main line piping installation shall include **warning tape** and **tracer wire** for future use.
- G. **Reseed and restore** to original condition any areas not in healthy condition which may have been damaged from installation of irrigation system.
- H. **Pavements:** Where existing pavements must be cut to install landscape irrigation system, cut smoothly to straight lines 6" wider than trench. Excavate to required depth. Repair or replace pavement cuts with equivalent materials and finishes.
- I. **Jacking:** At existing obstacles and walkways, jack pipe sleeves under paving material if possible, backfill and compact all voids.
- J. **Bore:** Fire lanes shall not be cut in any manner. Dry bore and jack sleeve to provide 24" minimum cover. Sleeve with Schedule 40 or stronger black steel pipe, as per Plans for irrigation pipe and wire.
- K. **Sleeves:** The General Contractor shall sleeve as per schedule at walkways, walls and obstructions. Provide 2" minimum wire sleeves as needed and 1 spare 2" sleeve. Field verify any existing sleeves shown on Plans.
- L. **Drain Pockets:** Excavate to sizes indicated. Backfill with acceptable drain material to 12" below grade. Cover drain material with a sheet of 30 lb. asphalt saturated felt and backfill remainder with excavated material. Restore plantings disturbed by this Work.
- M. **Alignment of pipe** shall be for a simple layout with pipe running parallel or perpendicular to features such as curbs and sidewalks as may be possible with on-site conditions and to avoid future conflict with the plant root balls.

### 3.3 Installation of Plastic Pipe and Fittings

- A. **Expansion:** Plastic pipe shall be installed in a manner so as to provide for expansion and construction as recommended by the manufacturer. Maximum of two laterals per trench. Allow a minimum of 16" between all trenches.
- B. **Cuts:** Plastic pipe shall be cut with a hand saw or hack saw with the assistance of squared-in sawing vise, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that smooth unobstructed flow will be obtained.



- C. **Joints:** All plastic to plastic joints shall be made using Weld-On P-70 primer and Weld-On 711 solvent as recommended by the pipe manufacturer. Plastic to metal joints shall be made with plastic male adapter to PVC schedule nipples. The solvent-weld joints shall be made in the following manner:
1. Thoroughly clean the mating pipe and fitting with a clean dry cloth.
  2. Apply a uniform coat of primer to both the pipe and fitting. While primer is still wet, apply a uniform coat of solvent to the outside of the pipe with a non-synthetic bristle brush.
  3. Apply solvent to the inside of the fitting in a similar manner.
  4. Re-apply a light coat of solvent to the pipe and quickly insert it into the fitting.
  5. Give the pipe or fitting a quarter turn to ensure even distribution of the solvent and make sure the pipe is inserted into the full depth of the fitting socket.
  6. Hold in position for 15 seconds.
  7. Wipe off excess solvent that appears at the outer shoulder of the fittings.
  8. Care should be taken so as not to use an excess amount of solvent, thereby causing a burr or obstruction to form on the inside of the pipe.
- D. **Sub-base:** Lay pipe on solid subbase, uniformly sloped without humps or depressions.
1. For circuit piping, slope to drain valve at least 1/2" per 10 foot run.
  2. All wall penetrations, pack the opening around pipe with non-shrink grout. At exterior face, leave a perimeter slope approximately 1/2" wide by 3/4" deep. Fill this slot with backer rod and an acceptable elastomeric sealant. Repair below grade waterproofing disturbed by this work and make penetration watertight.
  3. Contractor to ensure the installation of all sleeves necessary to route irrigation piping and electrical control wire.
  4. Install PVC pipe in dry weather when temperature is above 40 degrees F before testing, unless otherwise recommended by manufacturer.
- E. Threaded male adapters shall be compounded as per manufacturers recommendation. Adapter shall then be hand tightened, plus one turn with a strap wrench. 4" main line pipe shall be "Ring tite" with bolt-type fittings. Concrete thrust block all mainline fittings, behind fittings. No concrete on any inserted PVC joints.
- F. Piping under paved or concrete areas shall be sleeved in schedule 40 PVC pipe as shown on the Drawings. Where any cutting of A.C. pavement, sidewalks and/or concrete work is necessary, it shall be removed and replaced by the Contractor. Permission to cut roadway, sidewalks and/or concrete shall be obtained from the Facilities Project Manager.
- G. All pipe shall be thoroughly embedded 6" all around in construction grade sand or screened material. All lateral pipe in rocky soils shall be thoroughly embedded in sand or approved topsoil.
- H. **Marking Tape:** All main line pipe shall be identified with 3" wide metallic marking tape for future locating of lines.
- I. **Clearances:** All pipe lines shall have a minimum clearance of 6" from each other and 12" from lines of other trades. Parallel lines shall not be installed directly over one another.
- J. **Pipe sizes** on Drawings are minimum allowable. Increase in size if required by Code and wherever necessary to meet unusual conditions.
- K. Run lines parallel or perpendicular to buildings, walks, etc. and in straight lines as much as possible.
- L. **Dielectric Protection:** Use dielectric fittings at connection where pipes of dissimilar metal are joined.

### 3.4 Installation of Equipment

- A. **Backflow Preventer:** Provide union on downstream side. Install minimum 12" above grade. Maximum, height 16". Enclose in an enclosure as required by these specs and details found on the plans.
- B. Install **anti-drain valves** as needed to prevent drainage of lateral lines into parking areas and causing standing water.
- C. **Flush** circuit lines with full head of water and install sprinkler heads after hydrostatic test is completed.
  - 1. Install lawn heads at manufacturer's recommended heights.
  - 2. Install shrubbery heads at heights indicated on Drawings.
  - 3. Locate part-circle heads to maintain a minimum distance of 4" from walls and 2" from other boundaries, unless otherwise indicated.

### 3.5 Installation of Irrigation Heads & Risers

- A. Heights of irrigation heads in relation to ground level shall be shown on the Plans and in the details.
- B. Irrigation heads shall not be assembled to risers until flushing is completed. Care shall be taken prior to emitter installation and pipe kept free of foreign matter after flushing and prior to emitter installation.
- C. **Coordination of heads with planting is a requirement.** In cases where irrigation and planting is contracted to separate parties, final coordination of heads shall be the responsibility of Irrigation Contractor. In the case where more than one emitter outlet is required to a single plant, Irrigation Contractor shall install emitters equal distance around base of plant.
- D. **Contractor shall be responsible to ensure that all turf areas receive 100% spray coverage.** Contractor to add or delete irrigation heads as required to achieve desired result. If necessary, layout shall be adjusted in the field to provide uniform coverage over entire area of spray shown on the Drawings at the available water pressure.

### 3.6 Backfilling and Compacting

- A. The trench shall be backfilled and compacted in 8" lifts and leveled to the grade of adjacent soil. Compaction shall be 95% of the maximum density of adjacent soil. Any settling of trenches shall be brought up to grade as necessary.

### 3.7 Installation of Control Cable

- A. All electric control cable shall be of size as shown as specified herein and shall be installed in the piping trenches wherever possible. Pipe trench shall be partially backfilled to provide three to four inches of cover over the pipe before wire is installed. Wire shall be "snaked" into the trench as loose as possible and with as much slack as possible to allow for expansion and contraction of the wire. If it is so desired, rather than leaving slack in the wire, expansion joints in the wire may be provided at 200-foot intervals by making five to fifteen turns of the wire around a piece of 1/2" pipe. Where it is necessary to run wire in a separate trench, the wire shall have a minimum cover of 24".
- B. All wire connections at remote control valves, whether direct buried or in control boxes, and at all wire splices shall be left with sufficient "slack" so that in case of repair the valve bonnet or splice may be brought to the surface without disconnecting the wires (24" min.).

- C. Wire connections to remote control electric valve and splices of wire in the field shall be made in the following manner using Pen-Tite wire connectors and sealing cement, or approved equal:
  1. Strip ends of wires and push wires through the holes of the base socket.
  2. Twist wires together and mechanically bond together using crimp sleeve and crimp pliers.
  3. Pull wire connection back into base socket as far as possible.
  4. Apply solvent cement to outside of sealing plug then fill cavity of sealing plug completely with solvent cement.
  5. Push sealing plug into base socket, using slight twisting motion, until it bottoms.
  6. Push wires unseating sealing plug. This assures cement completely sealing around wire insulation and waterproofing the connection.
- D. It is important the joint be **absolutely waterproof** so that there is no chance for leakage of water and corrosion build-up on the joint.
- E. **No splices shall occur between the controller and the remote control valve.** If outstanding circumstances occur that require wire splices the contractor shall first send written notification to FSU Grounds Department, Irrigation Division for approval. Contractor shall make all splices inside a valve box with adequate slack at the ends of the wire run (24" min.).

## **PART 4 AUXILIARY EQUIPMENT**

### **4.1 Valve Boxes**

- A. **Type:** All remote control valves, unless otherwise indicated shall be installed in suitable plastic or other type valve access box of proper size and commercial grade as required for easy access to the valve. Access boxes shall be complete with plastic or other approved type locking cover. Keys shall be provided for the non-rusting locking covers. Valve boxes shall be CARSON or approved equal. All valve boxes in mulch areas shall be dark tan in color. Contractor shall make every effort to avoid placing valve boxes in turf areas. If, for proper operation of irrigation system, it is found to be impossible not to place valve boxes in turf, those valve boxes shall be forest green in color.
- B. **Controller designation** shall be clearly and neatly etched into top of valve box lid. All valve access boxes shall be provided with proper length and size extensions, wherever required, to bring the valve boxes level with the finish grade.
- C. **Weed Control fabric** shall be placed on bottom of box and wrap around piping to keep the interior of the valve box free from loose soil and weeds. A layer of pea gravel as detailed in the drawings shall also be placed within each component box.

### **4.2 Enclosures**

- A. The protective enclosure for the backflow preventers shall be detailed on the drawings. Padlocks shall be furnished by the Owner after final acceptance.

### **4.3 Field Quality Control**

- A. **Tests:** Notify FSU Grounds Department, Irrigation Division in writing when tests will be conducted. Notification of Tests shall be a minimum of 48 hours in advance. Conduct tests in presence of FSU Grounds Department Representative.

### **4.4 Flushing and Testing**

- A. After completion and prior to the installation of any terminal fittings, the entire pipeline system shall be thoroughly flushed to remove all foreign material. After flushing, the following tests shall be conducted in the sequence listed below. All equipment, materials and labor necessary to

perform the tests shall be furnished by the Contractor and all tests shall be conducted in the presence of FSU Grounds Department Representative.

1. **Pipeline Pressure Test:** A water pressure test shall be performed on all pressure mains and laterals before any couplings, fittings, valves and the like are concealed. All open ends shall be capped after the water is turned into the lines in such a manner that all air will be expelled. Pressure mains shall be tested with all control valves to lateral lines closed. The constant test pressure and the duration of the test are as follows:
  - a. **Mains:** 6 hours at 50 psi above operating pressure or 135 psi whichever is greater.
2. **Sprinkler Coverage Test:** The coverage test shall be performed after sprinkler heads have been installed and shall demonstrate that each section or unit in the irrigation system is balanced to provide uniform and adequate coverage of the areas serviced. The contractor shall correct any deficiencies in the system.
3. **Operation Test:** The performance of all components of the automatic control system shall be elevated for manual and automatic operation.
4. All necessary repairs, replacement and adjustments shall be made until all equipment, electrical work, controls and instrumentation are functioning to the satisfaction of FSU Grounds Department Representative.

#### 4.5 Adjusting

- A. After completion of grading, seeding or sodding, and rolling of grass areas, carefully adjust lawn sprinkler heads so they will be flush with or not more than 1/2 inch above finish grade, and plumb. Do not over spray onto walks, walls, buildings, signs or parking areas. Adjust to conform.
- B. Coordinate the controller watering schedules to minimize station overlap. Submit watering schedule to FSU Grounds Department, Irrigation Division for review prior to acceptance of project.

### PART 5 - CLEAN UP

#### 5.1 Clean-up

- A. Clean up shall be made daily as each portion of the Work progresses. Refuse and excess dirt shall be removed from the site, and walks and paving shall be broomed or washed down daily.

#### 5.2 Protection

- A. Protect Work from damage until acceptance. Any damage shall be repaired to original conditions at Contractor's expense.

#### 5.3 Protection of Existing Irrigation

- A. The Irrigation Contractor is to protect the existing irrigation system and to provide 100% uninterrupted coverage to all existing plant material.
- B. The Contractor is to supply temporary irrigation if there is work on-going within an existing irrigation system, i.e. temporary mainline, temporary lateral line, etc., to maintain uninterrupted service to all other areas.

- C. Contractor shall demonstrate proper operation of all previously existing systems prior to final acceptance. Contact FSU Grounds Department, Irrigation Division for inspection of all new and affected systems.

## **PART 6 - RECORD DRAWINGS AND GUARANTEES**

### **6.1 Record Drawings**

- A. During progress of the Work, keep an up-to-date set of Drawings showing field and shop drawing modifications. Record dimensioned locations and depths for each of the following:
  - 1. Sprinkler pressure line routing (Provide dimensions for each 100 lineal feet {maximum} along each routing, and for each change in directions).
  - 2. Gate valves and butterfly valves.
  - 3. Irrigation control valves
  - 4. Control wire routing and color designation.
  - 5. Sleeves under paving
  - 6. Turf sprinkler heads
  - 7. Other related items as may be directed by the Engineer/Owner's Representative
  - 8. Maintain as-builts on a daily basis to ensure accuracy.
- B. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs or pavements).
- C. Record all changes which are made from the Contract Drawings, including changes in the pressure and non-pressure lines.
- D. Record all required information on a set of blackline prints of the Drawings. Do not use these prints for any other purpose.
- E. Maintain information daily. Keep Drawings at the site at all times and available for review by the FSU Grounds Department, Irrigation Division Representative.
- F. Make dimensions accurately at the same scale used on original drawings, or larger. If photo reduction is required to facilitate controller chart housing, notes or dimensions must be a minimum 1/4" in size.
- G. Provide electronic as built record documents for all irrigation work as required elsewhere in the FSU Design Guidelines.

### **6.2 Guarantees**

- A. Submit for approval a written guarantee in addition to manufacturer's guarantees or warranties. All Work shall be guaranteed for one (1) year from date of final acceptance against defects in material, equipment and workmanship by the Construction Manager. Guarantee shall also include repairs to any part of the premises resulting from leaks or other defects in materials. Guarantee shall be presented on Contractors official stationary and signed by the Contractor and Subcontractor.

### **6.3 Operation and Maintenance Data**

- A. Submit detailed operation and maintenance data for all equipment and accessories provided under this Section including assembly and part lists for each type of valve, emitter, etc. Refer to requirements for project close-out documents.

#### **6.4 Controller Charts**

- A. Do not prepare charts until Record Drawings have been approved by the FSU Grounds Department, Irrigation Division Representative.
- B. Provide one controller chart for each automatic controller installed.
  - 1. Chart may be a reproduction of the Record Drawing, if the scale permits fitting the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
  - 2. Chart shall be blackline print of the actual system, showing the area covered by that controller.
- C. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage.
- D. Following approval of charts by the FSU Grounds Department, Irrigation Division Representative, they shall be hermetically sealed between two layers of 20 mil thick plastic sheet.
- E. Charts must be completed and approved prior to final acceptance of the irrigation system.

**END OF SECTION**