FLORIDA CHAPTER
AMERICAN SOCIETY OF
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August 12, 2013

Mr. Richard Browdy, Chair
Florida Building Commission
6944 St. Augustine, Suite D
Jacksonville, FL 32217

Re: Appendix F, Florida Building Code

Dear Mr. Browdy,

The Florida Chapter of the American Society of Landscape Architects (FLASLA) and the Florida Irrigation Society (FIS) are writing to support Glitch Amendment P6228 filed by the Florida Home Builders Association (FHBA) to be considered during the August 22 Florida Building Commission (FBC) meeting. Section 373.228, Florida Statutes, requires the use of Appendix F in developing and updating statewide irrigation design standards for new construction. The Legislature has mandated these standards and guidelines as well as the use of Appendix F. Additionally, Appendix F establishes uniform minimum standards and requirements for the design and installation of safe, cost effective, reliable irrigation systems for turf and landscape areas which promote the efficient use and protection of water and other natural resources.

We urge the Florida Building Commission to reconsider the adoption of Appendix F to the Florida Building Code and would appreciate your favorable consideration of this matter.

Sincerely,

Michael Miller, ASLA
President, Florida Chapter
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Tom Super
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cc:

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APPENDIX F

PROPOSED CONSTRUCTION BUILDING CODES FOR TURF AND LANDSCAPE IRRIGATION SYSTEMS

PART 1: GENERAL

A. Description.

1. Purpose. To establish uniform minimum standards and requirements for the design and installation of safe, cost effective, reliable irrigation systems for turf and landscape areas which promote the efficient use and protection of water and other natural resources.

2. Definition. Turf and landscape irrigation systems apply water by means of permanent above-ground or subsurface sprinkler or microsprinkler equipment under pressure.

3. Scope. These construction codes shall apply to all irrigation systems used on residential and commercial landscape areas. They address the design requirements, water quality, materials, installation, inspection, and testing for such systems. These construction codes do not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

4. Application. All new irrigation systems and any new work to existing irrigation systems shall conform to the requirements of this code.

5. Application to existing irrigation installations. Nothing contained in this code shall be deemed to require any irrigation system or part thereof, which existed prior to the establishment of this code, to be changed altered or modified to meet the standards of this code.

B. Permits.

1. Permits required. It shall be unlawful to construct, enlarge, alter, modify, repair, or move any irrigation system or part thereof, or to install or alter any equipment for which provision is made or the installation of which is regulated by this code without first having filed application and obtained a permit therefore from the building official. A permit shall be deemed issued when signed by the building official and impressed with the seal of the governmental agency issuing said permit.

2. Exceptions. All work where exempt from permit shall still be required to comply with the code. No permit shall be required for general maintenance or repairs which do not change the structure or alter the system and the value of which does not exceed $600.00 in labor and material based on invoice value.

C. Preconstruction submittals.

1. Plans or drawings.

a. Single-family residence. Provide design drawings or shop drawings, where required, for the installation prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and include all improvements. Drawings can be prepared by a properly licensed qualified contractor.

b. Commercial, industrial, municipal and multiple-family. Provide professionally designed drawings prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all improvements, and shall include but not be limited to: date, scale, revisions, legend, specifications which list all aspects of equipment and assembly thereof, water source, water meter and/or point of connection, backflow prevention devices, pump station size, pump station location, design operating pressure and flow rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, etc. The plans and specifications shall be prepared in accordance with Section 106 of the Florida Building Code, Building.

D. Definitions.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limited use in present day irrigation systems. Solvent weld fittings are used with this pipe (see ASTM D 1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of air from a pressurized pipeline. A small orifice is used to release air at low flow rates. Air release valves are normally required at all summits of mainline and submain pipelines in an irrigation system.

Anti-Siphon Device. A safety device used to prevent back-flow of irrigation water to the water source by back-siphonage.

Application Rate. The average rate at which water is applied by an irrigation system, sometimes also called precipitation rate. Units are typically inches/hr or mm/hr.

Arc. The angle of coverage of a sprinkler in degrees from one side of throw to the other. A 90-degree arc would be a quarter-circle sprinkler.

Atmospheric Vacuum Breaker. An anti-siphon device which uses a floating seat to direct water flow. Water draining back from irrigation lines is directed to the atmosphere to protect the potable water supply.

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way of hydraulic or electrical control lines and controls a single device or multiple devices.

Automatic System. An irrigation system which operates following a preset program entered into an automatic controller.

Backflow Prevention Device. An approved safety device used to prevent pollution or contamination of the irrigation water supply due to backflow from the irrigation system.

Belled (Pipe). Pipe which is enlarged at one end so that the spigot end of another length of pipe can be inserted into it during the assembly of a pipeline.

Block (of sprinklers). A group of sprinklers controlled by one valve. Also called zones or subunits.

Block System. An irrigation system in which several groups of sprinklers are controlled by one valve for each group.

Bubbler Irrigation. The application of water to the soil surface or a container as a small stream or fountain. Bubbler emitter discharge rates are greater than the 0.5 to 2 gph characteristic of drip emitters, but generally less than 60 gph.

Check Valve. A valve which permits water to flow in one direction only.

Chemical Water Treatment. The addition of chemicals to water to make it acceptable for use in irrigation systems

Chemigation. The application of water soluble chemicals by mixing or injecting with the water applied through an irrigation system.

Contractor. Any person who engages in the fabrication and installation of any type of irrigation system on a contractual basis in accordance with all stipulations receiving his compensation.

Control Lines. Hydraulic or electrical lines which carry signals (to open and close the valves) from the controller to the automatic valves.

Controller. The timing mechanism and its mounting box. The controller signals the automatic valves to open and close on a pre-set program or based on sensor readings.

Coverage. Refers to the way water is applied to an area.

Cycle. Refers to one complete run of a controller through all programmed controller stations.

Demand (or irrigation demand). Refers to the irrigation requirements of the irrigated area. Demand primarily depends on the type of crop, stage of growth, and climatic factors.

Design Area. The specific land area to which water is to be applied by an irrigation system.

Design Emission Uniformity. An estimate of the uniformity of water application with an irrigation system.

Design Pressure. The pressure at which the irrigation system or certain components are designed to operate. The irrigation system design pressure is that measured at the pump discharge or entrance to the system if there is no pump, and a zone design pressure is the average operating pressure of all emitters within that zone.

Direct Burial Wire. Plastic-coated single-strand copper wire for use as control line for electric valves.

Discharge Rate. The instantaneous flow rate of an individual sprinkler, emitter, or other water emitting device, or a unit length of line-source micro irrigation tubing. Also, the flow rate from a pumping system.

Double Check Valve. An approved assembly of two single, independently-acting check valves with test ports to permit independent testing of each check valve.

Drain Valve. A valve used to drain water from a line. The valve may be manually or automatically operated.

Drip Irrigation. The precise low-rate application of water to or beneath the soil surface near or directly into the plant root zone. Applications normally occur as small streams, discrete or continuous drops, in the range of 0.5 to 2.0 gph.

Effluent water. Also referred to as reclaimed or gray water is wastewater which has been treated per Florida Statute, §403.086 and is suitable for use as a water supply for irrigation systems.

Emitters. Devices which are used to control the discharge of irrigation water from lateral pipes. This term is primarily used to refer to the low flow rate devices used in micro irrigation systems.

Fertigation. The application of soluble fertilizers with the water applied through an irrigation system.

Filtration System. The assembly of physical components used to remove suspended solids from irrigation water. These include both pressure and gravity type devices, such as settling basins, screens, media filters, and centrifugal force units (vortex sand separators).

Flexible Swing Joint. A flexible connection between the lateral pipe and the sprinkler which allows the sprinkler to move when force is applied to it.

Flow Meters. Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typically in gpm), and to provide data on system usage.

Gauge (Wire). Standard specification for wire size. The larger the gauge number, the smaller the wire diameter.

Head. A sprinkler head. Sometimes used interchangeably with and in conjunction with "Sprinkler."

Infiltration Rate. The rate of water flow across the surface of the soil and into the soil profile. Units are usually inches/hr.

Irrigation. Application of water by artificial means, that is, means other than natural precipitation. Irrigation is practiced to supply crop water requirements, leach salts, apply chemicals, and for environmental control including crop cooling and freeze protection.

Irrigation Water Requirement or Irrigation Requirement. The quantity of water that is required for crop production, exclusive of effective rainfall.

Landscape. Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground covers, flowers, shrubs, trees, and similar plant materials as opposed to agricultural crops grown and harvested for monetary return.

Lateral. The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or header pipeline downstream of the control valve.

Line-Source Emitters. Lateral pipelines which are porous or contain closely-spaced perforations so that water is discharged as a continuous band or in overlapping patterns rather than discrete widely-spaced points along the pipeline length.

Looped System. A piping system which allows more than one path for water to flow from the supply to the emitters or sprinklers.

Mainline. A pipeline which carries water from the control station to submains or to manifolds or header pipelines of the water distribution system.

Manifold. The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. Also sometimes called a header pipeline.

Manual System. A system in which control valves are manually operated rather than operated by automatic controls.

Meter Box. A concrete or plastic box buried flush to grade which houses flow (water) meters or other components.

Microirrigation. The frequent application of small quantities of water directly on or below the soil surface, usually as discrete drops, tiny streams, or miniature sprays through emitters placed along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbler, and spray irrigation. Previously known as trickle irrigation.

Overlap. The amount one sprinkler pattern overlaps another one when installed in a pattern. Expressed as a percentage of the diameter of coverage.

PE Pipe. Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black for resistance to degradation by ultraviolet radiation.

Potable Water. Water which is suitable in quality for human consumption and meets the requirements of the Health Authority having jurisdiction.

Pressure Relief Valve. A valve which will open and discharge to atmosphere when the pressure in a pipeline or pressure vessel exceeds a pre-set point to relieve the high-pressure condition.

Pressure Vacuum Breaker. A backflow prevention device which includes a spring-loaded check valve and a spring-loaded vacuum breaker to prevent the backflow of irrigation system water to the water source.

Pumping Station. The pump or pumps that provide water to an irrigation system, together with all of the necessary accessories such as bases or foundations, sumps, screens, valves, motor controls, safety devices, shelters and fences.

PVC Pipe. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure rated for water. Manufactured in accordance with AWWA C-900 or ASTM D-2241.

Rain Shut off Device. A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprinkler system when a predetermined amount of rain fall has occurred.

Riser. A threaded pipe to which sprinklers or other emitters are attached for above-ground placement.

Sleeve. A pipe used to enclose other pipes, wire, or tubing; usually under pavement, sidewalks, or planters.

Spacing. The distance between sprinklers or other emitters.

Spray Irrigation. The micro irrigation application of water to the soil or plant surface by low flow rate sprays or mists.

Sprinkler. The sprinkler head. Sometimes called "Head."

Supply (Water Source). The origin of the water used in the irrigation system.

Swing Joint. A ridged connection between the lateral pipe and the sprinkler, utilizing multiple ells and nipples, which allows the sprinkler to move when force is applied to it.

Tubing. Generally used to refer to flexible plastic hydraulic control lines which are usually constructed of PE or PVC.

PART II — DESIGN CRITERIA

A. Design defined. Within the scope of this code, irrigation system design is defined as the science and art of properly selecting and applying all components within the system.

B. Water supply.

1. The water source shall be adequate from the stand-point of volume, flow rate, pressure, and quality to meet the irrigation requirements of the area to be irrigated, as well as other demands, if any, both at the time the system is designed and for the expected life of the system.

2. If the water source is effluent, it shall meet the advanced waste treatment standard as set forth in Florida Statute §403.086(4) as well as any other standard as set forth by the controlling governmental agency.

C. Application uniformity. Irrigation application uniformity describes how evenly water is distributed within an irrigation zone. Irrigation system uniformity is the uniformity coefficient. Use application rates which avoid runoff and permit uniform water infiltration into the soil. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds will be considered when application rates are specified. Sprinkler irrigation systems should be designed with the appropriate uniformity for the type of plant being grown and the type of soil found in that area. The general watering of different types of plants as one group without regard to their individual water requirements is to be avoided if at all possible. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, shall not be combined on the same zone or circuit.

D. System zoning. The irrigation system should be divided into zones based on consideration of the following:

1. Available flow rate.

2. Cultural use of the area.

3. Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

4. Type of sprinkler, i.e., sprinklers with matching precipitation rates.

5. Soil characteristics.

E. Sprinkler/emitter spacing and selection. Sprinkler/Emitter spacing will be determined considering the irrigation requirements, hydraulic characteristics of the soil and device, and water quality with its effect on plant growth, sidewalks, buildings, and public access areas. When using square spacing, sprinklers should not be spaced farther apart than 55 percent of their manufacturer-specified diameters of coverage for prevailing wind speeds of 5 miles per hour (mph) or less. Spacing should not exceed 50 percent of sprinkler diameters of coverage for wind speeds of 5 to 10 mph, and 45 percent for prevailing wind speeds greater than 10 mph. When using triangular spacing, the above overlap percentages can be reduced by five percent. Water conservation will be emphasized by minimizing irrigation of non-vegetated areas. Microirrigation systems should be designed using the Emission Uniformity concept. Space microirrigation emitters to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.

F. Pipelines. Pipelines will be sized to limit pressure variations so that the working pressure at all points in the irrigation system will be in the range required for uniform water application. Velocities will be kept to 5 feet (1524 mm) per second.

G. Wells.

1. Well diameters and depths are to be sized to correspond to the irrigation system demand. Refer to SCS Code FL-642 and local water management district regulations.

2. Well location and depth shall be in compliance with applicable state, water management district and local codes.

H. Pumps.

1. Pump and motor combinations shall be capable of satisfying the total system demand without invading the service factor of the motor except during start-up and between zones.

2. Pumps shall be positioned with respect to the water surface in order to ensure that the net positive suction head required (NPSHr) for proper pump operation is achieved.

3. The pumping system shall be protected against the effects of the interruption of water flow.

I. Control valves.

1. Control valve size shall be based on the flow rate through the valve. Friction loss through the valve, an approved air gap separation, or a reduced pressure should not exceed 10 percent of the static mainline head.

2. Control systems using hydraulic communication between controller and valve(s) shall comply with the manufacturer's recommendations for maximum distance between controller and valve, both horizontally and vertically (elevation change).

3. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications; based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except individual, single lot residential systems.

4. Locate manually operated control valves so that they can be operated without wetting the operator.

J. Automatic irrigation controller. Automatic irrigation controllers must be UL approved and have an adequate number of stations and power output per station to accommodate the irrigation system design. The controller shall be capable of incorporating a rain shut off device to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.

K. Chemical injection.

1. Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or any other injected substance will be located and sized according to the manufacturers' recommendations.

2. Injection systems will be located downstream of the applicable backflow prevention devices as required by Florida Statutes, Section 487.021 and 487.055; the Environmental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

3. If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device is required.

L. Backflow prevention methods. Provide backflow prevention assemblies at all cross connections with all water supplies in accordance with county, municipal or other applicable codes to determine acceptable backflow prevention assembly types and installation procedures for a given application. In the event of conflicting regulation provide the assembly type which gives the highest degree of protection.

1. Irrigation systems into which chemicals are injected shall conform to Florida state law (Florida Statutes 487.021 and 487.055) and Environmental Protection Agency Pesticide Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the chemical label.

2. For municipal water supplies, chemical injection equipment must be separated from the water supply by an approved air gap separation or a reduced pressure principle assembly that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equipment must also comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

3. For other water supplies, Florida State law, EPA regulations, or other applicable local codes must be followed. In the absence of legal guidelines at least a PVB should be used.

PART III — STANDARDS

1. American Society of Agricultural Engineers (ASAE) Standards:

ASAE S330.1: Procedure for sprinkler distribution testing for research purposes.

ASAE S376.1: Design, installation, and performance of underground thermoplastic irrigation pipelines.

ASAE S397.1: Electrical service and equipment for irrigation.

ASAE S435: Drip/Trickle Polyethylene Pipe used for irrigation laterals.

ASAE S398.1: Procedure for sprinkler testing and performance reporting.

ASAE S339: Uniform classification for water hardness.

ASAE S394: Specifications for irrigation hose and couplings used with self-propelled, hose-drag agricultural irrigation system.

ASAE EP400.1: Designing and constructing irrigation wells.

ASAE EP405: Design, installation, and performance of trickle irrigation systems.

ASAE EP409: Safety devices for applying liquid chemicals through irrigation systems.

2. ASTM International Standards:

ASTM D 2241: Poly (Vinyl Chloride) (PVC) Plastic pipe (SDR-PR).

ASTM D 2239: Specification for polyethylene (PE) plastic pipe (SDR-PR).

ASTM D 2466: Specification for socket-type poly (vinyl chloride) (PVC) and chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 40.

ASTM D 2855: Standard recommended practice for making solvent cemented joints with polyvinyl chloride pipe and fittings.

ASTM D 3139: Specification for joints for plastic pressure pipes using flexible elastomeric seals.

ASTM F 477: Specification for elastomeric seals (gaskets for joining plastic pipe).

3. American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

4. American Society of Sanitary Engineers (ASSE) Standards:

ASSE 1001: Pipe applied atmospheric type vacuum breakers.

ASSE 1013: Reduced pressure principle backflow preventers.

ASSE 1015: Double check valve type back pressure backflow preventers.

ASSE 1020: Vacuum breakers, anti-siphon, pressure type.

ASSE 1024: Dual check valve type backflow preventers.

5. Hydraulic Institute Standards, 14th Edition

6. Standards and Specifications For Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

7. Soil Conservation Service (SCS) Field Office Technical Guide, Section IV-A — Cropland Codes:

SCS Code 430-DD: Irrigation water conveyance, underground, plastic pipeline.

SCS Code 430-EE: Irrigation water conveyance. Low pressure, underground, plastic pipeline.

SCS Code 430-FF: Irrigation water conveyance, steel pipeline.

SOS Code 441-1: Irrigation system, trickle.

SCS Code 442: Irrigation system sprinkler.

SCS Code 449: Irrigation water management.

SCS Code 533: Pumping plant for water control.

SCS Code 642: Well.

PART IV: MATERIALS

A. PVC pipe and fittings.

1. PVC pipe should comply with one of the following standards ASTM D 1785, ASTM D 2241, AWWA C-900, or AWWA C-905. SDR-PR pipe shall have a minimum wall thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

2. All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

B. Ductile iron pipe and fittings.

1. Gasket fittings for iron pipe should be of materials and type compatible with the piping material being used.

C. Steel pipe and fittings.

1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

2. Threaded fittings for steel pipe should be Schedule 40 Malleable Iron.

D. Polyethylene pipe.

1. Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

2. Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

3. Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

E. Sprinklers, spray heads, and emitters.

1. Select units and nozzles in accordance with the size of the area and the type of plant material being irrigated. Sprinklers must fit the area they are intended to water without excessive overspray onto anything but the lot individual landscaped surface. Intentional direct spray onto walkways, buildings, roadways, and drives is prohibited. All sprinklers used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2. Use equipment that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

3. Support riser-mounted sprinklers to minimize movement of the riser resulting from the action of the sprinkler.

4. Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

F. Valves.

1. Valves must have a maximum working pressure rating equal to or greater than the maximum pressure of the system, but not less than 125 psi (861 kPa). This requirement may be waived for low mainline pressure systems [30 psi (207 kPa) or less]. All valves used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.

2. Only valves that are constructed of materials designed for use with the water and soil conditions of the installation shall be used. Valves that are constructed from materials that will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

G. Valve boxes.

1. Valve boxes are to be constructed to withstand traffic loads common to the area in which they are installed. They should be sized to allow manual operation of the enclosed valves without excavation.

2. Each valve box should be permanently labeled to identify its contents. All valve boxes used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

H. Low voltage wiring.

1. All low voltage wire which is directly buried must be labeled for direct burial wire. Wire not labeled for direct burial must be installed in watertight conduits, and be UL listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a pipe and sleeve.

2. The size of the electrical control wire shall be in accordance with the valve manufacturer's specifications, based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating, on the

circuit. Minimum of # 14 AWG single strand control wire shall be used on all systems, except single lot individual residential systems.

3. Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

I. Irrigation controllers.

1. All irrigation controllers shall be UL listed, conform to the provisions of the National Electric Code (NEC), and be properly grounded in accordance with manufacturer's recommendations. Equip solid state controls with surge suppressors on the primary and secondary wiring, except single lot residential systems.

2. The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) clearance from other outdoor equipment, free and clear of any tree canopy or other overhead obstructions, and above the height of the sprinkler coverage.

J. Pumps and wells.

1. Irrigation pump electrical control systems must conform to NEC and local building codes.

2. The pumping system shall be protected from the hazards of the environment in which it is installed.

3. Use electric motors with a nominal horsepower rating greater than the maximum horsepower requirement of the pump during normal operation. Motor shall have a service factor of at least 1.15.

4. Casings for drilled wells may be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. Steel pipe must have a wall thickness equal to or greater than Schedule 40. See SCS code FL-642. Steel casings shall be equal to or exceed requirements of ASTM A 589.

K. Chemical injection equipment.

1. Chemical injection equipment must be constructed of materials capable of withstanding the potential corrosive effects of the chemicals being used. Equipment shall be used only for those chemicals for which it was intended as stated by the injection equipment manufacturer.

L. Filters and strainers.

1. Filtration equipment and strainers constructed of materials resistant to the potential corrosive and erosive effects of the water shall be used. They shall be sized to prevent the passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance with the manufacturer's recommendations.

PART V: INSTALLATION

A. Pipe installation.

1. Pipe shall be installed at sufficient depth below ground to protect it from hazards such as vehicular traffic or routine occurrences which occur in the normal use and maintenance of a property. Depths of cover shall meet or exceed SCS Code 430-DD, Water Conveyance, as follows:

a. Vehicle traffic areas.

Pipe Size (inches)	Depth of Cover (inches)
1/2 – 2 1/2	18 - 24
3 - 5	24 - 30
6 and larger	30 - 36

b. Nontraffic and noncultivated areas.

Pipe Size (inches)	Depth of Cover (inches)
1/2 – 1 1/4	6 – 12
1 1/2 - 2	12 – 18
1/2 - 3	18 - 24
4 and larger	24 - 36

c. Residential single lot installations only.

Pipe Size (inches)	Depth of Cover* (inches)
1/2 - 1	4 - 6
1 1/4 - 1 1/2	8 – 12
2 - 2 1/2	12 – 18
3 and larger	24

* Except in areas where more than one lot is connected together, controlled, or connected through a master system then the depths in Chart B shall apply.

2. Make all pipe joints and connections according to manufacturer's recommendations. Perform all solvent-weld connections in accordance with ASTM D 2855.

3. Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another. Comingling or mixing of different types of pipe assemblies shall be prohibited.

4. Thrust blocks must be used on all gasketed PVC systems. They must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outside diameter of the pipe. Size thrustblocks in accordance with ASAE S-376.1.

5. The trench bottom must be uniform, free of debris, and of sufficient width to properly place pipe and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material shall be free from rocks or stones larger than 1-inch in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking or mounding shall not be used to bring the pipe to final grade.

6. Pipe sleeves must be used to protect pipes or wires installed under pavement or roadways. Use pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle to be placed under the paving or roadway and extending a minimum of 3 feet beyond the paved area or as required by the Florida Department of Transportation (FDOT). Use sleeve pipe with wall thickness at least equal to the thickness of schedule 40 or PR 160 pipe, whichever is thicker. Proper backfill and compaction procedures should be followed.

B. Control valve installation.

1. Valve installation shall allow enough clearance for proper operation and maintenance. Where valves are installed underground, they shall be provided with a valve box with cover extending from grade to the body of the valve. The top of the valve body should have a minimum of 6 inches (152 mm) of cover in nontraffic and noncultivated areas and 18 inches (457 mm) of cover in traffic areas. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

2. Install valve boxes so that they do not rest on the pipe, the box cover does not conflict with the valve stem or interfere with valve operation, they are flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

3. Install quick coupling valves on swing joints or flexible pipe with the top of the valve at ground level.

Any above-ground manually-operated valves on nonpotable water systems will be adequately identified with distinctive purple colored paint. Do not provide hose connections on irrigation systems that utilize nonpotable water supplies.

C. Sprinkler installation.

1. On flat landscaped areas, install sprinklers plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers should be adjusted to avoid unnecessary discharge on pavements and structures. Adjust sprinklers so they do not water on roads.

2. Provide a minimum separation of 4 inches (102 mm) between sprinklers and pavement. Provide a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping must be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on

swing joints, flexible pipe, or polyethylene (PE) nipples. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be effectively stabilized.

D. Pump installation.

1. Install pumps as per the manufacturer's recommendations. Set pumps plumb and secure to a firm concrete base. There should be no strain or distortion on the pipe and fittings. Pipe and fittings should be supported to avoid placing undue strain on the pump. Steel pipe should be used on pumps 5 horsepower (hp) or larger whenever practical.

2. Pumps must be installed in a manner to avoid loss of prime. Install suction line to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes should be designed to avoid causing air pockets and cavitation.

3. Pumps must be located to facilitate service and ease of removal. Appropriate fittings should be provided to allow the pump to readily be primed, serviced, and disconnected. Provide an enclosure of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

E. Low voltage wire installation.

1. Install low voltage wire (30 volts or less) with a minimum depth of cover of 12 inches (305 mm). Provide a sufficient length of wire at each connection to allow for thermal expansion/shrinkage. As a minimum, provide a 12-inch (305 mm) diameter loop at all splices and connections. Terminations at valves will have 24 inches (610 mm) minimum free wire.

2. Install all above-ground wire runs and wire entries into buildings in electrical conduit. Provide common wires with a different color than the power wires (white shall be used for common wires). Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

F. Hydraulic control tubing.

1. For hydraulic control systems, use a water supply that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer. Install a backflow prevention device where the hydraulic control system is connected to potable water supplies.

2. Install tubing in trenches freely and spaced so that it will not rub against pipe, fittings, or other objects that could score the tubing, and with a minimum 12-inch (305 mm) diameter loop at all turns and connections. Provide a minimum depth of cover of 12 inches (305 mm).

3. Connect tubing with couplings and collars recommended by the tubing manufacturer. All splices shall be made in valve boxes. Prefill tubing with water, expelling entrapped air and testing for leaks prior to installation.

Install exposed tubing in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

PART VI: TESTING & INSPECTIONS

A. Purpose. All materials and installations covered by the Irrigation Code shall be inspected by the governing agency to verify compliance with the Irrigation Code.

B. Rough inspections. Rough inspections will be performed throughout the duration of the installation. These inspections will be made by the governing agency to ensure that the installation is in compliance with the design intent, specifications, and the Irrigation Codes. Inspections will be made on the following items at the discretion of the governing agency:

1. Sprinkler layout and spacing: This inspection will verify that the irrigation system design is accurately installed in the field. It will also provide for alteration or modification of the system to meet field conditions. To pass this inspection, sprinkler/emitter spacing should be within ± 5 percent of the design spacing.

2. Pipe installation depth: All pipes in the system shall be installed to depths as previously described in this code.

Test all mainlines upstream of the zone valves as follows:

a. Fill the completely installed pipeline slowly with water to expel air. Allow the pipe to sit full of water for 24 hours to dissolve remaining trapped air.

b. Using a metering pump, elevate the water pressure to the maximum static supply pressure expected and hold there for a period of 2 hours, solvent-weld pipe connections shall have no leakage.

c. For gasketed pipe main lines add water as needed to maintain the pressure. Record the amount of water added to the system over the 2-hour period.

d. Use the following formulas to determine the maximum allowable leakage limit of gasketed pipe.

DUCTILE IRON:

$$L = \frac{SDP}{133{,}200}$$

PVC, GASKETED JOINT:

$$L = \frac{NDP}{7{,}400}$$

Where:

L = allowable leakage (gph),

N = number of joints,

D = nominal diameter of pipe (inches),

P = average test pressure (psi), and

S = length of pipe (fi).

e. When testing a system which contains metal-seated valves, an additional leakage per closed valve of 0.078 gph/inch of nominal valve size is allowed.

C. Final inspection. When the work is complete the contractor shall request a final inspection.

1. Cross connection control and backflow prevention.

a. Public or domestic water systems: Check that an approved backflow prevention assembly is properly installed and functioning correctly. Review the location of the assembly to check that it is not creating a hazard to pedestrians or vehicular traffic.

b. Water systems other than public or domestic water systems: Check that the proper backflow prevention assemblies are provided.

c. All assemblies that can be, will be tested by a certified technician prior to being placed into service.

2. Sprinkler coverage testing.

a. All sprinklers must be adjusted to minimize overspray onto buildings and paved areas.

b. All sprinkler controls must be adjusted to minimize runoff of irrigated water.

c. All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used.

d. Spray patterns must overlap as designed.

e. Sprinklers must be connected, as designed, to the appropriate zone.

D. Site restoration.

1. All existing landscaping, pavement, and grade of areas affected by work must be restored to original condition or to the satisfaction of the governing authority.

Verify that the pipeline trenches have been properly compacted to the densities required by the plans and specifications.