

Florida Building Code – Plumbing – APPENDIX F , 5th Edition (2014)

Amendment to APPENDIX F

c. Sprinkler layout. Sprinkler layout may be modified to adjust for field conditions provided it complies with part VI, Section B, subsection 1 Sprinkler layout and spacing. Prior to final inspection, the contractor shall submit a letter or as-built drawing that reflects the modification to the authority with jurisdiction.

PART IV: MATERIALS

A. PVC Pipe and fittings

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

PART V: INSTALLATION

A. Pipe Installation

4. Thrust blocks, or other approved method 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 os debris, and sufficient width to properly place pipa and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material to 6" above the top of the pipe shall be free from rocks or stones larger than 1-inch in diameter. The final backfill material shall be free of rock or debris that is greater than 3" 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 or when position of irrigation pipes or wires conflict with pipes or appurtenances of other trades. 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.

PART VI: TESTING & INSPECTIONS

C. Final Inspection.

3. Open Trench Inspection: The trench at all joints and every transition in pipe size, will be open where open trench inspection is required.

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 multi-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 107 of the *Florida Building Code, Building*.

c. Sprinkler layout. Sprinkler layout may be modified to adjust for field conditions provided it complies with part VI, Section B, subsection 1 Sprinkler layout and spacing. Prior to final inspection, the contractor shall submit a letter or as-built drawing that reflects the modification to the authority with jurisdiction.

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 sub-main 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

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 versus 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. Micro irrigation systems should be designed using the Emission Uniformity concept. Space micro irrigation 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 Section 373.62, *Florida Statutes*.

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 Section 487.021, *Florida Statutes*; the Environ-

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 fittings 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 microirrigation 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 nonpotable 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 be 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.

APPENDIX F

- 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.

- 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.
- 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.

- Irrigation pump electrical control systems must conform to NEC and local building codes.
- The pumping system shall be protected from the hazards of the environment in which it is installed.
- 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.
- 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.

- 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.

- 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.

- 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
3 - 5	24
6 and larger	30

b. All areas except vehicle traffic:

Pipe Size (inches)	Depth of Cover (inches)
1/2 - 1 1/2	6
2 - 3	12
4 - 6	18
More than 6	24

- Make all pipe joints and connections according to manufacturer's recommendations. Perform all solvent-weld connections in accordance with ASTM D 2855.
- 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.
- Thrust blocks, or other approved method 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
- 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 to 6" above the top of the pipe shall be free from rocks or stones larger than 1-inch in diameter. The final backfill material shall be free of rock or debris that is greater than 3" 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.
- Pipe Sleeves must be used to protect pipes or wires installed under pavement or roadways or when position of irrigation pipes or wires conflict with pipes or appurtenances of other trades. 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.

APPENDIX F

tion 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.

3. Open Trench Inspection: The trench at all joints and every transition in pipe size, will be open where open trench inspection is required.

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.