Sub Code: Plumbing

SP8091

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Date Submitted	12/14/2018	**Section**	1401	**Proponent**	Cheryl Harris
Chapter	14	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **No**

Related Modifications

8163

Summary of Modification

Modification adds Surface and Subsurface Landscape Irrigation Systems connected to either potable or nonpotable water supplies and modifies the current Chapter 14 numbering system to integrate into the new section. Current code addresses subsurface irrigation connected to nonpotable water supply.

Rationale

Chapter 14 of the Plumbing Code was added during the last cycle direct from ICC Green Construction. However, it only addressed subsurface landscape irrigation systems connected to nonpotable water sources. The majority of Florida's landscape/turf irrigation is done by surface systems and subsurface systems connected to both potable and non potable water sources not from on-site reuse systems. Without addressing all types of irrigation systems the code now in place intended to encourage water conservation does little to conserve or protect the quality of Florida's water. The most widely used method of irrigation not addressed in code uses approximately 40% of Florida's water. Properly designed and installed irrigation systems will save and improve the quality of Florida's limited water resources.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Minimal except jurisdictions w/o local ordinance requiring permits. Unknown how many jurisdictions do not have commercial or residential irrigation requirements. Backflow device inspection is required so costs for adding inspection at same time for irrigation could be recovered by permit fees.

Impact to building and property owners relative to cost of compliance with code

Irrigation system is optional. If system is installed it should be done in accordance to a standard that conserves water supply and quality. Offset to any extra cost would be in the savings of consumers water bills and cost to the public to find new water sources.

Impact to industry relative to the cost of compliance with code

No impact to the irrigation industry relative to compliance with code.

Impact to small business relative to the cost of compliance with code

No impact to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Conservation of Florida's water supply and quality through proper installation of irrigation systems is critical to the health and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens code by adding a standard for design and installation of irrigation systems.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Modification does not discriminate.

Does not degrade the effectiveness of the code

Modification does not degrade but to the contrary improves the effectiveness of the code.

Alternate Language

1st Comment Period History

8091-A2

Proponent Eberhard Roeder **Submitted** 2/18/2019 **Attachments** Yes

Rationale

The proposed alternate language achieves the objective of the Florida Irrigation Society to include irrigation language in Chapter 14. It clarifies that onsite sewage treatment and disposal systems and their drainfields are regulated by Chapter 64E-6, Florida Administrative Code. This will avoid conflicts between Plumbing Code and Florida Onsite Sewage Statutes. The proposed alternate language deletes the language that my proposed modification 8384 aimed to delete as well. Several smaller edits for clarity are also included. The proposed alternate language was the result of discussions with Ms. Harris of the Florida Irrigation Society, the author of this modification 8091.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Proposal simplifies enforcement by clarifying that there is a single jurisdiction over onsite sewage treatment and disposal systems. Graywater systems are included in the definition of “onsite sewage treatment and disposal system” per 381.0065(2)(k) Fl. Statutes. No impact on local entities.

Impact to building and property owners relative to cost of compliance with code

Simplifies compliance with code by avoiding conflicts with Department of Health regulations. No impact on building and property owners, the existing requirements remain the same.

Impact to industry relative to the cost of compliance with code

Simplifies compliance with code by avoiding conflicts with Department of Health regulations. No impact, the existing requirements remain the same.

Impact to Small Business relative to the cost of compliance with code

No impact to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Sanitary wastewater, including of graywater, disposal protects public health and the environment, and a clear code helps to achieve that. Application of Florida’s onsite sewage regulations provides uniformity and protection.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposed modification makes the code clearer by avoiding conflict with another state regulation, namely 64E-6, Florida Administrative Code, which provides at least equivalent methods.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed modification does not discriminate in this manner.

Does not degrade the effectiveness of the code

By making the building code and the onsite sewage treatment code more consistent with each other the code system overall will become more effective.

Alternate Language

1st Comment Period History

8091-A1

Proponent Cheryl Harris **Submitted** 2/18/2019 **Attachments** Yes

Rationale

After reviewing the Modification number SP8384 submitted by the Florida Department of Health, the Florida Irrigation Society agrees with the rationale of completely eliminating the content of Chapter 14 as it was published in the 2017 Florida Building Code Plumbing. This change would eliminate a potential conflict between Florida Building Code and the Florida Administrative Code that is already in effect governing subsurface irrigation systems. However, we suggest alternate language for Chapter 14 and the scope in Section 1401 to cover irrigation systems EXCEPT for systems connected to on-site sewage treatment and disposal systems and add wording for design and installation of all other irrigation systems. There were also minor changes in wording in the following for grammar, correction of definition, correction of Agency Title: 1401.5.9, 1401.12.1.2, 1401.13.7, 1401.14.1.5 and 1401.14.1.6. from the original submittal.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

The alternate language clarifies that that the Department of Health/FAC has jurisdiction over subsurface connection to onsite wastewater treatment and sewage treatment reuse systems for irrigation purposes.

Impact to building and property owners relative to cost of compliance with code

There would be no change in cost to comply as current Florida Administrative Code is in place and would continue to prevail.

Impact to industry relative to the cost of compliance with code

There would be no change in cost to comply as current Florida Administrative Code is in place and would continue to prevail.

Impact to Small Business relative to the cost of compliance with code

No impact to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes. Clarifies that the Department of Health has jurisdiction over onsite wastewater and sewage treatment water reuse systems.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

CHAPTER14
LANDSCAPE IRRIGATION SY

SECTION 1401
GENERAL

1401.1Scope.

The provisions of Chapter 14 shall govern the materials, design, construction and installation of ~~subsurface~~ turf and land ~~reuse~~ systems.

Exception: All Turf and Landscape irrigation systems serving as drainfields for onsite sewage treatment and disposa Onsite Sewage Treatment and Disposal Systems.

~~SECTION 1402~~
~~Subsurface Landscape Irrigation Systems Connected to No~~

~~**1402.1 Scope.**~~

~~The provisions of Section 1402 shall govern the materials, design, construction and installation of subsurface landscape irrig~~

~~**1402.2 1402.2Materials.**~~

~~Above-ground drain, waste and vent piping for subsurface landscape irrigation systems connected to NonPotabale On-site landscape irrigation, underground building drainage and vent pipe shall conform to one of the standards listed in Table 7~~

~~**1401.3 1402.3Tests.**~~

~~Drain, waste and vent piping for subsurface landscape irrigation systems shall be tested in accordance with Section 312.~~

~~**1401.4 1402.4Inspections.**~~

~~Subsurface landscape irrigation systems shall be inspected in accordance with Section 110 of the *Florida Building Code*,~~

~~**1401.5 1402.5Disinfection.**~~

~~Disinfection shall not be required for on-site nonpotable water reuse for subsurface landscape irrigation systems.~~

~~**1401.6 1402.6Coloring.**~~

~~On-site nonpotable water reuse for subsurface landscape irrigation systems shall not be required to be dyed.~~

~~SECTION1402~~
~~SYSTEM DESIGN AND SI~~

~~**1402.1 1402.7Sizing.**~~

~~The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface i irrigation systems, gray water output shall be calculated according to the gallons-per-day-per-occupant number based on equation:~~

~~**where:**~~

~~***A* = Number of occupants:**~~

~~**Residential – Number of occupants shall be determined by the actual number of occupants, but not less than two-**~~

~~**Commercial – Number of occupants shall be determined by the *Florida Building Code, Building*.**~~

~~***B* = Estimated flow demands for each occupant:**~~

~~**Residential – 25 gallons per day (94.6 lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per d**~~

~~**Commercial – Based on type of fixture or water use records minus the discharge of fixtures other than those discl**~~

~~***C* = Estimated gray water discharge based on the total number of occupants.**~~

~~**1402.2 1402.8Percolation tests.**~~

~~The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability e~~

~~**1402.2.1 1402.8.1Percolation tests and procedures.**~~

~~At least three percolation tests in each system area shall be conducted. The holes shall be spaced uniformly in relation t where necessary, depending on system design.~~

~~**1402.2.1.1 1402.8.1.1Percolation test hole.**~~

~~The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inc pointed instrument to expose the natural soil. All loose material shall be removed from the hole and the bottom shall be~~

~~**1402.2.1.2 1402.8.1.2Test procedure, sandy soils.**~~

The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test s above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute in minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (15 be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be us in accordance with Section 1303.7.1.3.

1402.2.1.3 1402.8.1.3Test procedure, other soils.

The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed period, the measurements for determining the percolation rate shall be made as follows: any soil sloughed into the hole sl or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a p (1.59 mm). At least three water level drops shall be observed and recorded. The hole shall be filled with clear water to a p nearly empty. Adjustments of the water level shall not be made during the three measurement periods except to the lim away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

1402.2.1.4 1402.8.1.4Mechanical test equipment.

Mechanical percolation test equipment shall be of an *approved* type.

1402.2.2 1402.8.2Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluat evaluating the soil.

1402.3 1402.9Subsurface landscape irrigation site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be l 1402.3 1402.9. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. S lots.

TABLE 1402.3 1402.9
LOCATION OF SUBSURFACE IRRIGA

ELEMENT	Storage tank (feet)
Buildings	5
Lot line adjoining private property	5
Water wells	50
Streams and lakes	50
Seepage pits	5
Septic tanks	0
Water service	5
Public water main	10

For SI: 1 foot = 304.8 mm.

SECTION14031 INSTALLATION

14031.1 1402.10Installation.

Absorption systems shall be installed in accordance with Sections 14031.1.1 1402.10.1 through 14031.1.5 1402.10.1.5 t

14031.1.1 1402.10.1Absorption area.

The total absorption area required shall be computed from the estimated daily gray water discharge and the design loa estimated gray water discharge divided by the design loading rate from Table 14031.1.1 1402.10.1.

TABLE 14031.1.1 1402.10.1
DESIGN LOADING RATE

PERCOLATION RATE(minutes per inch)	DESI
0 to less than 10	
10 to less than 30	
30 to less than 45	

45 to 60

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m².

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14031.1.2 1402.10.1.2 Seepage trench excavations.

Seepage trench excavations shall be not less than 1 foot (304 mm) in width and not greater than 5 feet (1524 mm) in width area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pip *length.*

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14031.1.3 1402.10.1.3 Seepage bed excavations.

Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one distribution pipe. The Distribution piping in a seepage bed shall be uniformly spaced not greater than 5 feet (1524 mm) and not less than 3 fee the sidewall or headwall.

14031.1.4 1402.10.1.4 Excavation and construction.

The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the so compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation bottc removed.

14031.1.5 1402.10.1.5 Aggregate and backfill.

Not less than 6 inches in depth of aggregate, ranging in size from ¹/₄ to 2¹/₂ inches (12.7 mm to 64 mm), shall be laid into not less than 2 inches (51 mm) in depth over the top of the distribution pipe. The aggregate shall be covered with *appro* paper shall not be used to cover the aggregate. Not less than 9 inches (229 mm) of soil backfill shall be provided above t

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14031.2 1402.11Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table 14031.2 14 original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches

TABLE 14031.2 1402.11
DISTRIBUTION PIPE

MATERIAL
Polyethylene (PE) plastic pipe
Polyvinyl chloride (PVC) plastic pipe
Polyvinyl chloride (PVC) plastic pipe with a 3.5-inch O.D. and solid cellular core

For SI: 1 inch=25.4 mm.

14031.2.1Joints.

Joints in distribution pipe shall be made in accordance with Section 705 of this code.

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SECTION 14031
Surface and Subsurface Landscape Irri

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14031.1 Scope.

The provisions of Section 14031 shall govern the materials, design, construction and installation of turf and permanent above ground or subsurface sprinkler or microsprinkler equipment that move water through variou

1403~~1~~1.1.2 This section shall apply to all irrigation systems used on residential and commercial landscape area

1403~~1~~1.1.3 This section shall apply to all new irrigation systems and any new work to existing irrigation system

Exception. This section shall not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

1403~~1~~.1.4 Nothing contained in this section shall be deemed to require any irrigation system or part there modified to meet the standards of this code.

1403~~1~~.2 Permits.

1403~~1~~.2.1 A permit shall be required for new installation of landscape irrigation systems and for repairs or mo on invoice value.

1403~~1~~.2.2 No permit shall be required for general maintenance or repairs which do not change the structure material based on invoice value. -

1403~~1~~.3 Preconstruction submittals.

1403~~1~~.3.1 Plans or drawings.

1403~~1~~.3.1.1 Single-family residence. Design drawings or shop drawings, where required, shall be provided f shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and include all improveme licensed landscape architect.

1403~~1~~.3.1.2 Commercial, industrial, municipal and multiple-family. Professionally designed drawings pric drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all im specifications which list all aspects of equipment and assembly there of, water source, water meter and/or location, design operating pressure and flow rate per zone, precipitation rate per zone, locations of pipe, specifications shall be prepared in accordance with Section 107 of the Florida Building Code, Building.

1403~~1~~.4 Definitions. The following definitions are exclusive to this section of the code.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limite (see ASTM D 1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of a Air release valves are normally required at all summits of mainline and submain pipelines in an irrigation syste

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

Application Rate. The average rate at which water is applied by an irrigation system, sometimes also called

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how

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

Atmospheric Vacuum Breaker (AVB). An anti-siphon backflow device which uses a floating seat to allow an

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way o

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

Backflow Prevention Device. An approved safety device used to prevent pollution or contamination of the ir

Belled (Pipe). Pipe which is enlarged at one end so that the spigot end of another length of pipe can be inser

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

Bubbler Irrigation. The application of water to the soil surface or a container as a small stream or fountain. E
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 sys

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

Contractor. Any person who engages in the fabrication and installation of any type of irrigation system on a c

Control Lines. Hydraulic or electrical lines which carry signals to open and close the valves from the controlle

Controller. The timing mechanism and its mounting box. The controller signals the automatic valves to open

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

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
entrance to the system if there is no pump, and a zone design pressure is the average operating pressure of a

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 devi
pumping system or from a reduced pressure assembly or relief valve.

Double Check Valve. An approved assembly of two single, independently-acting check valves with test ports

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 p
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

Emitters. Devices which are used to control the discharge of irrigation water from lateral pipes. This term is p

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 wa
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 sprink

Flow Meters. Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typical

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

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 usuall

Irrigation. Application of water by artificial means, that is, means other than natural precipitation. Irrigation is environmental control including crop cooling and freeze protection.

Irrigation Water Requirement or Irrigation Requirement. The quantity of water that is required for crop pro

Landscape. Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground crops grown and harvested for monetary return.

Lateral. The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or heade

Line-Source Emitters. Lateral pipelines which are porous or contain closely-spaced perforations so that wate 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 er

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

Mainline. A pipeline which carries water from the control station to submains or to manifolds or header pipelir

Manifold. The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. A

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

Matched Precipitation. An equal distribution of water over a given area or zone.

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

Microirrigation. The frequent application of small quantities of water directly on or below the soil surface, u along the water delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, in irrigation.

Overlap. The amount one sprinkler pattern overlaps another one when installed in a pattern. Expressed as a

PE Pipe. Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black fo

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

Pressure Relief Valve. A valve which will open and discharge to atmosphere when the pressure in a pipeline

Pressure Vacuum Breaker. A backflow prevention device which includes a spring-loaded check valve and a the water source.

Pumping Station. The pump or pumps that provide water to an irrigation system, together with all of the ne controls, safety devices, shelters and fences.

PVC Pipe. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure

Rain Shut off Device. A calibrated device that is designed to detect rainfall and override the irrigation cycle c

Reduced Pressure Principle Backflow Preventer (RPZD) (also known as Reduced Pressure Zone Devi supplies from contamination.

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

Runoff. The result of excess water applied either naturally (precipitation) or mechanically (irrigation) that exce

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 c

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 elbows and nip

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

1403~~1~~.4 DESIGN CRITERIA

1403~~1~~.4.1 Design defined. Within the scope of this code, irrigation system design is defined as the science

1403~~1~~.4.2 Water supply.

1403~~1~~.4.2.1 The water source shall be adequate from the stand-point of volume, flow rate, pressure, and qu demands, if any, both at the time the system is designed and for the expected life of the system.

1403~~1~~.4.2.2 If the water source is effluent, it shall meet the advanced waste treatment standard as set for controlling governmental agency.

1403~~1~~.4.3 Application uniformity.

1403~~1~~.4.3.1 Sprinkler irrigation systems shall be designed with the appropriate uniformity for the type of plants types of plants as one group without regard to their individual water requirements shall be avoided.

1403~~1~~.4.3.2 Sprinkler head spacing, type and nozzle selection that achieves the highest application uniformit

1403~~1~~.4.3.3 Application rates which avoid runoff and permit uniform water infiltration into the soil shall be util winds and sun exposure shall be considered when application rates are specified. Different types of sprinklers rotor heads, shall not be combined on the same zone or circuit.

1403~~1~~.4 System zoning. The irrigation system shall be divided into zones based on consideration of the foll

1403~~1~~.4.1 Available flow rate.

1403~~1~~.4.2 Cultural use of the area.

1403~~1~~.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

1403~~1~~.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

1403~~1~~.4.5 Soil characteristics and slope.

1403~~1~~.4.6 Sun exposure.

1403~~1~~.5 Sprinkler/emitter spacing and selection.

1403~~1~~.5.1 Sprinkler/Emitter spacing shall be determined considering the irrigation requirements, hydraulic ch sidewalks, buildings, and public access areas.

1403~~1~~.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoys Paspalum.

1403~~1~~.5.3 Sprinklers shall be located in accordance with manufacturer's specifications in each irrigated zone

1403~~1~~.5.4 Single row head spacing shall only occur when an additional row will cause saturated soils at the t

1403~~1~~.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

1403~~1~~.5.6 Water conservation shall be taken into consideration by minimizing irrigation of non-vegetated area

1403~~1~~.5.7 Microirrigation systems shall be designed using the Emission Uniformity concept. Microirrigation percent of the root zone for shrubs and trees.

1403~~1~~.5.8 Microirrigation or low volume heads shall be required in all areas to be irrigated that are less than 4

1403~~1~~.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point w from contamination from a ~~PD~~ main or lateral break.

1403~~1~~.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properly plac

1403~~1~~.6 Pipelines. Pipelines shall be sized to limit pressure variations so that the working pressure at all poin Velocities shall not exceed 5 feet (1524 mm) per second.

1403~~1~~.7 Wells.

1403~~1~~.7.1 Well diameters, depths and location shall correspond to the irrigation system demand and in com

1403~~1~~.8 Pumps.

1403~~1~~.8.1 Pump and motor combinations shall be capable of satisfying the total system demand without inv

1403~~1~~.8.2 Pumps shall be positioned with respect to the water surface in order to ensure that the net positiv

1403~~1~~.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

1403~~1~~.9 Control valves.

1403~~1~~.9.1 Control valve size shall be based on the flow rate through the valve. Friction loss through the valve 10 percent of the static mainline head.

1403~~1~~.9.2 Control systems using hydraulic communication between controller and valve(s) shall comply wi and valve, both horizontally and vertically (elevation change).

1403~~1~~.9.3 The size of the electrical control wire shall be in accordance with the valve manufacturer's specifi the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand control systems.

1403~~1~~.9.4 Manually operated control valves shall be located so that they can be operated without wetting t

1403~~1~~.9.5 In ground valves shall be located away from large tree and palm root zones.

1403~~1~~.9.6 A manual shut off valve shall be required to be installed close to the point of connection but do minimize water loss when the system is shut off for repairs or emergencies.

1403~~1~~.9.7 An automatic shut-off valve or master valve (normally closed) is required on all systems with a cc weeping valves, or stuck on valves to just the time the system is operating automatically.

1403~~1~~.10 Automatic irrigation controller. Automatic irrigation controllers shall conform to UL 1310 and ha the irrigation system design. The controller shall be capable of incorporating a rain shut off device or other sens by Florida Statutes, Section 373.62.

1403~~1~~.11 Chemical injection.

1403~~1~~.11.1 Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or any otl recommendations.

1403~~1~~.11.2 Injection systems shall be located downstream of the applicable backflow prevention devices Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

1403~~1~~.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or an ap compliance with ASSE 1013 and Section 14031.12.

1403~~1~~.12 Backflow prevention methods. Backflow prevention assemblies at all cross connections with applicable codes. In the event of conflicting regulations the assembly type shall be provided which gives the l

1403~~1~~.12.1 Irrigation systems into which chemicals are injected shall conform to Florida state law (Florid Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the chemical label.

1403~~1~~.12.1.1 For municipal water supplies, chemical injection equipment must be separated from the water s that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equipment shall cor pressure.

1403~~1~~.12.1.2 For other water supplies, Florida State law, EPA regulations, or other applicable local codes Vacuum Breaker shall be required.

SECTION 14031.13 REFERENCED STANDARDS
The standards referenced below are exclusive to this section.

1403~~1~~.13.1 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 ir

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.

1403~~1~~.13.2 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) (C

ASTM D 2855: Standard recommended practice for making solvent cemented joints with polyvinyl chloride pi

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).

1403~~1~~.13.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

1403~~1~~.13.4 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 backflow preventers.

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

ASSE 1024: Dual check valve backflow preventers.

1403~~1~~.13.5 Hydraulic Institute Standards, 14th Edition

1403~~1~~.13.6 Standards and Specifications for Turf and Landscape Irrigation Systems Florida Irrigatior

1403~~1~~.13.~~7 Soil Conservation Service (SCS)~~ Natural Resources Conservation Service (NRCS) Field Of

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

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

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

~~SCS~~ NRCS Code 441-1: Irrigation system, trickle.

~~SCS~~ NRCS Code 442: Irrigation system sprinkler.

~~SCS~~ NRCS Code 449: Irrigation water management.

~~SCS~~ NRCS Code 533: Pumping plant for water control.

~~SCS~~ NRCS Code 642: Well.

1403~~1~~.13.8. Underwriters Laboratories (UL) 333 Pfingsten Road, Northbrook, IL 60062-296 Standards

UL 486C-1995 Splicing Wire Connectors

UL 969-2013 Standard for Marking and Labeling Systems

UL 1310-2011 Standard for Class 2 Power Units

Section 1403~~1~~.14 MATERIALS
The materials referenced below are exclusive to this section.

1403~~1~~.14.1 PVC pipe and fittings.

1403~~1~~.14.1.1 PVC pipe shall comply with one of the following standards ASTM D 1785, ASTM D 2241, AWV required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by eith

1403~~1~~.14.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as se

1403~~1~~.14.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D

1403~~1~~.14.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

1403~~1~~.14.1.5. PVC flexible pipe ~~should~~ shall be pressure rated as described in ASTM D 2740 with standard

1403~~1~~.14.1.6. PVC cement ~~should~~ shall meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

1403~~1~~.14.2 Ductile iron pipe and fittings.

1403~~1~~.14.2.1 Gasket fittings for iron pipe shall be of materials and type compatible with the piping material b

1403~~1~~.14.3. Steel pipe and fittings.

1403~~1~~.14.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in a

1403~~1~~.14.3.2 Threaded fittings for steel pipe shall be Schedule 40 Malleable Iron.

1403~~1~~.14.4 Polyethylene pipe.

1403.14.4.1 Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in

1403~~1~~.14.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

1403~~1~~.14.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

1403~~1~~.14.5 Sprinklers, spray heads, and emitters.

1403~~1~~.14.5.1 Units and nozzles shall be selected in accordance with the size of the area and the type of pl without excessive overspray. Intentional direct spray onto walkways, buildings, roadways, and driveways is pr

1403~~1~~.14.5.2 Equipment shall be used that is protected from contamination and damage by use of seals, s

1403~~1~~.14.5.3 Riser-mounted sprinklers shall be supported to minimize movement of the riser resulting from t

1403~~1~~.14.5.4 Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection be prevent equipment damage.

1403~~1~~.14,5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

1403~~1~~.14.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstruc height for Bermuda, Centapede and Seashore Paspalum.

1403~~1~~.14.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point contamination from a PVC main or lateral break.

1403~~1~~.14.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or devices meet the manufacturer's performance standards.

1403~~1~~.14.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, properly pl

1403~~1~~.14.5.10 All tubing shall be secured to prevent movement in accordance with manufacturer's specifica

1403~~1~~.14.6 Valves.

1403~~1~~.14.6.1 Valves shall have a maximum working pressure rating equal to or greater than the maximum be waived for low mainline pressure systems [30 psi (207 kPa) or less].

1403~~1~~.14.6.2 Only valves that are constructed of materials designed for use with the water and soil conditic will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

1403~~1~~.14.7 Valve boxes.

1403~~1~~.14.7.1 Valve boxes shall be constructed to withstand traffic loads common to the area in which they a without excavation.

1403~~1~~.14.7.2. Each valve box shall be permanently labeled in accordance with UL 969 to identify its content

1403~~1~~.14.8 Low voltage wiring.

1403~~1~~.14.8.1 All low voltage wire which is directly buried shall be labeled for direct burial wire. Wire not lab THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed w

1403~~1~~.14.8.2 The size of the electrical control wire shall be in accordance with the valve manufacturer's specif the number of solenoids operating, on the circuit. Minimum of # 14 AWG single strand control wire shall be us

1403~~1~~.14.8.3 Connections shall be made using devices conforming to UL 486 specifically designed for direc

1403~~1~~.14.9 Irrigation controllers.

1403~~1~~.14.9.1 All irrigation controllers shall conform to UL 1310 and the provisions of the National Electric C Solid state controls shall be equipped with surge suppressors on the primary and secondary wiring, except sir

1403~~1~~.14.9.2 The controller housing or enclosure shall protect the controller from the hazards of the environ

1403~~1~~.14.9.3 The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) clearance obstructions, and above the height of the sprinkler coverage. Soil moisture sensors and ET sensors shall b Section 373.62.

1403~~1~~.14.10 Pumps and wells.

1403~~1~~.14.10.1 Irrigation pump electrical control systems shall conform to the NEC and local building codes.

1403~~1~~.14.10.2 The pumping system shall be protected from the hazards of the environment in which it is ins

1403~~1~~.14.10.3 Use electric motors with a nominal horsepower rating greater than the maximum horsepower of at least 1.15.

1403~~1~~.14.10.4 Casings for drilled wells shall be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Or casings shall conform to ASTM A 589.

1403~~1~~.14.11 Chemical injection equipment.

1403~~1~~.14.11.1 Chemical injection equipment shall be constructed of materials capable of withstanding the pc for those chemicals for which it was intended as stated by the injection equipment manufacturer.

1403~~1~~.14.12 Filters and strainers.

1403~~1~~.14.12.1 Filtration equipment and strainers constructed of materials resistant to the potential corrosive passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance with the manufactu

Section 1403~~1~~.15 INSTALLATION

1403~~1~~.15.1 Pipe installation.

1403~~1~~.15.1.1 Pipe shall be installed at sufficient depth below ground to protect it from hazards such as vehi of a property. Depths of cover shall meet or exceed NRCS Code 430-DD, Water Conveyance, as follows:

1403~~1~~.15.1.1.1 Vehicle traffic areas.

Pipe Size (inches)

Depth of Cover (inches)

½ – 2 ½

18 - 24

3 - 5

24 - 30

6 and larger

30 - 36

1403~~1~~.15.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)

Depth of Cover (inches)

½ – 1 ½

6

2 - 3

12

4 - 6

18

More than 6

24

1403~~1~~.15.1.2 All pipe joints and connections shall be made according to manufacturer's specifications. All sol

1403~~1~~.15.1.3 Minimum clearances shall be maintained between irrigation lines and other utilities. In no ca
onsite sewage treatment and disposal systems, refer to Rule 64E-6.005(2)(b) of the Florida Administrative Co

1403~~1~~.15.1.4 Thrust blocks shall be used on all gasketed PVC systems. They must be formed against a soli
constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outsi
376.1.

1403~~1~~.15.1.5 The trench bottom shall be uniform, free of debris, and of sufficient width to properly place pi
backfill the pipe trench. However, the initial backfill material shall be free from rocks or stones larger than 1-ir
be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking

1403~~1~~.15.1.6. Pipe sleeves shall be used to protect pipes or wires installed under pavement or roadways. F wire bundle shall be used under the paving or roadway and extending a minimum of 3 feet beyond the pav sleeves shall be Sch 40. Proper backfill and compaction procedures shall be followed.

1403~~1~~.15.2 Control valve installation.

1403~~1~~.15.2.1 Valve installation shall allow enough clearance for proper operation and maintenance. Where extending from grade to the body of the valve. The top of the valve body should have a minimum of 6 inches cover in traffic areas. The valve box shall be installed to minimize the effect of soil intrusion within the valve bo valve is installed under each sprinkler, then the valve box may be omitted.

1403~~1~~.15.2.2 Valve boxes shall be installed so that they do not rest on the pipe and the box cover does not c the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscap

1403~~1~~.15.2.3. Quick coupling valves shall be installed on swing joints or flexible pipe with the top of the valv

1403~~1~~.15.2.4 Any above-ground manually-operated valves on nonpotable water systems shall be adequately systems that utilize nonpotable water supplies shall not be permitted.

1403~~1~~.15.3 Sprinkler installation.

1403~~1~~.15.3.1. On flat landscaped areas, sprinklers shall be installed plumb. In areas where they are installe be adjusted to avoid unnecessary discharge on roads, pavements and structures.

1403~~1~~.15.3.2. There shall be a minimum separation of 4 inches (102 mm) between sprinklers and pavemer and buildings and other vertical structures. Piping shall be thoroughly flushed before installation of sprinkle polyethylene (PE) nipples or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance e mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be stabilized.

1403~~1~~.15.4 Pump installation.

1403~~1~~.15.4.1 Pumps shall be installed in accordance with the manufacturer's specifications. Pumps shall be on the pipe and fittings. Pipe and fittings shall be supported to avoid placing undue strain on the pump. Steel

1403~~1~~.15.4.2 Pumps shall be installed in a manner to avoid loss of prime. Suction line shall be installed to pipe sizes shall be designed to avoid causing air pockets and cavitation.

1403~~1~~.15.4.3 Pumps shall be located to facilitate service and ease of removal. Appropriate fittings shall be enclosure shall be provide of adequate size and strength, with proper ventilation, to protect the pump from the

1403~~1~~.15.5 Low voltage wire installation.

1403~~1~~.15.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 r be provided at each connection to allow for thermal expansion/shrinkage. As a minimum, a 12-inch (305 mr valves shall have 24 inches (610 mm) minimum free wire.

1403~~1~~.15.5.2 All above-ground wire runs and wire entries into buildings shall be installed in electrical conduit common wires) shall be provided. Connections shall be made using devices conforming to UL 486C specifica

Exception: When wiring above ground manifolds from the valve to the ground immediately beneath it, no cor

1403~~1~~.15.6 Hydraulic control tubing installation

1403~~1~~.15.6.1. For hydraulic control systems, a water supply shall be used that is filtered and free of deleterious A backflow prevention device shall be installed where the hydraulic control system is connected to potable wa

1403~~1~~.15.6.2 Tubing shall be installed in trenches and spaced so that it will not rub against pipe, fittings, o diameter loop at all turns and connections A minimum depth of cover of 12 inches (305 mm) shall be provided

1403~~1~~.15.6.3 Tubing shall be connected with couplings and collars according to Manufacturer's specificatio expel entrapped air and tested for leaks prior to installation.

1403~~1~~.15.6.4 Exposed tubing shall be installed in a protective conduit manufactured from Schedule 40 UV pr

1403~~1~~.16 As-Built Drawings.

1403~~1~~.16.1 An As-Built drawing shall be required of all irrigation systems installed on commercial and resider

1403~~1~~.16.1.1 Location, type, pressure and maximum flow available of all water sources.

1403~~1~~.16.1.2 Location, type and size of all components including sprinklers, microirrigation, main and later start relays, backflow devices, pumps, wells, etc.

1403~~1~~.16.1.3 The flow rate, application rate (inches per hour), and the operating pressure for the sprinklers

1403~~1~~.16.1.4 The name, address, phone, email, professional license or certification number of the installati

1403~~1~~.16.1.5 Date of installation.

SP8091 -A2 Text Modification

CHAPTER14
LANDSCAPE IRRIGATION SYST

~~SECTION 1401~~
GENERAL

1401.1Scope.
The provisions of Chapter 14 shall govern the materials, design, construction and installation of ~~subsurface~~ turf and lands~~cape~~ ~~reuse~~ systems.

~~Exception:~~ ~~Landscape irrigation systems connected to onsite sewage~~ ~~by Chapter 64E-6, Florida Administrative Code, Standards for Onsite~~
Turf and Landscape irrigation systems serving as drainfields for onsite sewage treatment and disposal systems shall be regulated by Systems.

~~SECTION 1402~~
~~Subsurface Landscape Irrigation Systems Connected to NonP~~

~~1402.1 Scope.~~
~~The provisions of Section 1402 shall govern the materials, design, construction and installation of subsurface landscape irrigation systems~~

~~1402.2 1402.2Materials.~~
~~Above-ground drain, waste and vent piping for subsurface landscape irrigation systems connected~~ ~~standards listed in Table 702.1. Subsurface landscape irrigation, underground building drainage and v~~
~~1401.3 1402.3Tests.~~
~~Drain, waste and vent piping for subsurface landscape irrigation systems shall be tested in accordance with Section 312.~~
~~1401.4 1402.4Inspections.~~
~~Subsurface landscape irrigation systems shall be inspected in accordance with Section 110 of the *Florida Building Code,*~~
~~1401.5 1402.5Disinfection.~~
~~Disinfection shall not be required for on-site nonpotable water reuse for subsurface landsc~~
~~1401.6 1402.6Coloring.~~
~~On-site nonpotable water reuse for subsurface landscape irrigation systems shall not be required to be dyed.~~

~~SECTION1402~~
~~SYSTEM DESIGN AND SIZING~~

~~1402.1 1402.7Sizing.~~
~~The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface irr~~ ~~irrigation systems, gray water output shall be calculated according to the gallons-per-day-per-occupant number based~~ ~~following equation:~~

~~where:~~
***~~A~~* = ~~Number of occupants:~~**
~~Residential – Number of occupants shall be determined by the actual number of occupants, but not less than two occu~~
~~Commercial – Number of occupants shall be determined by the *Florida Building Code, Building*.~~
~~B = Estimated flow demands for each occupant:~~
~~Residential – 25 gallons per day (94.6 lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per da~~
~~Commercial – Based on type of fixture or water use records minus the discharge of fixtures other than those dischr~~
***~~C~~* = Estimated gray water discharge based on the total number of occupants.**
~~1402.2 1402.8Percolation tests.~~

The permeability of the soil in the proposed absorption system shall be determined by percolation test

1402.2.1 1402.8.1Percolation tests and procedures.

At least three percolation tests in each system area shall be conducted. The holes shall be spaced ur More percolation tests shall be made where necessary, depending on system design.

1402.2.1.1 1402.8.1.1Percolation test hole.

The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension o shall be scratched with a sharp-pointed instrument to expose the natural soil. All loose material shall l mm) of gravel or coarse sand.

1402.2.1.2 1402.8.1.2Test procedure, sandy soils.

The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test sh above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute inte minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be usec in accordance with Section 1303.7.1.3.

1402.2.1.3 1402.8.1.3Test procedure, other soils.

The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be mair necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be rem more than 30 hours. Immediately after the soil swelling period, the measurements for determining the shall be removed and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coa measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gra not be made during the three measurement periods except to the limits of the last measured water level drop. When the firs measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at an period shall be used in calculating the percolation rate.

1402.2.1.4 1402.8.1.4Mechanical test equipment.

Mechanical percolation test equipment shall be of an *approved* **type.**

1402.2.2 1402.8.2Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accept 1402.2.1.1 1402.8.1.1 for evaluating the soil.

1402.3 1402.9Subsurface landscape irrigation site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well o so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be loc 1402.3 1402.9. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Su lots.

TABLE 1402.3 1402.9
LOCATION OF SUBSURFACE IRRIGAT

ELEMENT	Storage tank (feet)
Buildings	5
Lot line adjoining private property	5
Water wells	50
Streams and lakes	50
Seepage pits	5
Septic tanks	0
Water service	5
Public water main	10

For SI: 1 foot = 304.8 mm.

SECTION14031
INSTALLATION

14031.1 1402.10Installation.

Absorption systems shall be installed in accordance with Sections 14031.1.1 1402.10.1 through 14031.1.5 1402.10.1.

14031.1.1 1402.10.1Absorption area.

The total absorption area required shall be computed from the estimated daily gray water discharge and the design loadi estimated gray water discharge divided by the design loading rate from Table 14031.1.1 1402.10.1.

TABLE 14031.1.1 1402.10.1
DESIGN LOADING RATE

PERCOLATION RATE(minutes per inch)	DESIC
0 to less than 10	
10 to less than 30	
30 to less than 45	
45 to 60	

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m^2.

14031.1.2 1402.10.1.2 Seepage trench excavations.

Seepage trench excavations shall be not less than 1 foot (304 mm) in width and not greater than 5 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom o trenches shall be not greater than 100 feet (30 480 mm) in *developed length*.

14031.1.3 1402.10.1.3 Seepage bed excavations.

Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one dis using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced nc greater than 3 feet (914 mm) and not less than 1 foot (305 mm) from the sidewall or headwall.

14031.1.4 1402.10.1.4 Excavation and construction.

The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soi compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation botton removed.

14031.1.5 1402.10.1.5 Aggregate and backfill.

Not less than 6 inches in depth of aggregate, ranging in size from $^1/_2$ to $2^1/_2$ **inches (12.7 mm to 64 mm), shall aggregate shall be evenly distributed not less than 2 inches (51 mm) in depth over the top synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building pap (229 mm) of soil backfill shall be provided above the covering.**

14031.2 1402.11Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table 14031.2 140 original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches (

TABLE 14031.2 1402.11
DISTRIBUTION PIPE

MATERIAL
Polyethylene (PE) plastic pipe
Polyvinyl chloride (PVC) plastic pipe
Polyvinyl chloride (PVC) plastic pipe with a 3.5-inch O.D. and solid cellular core or

For SI: 1 inch=25.4 mm.

14031.2.1Joints.

Joints in distribution pipe shall be made in accordance with Section 705 of this code.

SECTION 14031
Surface and Subsurface Landscape Irrig

14031.1 Scope.

~~The provisions of Section 14031 shall govern the materials, design, construction and installation of turf and landsca~~
~~above ground or subsurface sprinkler or microsprinkler equipment that move water through various means of me~~

14031.1.2 This section shall apply to all irrigation systems used on residential and commercial landsca

14031.1.3 This section shall apply to all new irrigation systems and any new work to existing irrigation systems.

Exception. This section shall not apply to irrigation systems for golf courses,
nurseries, greenhouses, or agricultural production systems.

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14031.1.4 Nothing contained in this section shall be deemed to require any irrigation system or part tl
altered or modified to meet the standards of this code.

~~14031.2 Permits.~~

14031.2.1 A permit shall be required for new installation of landscape irrigation systems and for repairs
material based on invoice value.

14031.2.2 ~~No permit shall be required for general maintenance or repairs which do not change the struc~~
~~labor and material based on invoice value.~~

14031.3 Preconstruction submittals.

~~14031.3.1 Plans or drawings.~~

14031.3.1.1 ~~Single-family residence~~. Design drawings or shop drawings, where required, shall be pro
Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, and i
or irrigation contractor or licensed landscape architect.

14031.3.1.2 Commercial, industrial, municipal and multiple-family. Professionally designed drawings prior
Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, inc
revisions, legend, specifications which list all aspects of equipment and assembly there of, water so
pump station size, pump station location, design operating pressure and flow rate per zone, precipitat
gate valves, sensors, etc. The plans and specifications shall be prepared in accordance with Section 1

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14031.4 Definitions. The following definitions are exclusive to this section of the code.

ABS Pipe. Acrylonitrile-butadiene-styrene black, semi-rigid, plastic pipe extruded to IPS. ABS pipe is in limited use in
1788).

Air Release Valve. A valve which will automatically release to the atmosphere accumulated small pockets of air from
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

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly

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 quar

Atmospheric Vacuum Breaker (AVB). An anti-siphon backflow device which uses a floating seat to allow an air break tc

Automatic Control Valve. A valve in a sprinkler system which is activated by an automatic controller by way of hydraul

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 wat

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

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 emit

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 irrigat

Contractor. Any person who engages in the fabrication and installation of any type of irrigation system on a contractual l

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

Controller. The timing mechanism and its mounting box. The controller signals the automatic valves to open and close or

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 o

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 irrigatio
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 l
from a reduced pressure assembly or relief valve.

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

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 roc~~
~~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 Statut

Emitters. Devices which are used to control the discharge of irrigation water from lateral pipes. This term is primarily use

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 in 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

Flow Meters. Devices used to measure the volume of flow of water (typically in gallons), or flow rates (typically in gpm)

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 practice control including crop cooling and freeze protection.

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

Landscape. Refers to any and all areas which are ornamentally planted, including but not limited to turf, ground covers, and harvested for monetary return.

Lateral. The water delivery pipeline that supplies water to the emitters or sprinklers from a manifold or header pipeline d

Line-Source Emitters. Lateral pipelines which are porous or contain closely-spaced perforations so that water is discharge 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 sp

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

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

Manifold. The water delivery pipeline that conveys water from the main or submain pipelines to the laterals. Also sometir

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

Matched Precipitation. An equal distribution of water over a given area or zone.

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 delivery pipes (laterals). Microirrigation encompasses a number of methods or concepts, including drip, subsurface, bubbl

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

PE Pipe. Flexible polyethylene pipe for use in irrigation systems, normally manufactured with carbon black for resistance

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

Pressure Relief Valve. A valve which will open and discharge to atmosphere when the pressure in a pipeline or pressure

Pressure Vacuum Breaker. A backflow prevention device which includes a spring-loaded check valve and a spring-load

Pumping Station. The pump or pumps that provide water to an irrigation system, together with all of the necessary acces shelters and fences.

PVC Pipe. Polyvinyl chloride plastic pipe made in standard thermoplastic pipe dimension ratios and pressure rated for wa

Rain Shut off Device. A calibrated device that is designed to detect rainfall and override the irrigation cycle of the sprink

Reduced Pressure Principle Backflow Preventer (RPZD) (also known as Reduced Pressure Zone Device RPZ or contamination.

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

Runoff. The result of excess water applied either naturally (precipitation) or mechanically (irrigation) that exceeds the abs

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 elbows and nipples, which

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

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1403~~1~~.4 DESIGN CRITERIA

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1403~~1~~.4.1 Design defined. Within the scope of this code, irrigation system design is defined as the sc system

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1403~~1~~.4.2 Water supply.

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1403~~1~~.4.2.1 The water source shall be adequate from the stand-point of volume, flow rate, pressure, and as other demands, if any, both at the time the system is designed and for the expected life of the syste

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1403~~1~~.4.2.2 If the water source is effluent, it shall meet the advanced waste treatment standard as set f by the controlling governmental agency.

-

1403~~1~~.4.3 Application uniformity.

-

1403~~1~~.4.3.1 Sprinkler irrigation systems shall be designed with the appropriate uniformity for the type watering of different types of plants as one group without regard to their individual water requirements

1403~~1~~.4.3.2 Sprinkler head spacing, type and nozzle selection that achieves the highest application uni

1403~~1~~.4.3.3 Application rates which avoid runoff and permit uniform water infiltration into the soil shal and prevailing winds and sun exposure shall be considered when application rates are specified. Diffe rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

1403~~1~~.4 System zoning. The irrigation system shall be divided into zones based on consideration of the

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1403~~1~~.4.1 Available flow rate.

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1403~~1~~.4.2 Cultural use of the area.

-

1403~~1~~.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

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1403~~1~~.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

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1403~~1~~.4.5 Soil characteristics and slope.

-

1403~~1~~.4.6 Sun exposure.

-

1403~~1~~.5 Sprinkler/emitter spacing and selection.

-

1403~~1~~.5.1 Sprinkler/Emitter spacing shall be determined considering the irrigation requirements, hydrau plant growth, sidewalks, buildings, and public access areas.

-

1403~~1~~.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahi

-

1403~~1~~.5.3 Sprinklers shall be located in accordance with manufacturer's specifications in each irrigated

-

1403~~1~~.5.4 Single row head spacing shall only occur when an additional row will cause saturated soils at

-

1403~~1~~.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

-

1403~~1.5.6~~ Water conservation shall be taken into consideration by minimizing irrigation of non-vegetate

1403~~1~~.5.7 Microirrigation systems shall be designed using the Emission Uniformity concept. Microirriga and 50 percent of the root zone for shrubs and trees.

-

1403~~1~~.5.8 Microirrigation or low volume heads shall be required in all areas to be irrigated that are less

-

1403~~1~~.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point wh from contamination from a ~~PD~~ **main or lateral break.**

-

1403~~1~~.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properl

-

1403~~1~~.6 Pipelines. Pipelines shall be sized to limit pressure variations so that the working pressure at all points i Velocities shall not exceed 5 feet (1524 mm) per second.

-

1403~~1~~.7 Wells.

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1403~~1~~.7.1 Well diameters, depths and location shall correspond to the irrigation system demand and ir regulations.

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1403~~1~~.8 Pumps.

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1403~~1~~.8.1 Pump and motor combinations shall be capable of satisfying the total system demand witho between zones.

-

1403~~1~~.8.2 Pumps shall be positioned with respect to the water surface in order to ensure that the net p achieved.

-

1403~~1~~.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

-

1403~~1~~.9 Control valves.

-

1403~~1~~.9.1 Control valve size shall be based on the flow rate through the valve. Friction loss through shall not exceed 10 percent of the static mainline head.

-

1403~~1~~.9.2 Control systems using hydraulic communication between controller and valve(s) shall compl controller and valve, both horizontally and vertically (elevation change).

-

1403~~1~~.9.3 The size of the electrical control wire shall be in accordance with the valve manufacturer's sp considering the number of solenoids operating on the circuit. Minimum of # 14 AWG single strand cont systems.

-

1403~~1~~.9.4 Manually operated control valves shall be located so that they can be operated without wet

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1403~~1~~.9.5 In ground valves shall be located away from large tree and palm root zones.

~~1403~~1.9.6 A manual shut off valve shall be required to be installed close to the point of connection bu device) to minimize water loss when the system is shut off for repairs or emergencies.

1403~~1~~.9.7 An automatic shut-off valve or master valve (normally closed) is required on all systems with line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

-

1403~~1~~.10 Automatic irrigation controller. Automatic irrigation controllers shall conform to UL 1310 and have a irrigation system design. The controller shall be capable of incorporating a rain shut off device or other sensor by Florida Statutes, Section 373.62.

-

1403~~1~~.11 Chemical injection.

-

1403~~1~~.11.1 Chemical injection systems for the injection of fertilizer, pesticides, rust inhibitors, or manufacturers' recommendations.

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1403~~1~~.11.2 Injection systems shall be located downstream of the applicable backflow prevention d Environmental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

-

1403~~1~~.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or a required in compliance with ASSE 1013 and Section 14031.12.

-

1403~~1~~.12 Backflow prevention methods. Backflow prevention assemblies at all cross connections with a other applicable codes. In the event of conflicting regulations the assembly type shall be provided whi

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1403~~1~~.12.1 Irrigation systems into which chemicals are injected shall conform to Florida state law (F Pesticide Regulation Notice 87-1, which requires backflow prevention regulations to be printed on the d

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1403~~1~~.12.1.1 For municipal water supplies, chemical injection equipment must be separated from the wa assembly that is approved by the Foundation for CCC and the Hydraulic Research Institute. The equi siphonage and back-pressure.

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1403~~1.12.1.2~~ For other water supplies, Florida State law, EPA regulations, or other applicable local codes s Vacuum Breaker **shall be required**

SECTION 14031.13 REFERENCED STANDARDS
The standards referenced below are exclusive to this section.

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1403~~1~~.13.1 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 irri

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.

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1403~~1~~.13.2 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) (CP

ASTM D 2855: Standard recommended practice for making solvent cemented joints with polyvinyl chloride pip

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).

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1403~~1~~.13.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

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1403~~1~~.13.4 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 backflow preventers.

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

ASSE 1024: Dual check valve backflow preventers.

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1403<u>1</u>.13.5 Hydraulic Institute Standards, 14th Edition

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1403<u>1</u>.13.6 Standards and Specifications for Turf and Landscape Irrigation Systems Florida Irrigation S

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1403<u>1</u>.13.~~7 Soil Conservation Service (SCS)~~ <u>Natural Resources Conservation Service (NRCS) Field Office T</u>

~~SCS~~<u>NRCS Code 430-DD: Irrigation water conveyance, underground, plastic pipeline.</u>

~~SCS~~<u>NRCS Code 430-EE: Irrigation water conveyance. Low pressure, underground, plastic pipeline.</u>

~~SCS~~ <u>NRCS Code 430-FF: Irrigation water conveyance, steel pipeline.</u>

~~SCS~~<u>NRCS Code 441-1: Irrigation system, trickle.</u>

~~SCS~~ <u>NRCS Code 442: Irrigation system sprinkler.</u>

~~SCS~~ <u>NRCS Code 449: Irrigation water management.</u>

~~SCS~~ <u>NRCS Code 533: Pumping plant for water control.</u>

~~SCS~~ <u>NRCS</u> -**<u>Code 642: Well.</u>**

1403<u>1</u>.13.8. Underwriters Laboratories (UL) 333 Pfingsten Road, Northbrook, IL 60062-296 Standards
UL 486C-1995 Splicing Wire Connectors

UL 969-2013 Standard for Marking and Labeling Systems

UL 1310-2011 Standard for Class 2 Power Units

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Section 1403<u>1</u>.14 MATERIALS
The materials referenced below are exclusive to this section.

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1403<u>1</u>.14.1 PVC pipe and fittings.

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1403<u>1</u>.14.1.1 PVC pipe shall comply with one of the following standards ASTM D 1785, ASTM D 224 thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nor

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1403<u>1</u>.14.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 a

-

1403~~1~~.14.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in AS

1403~~1~~.14.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 4

-

1403~~1~~.14.1.5. PVC flexible pipe ~~should~~shall ~~be pressure rated as described in ASTM D 2740 with standard out~~

-

14031.14.1.6. PVC cement ~~should~~ shall **meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.**

-

1403~~1~~.14.2 Ductile iron pipe and fittings.

-

1403~~1~~.14.2.1 Gasket fittings for iron pipe shall be of materials and type compatible with the piping mat

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1403~~1~~.14.3. Steel pipe and fittings.

-

1403~~1~~.14.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or blac

1403~~1~~.14.3.2 Threaded fittings for steel pipe shall be Schedule 40 Malleable Iron.

-

1403~~1~~.14.4 Polyethylene pipe.

14031.14.4.1 ~~Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 k~~

1403~~1~~.14.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-

-

1403~~1~~.14.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe us

-

1403~~1~~.14.5 Sprinklers, spray heads, and emitters.

-

1403~~1~~.14.5.1 Units and nozzles shall be selected in accordance with the size of the area and the type of to water without excessive overspray. Intentional direct spray onto walkways, buildings, roadways, and

-

1403~~1~~.14.5.2 Equipment shall be used that is protected from contamination and damage by use of seals

-

1403~~1~~.14.5.3 Riser-mounted sprinklers shall be supported to minimize movement of the riser resulting

-

1403~~1~~.14.5.4 Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection and to prevent equipment damage.

-

1403~~1~~.14,5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

-

1403~~1~~.14.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstr and 4" height for Bermuda, Centapede and Seashore Paspalum.

-

1403~~1~~.14.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the devices from contamination from a PVC main or lateral break.

-

1403~~1~~.14.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone val all emission devices meet the manufacturer's performance standards.

-

1403~~1~~.14.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, proper

-

1403~~1~~.14.5.10 All tubing shall be secured to prevent movement in accordance with manufacturer's specifica~~tion~~**tic**

-

1403~~1~~.14.6 Valves.

-

~~1403~~1.14.6.1 Valves shall have a maximum working pressure rating equal to or greater than the m requirement shall be waived for low mainline pressure systems [30 psi (207 kPa) or less].

-

1403~~1~~.14.6.2 Only valves that are constructed of materials designed for use with the water and soil c materials that will not be deteriorated by chemicals injected into the system shall be used on all chemi

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1403~~1~~.14.7 Valve boxes.

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1403~~1~~.14.7.1 Valve boxes shall be constructed to withstand traffic loads common to the area in whic enclosed valves without excavation.

-

1403~~1~~.14.7.2. Each valve box shall be permanently labeled in accordance with UL 969 to identify its co

-

1403~~1~~.14.8 Low voltage wiring.

-

1403~~1~~.14.8.1 All low voltage wire which is directly buried shall be labeled for direct burial wire. Wire listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadv

-

1403~~1~~.14.8.2 The size of the electrical control wire shall be in accordance with the valve manufacture length, considering the number of solenoids operating, on the circuit. Minimum of # 14 AWG single s residential systems.

-

1403~~1~~.14.8.3 Connections shall be made using devices conforming to UL 486 specifically designed for

-

1403~~1~~.14.9 Irrigation controllers.

-

1403~~1~~.14.9.1 All irrigation controllers shall conform to UL 1310 and the provisions of the National El specifications. Solid state controls shall be equipped with surge suppressors on the primary and seco

-

1403~~1~~.14.9.2 The controller housing or enclosure shall protect the controller from the hazards of the er

-

1403~~1.14.9.3~~ The rain switch shall be placed on a stationary structure minimum of 5-foot (1524 mm) cl other overhead obstructions, and above the height of the sprinkler coverage. Soil moisture sens specifications and Florida Statutes, Section 373.62.

1403~~1~~.14.10 Pumps and wells.

-

1403~~1~~.14.10.1 Irrigation pump electrical control systems shall conform to the NEC and local building c

-

1403~~1~~.14.10.2 The pumping system shall be protected from the hazards of the environment in which it

-

1403~~1~~.14.10.3 Use electric motors with a nominal horsepower rating greater than the maximum horse service factor of at least 1.15.

-

1403~~1~~.14.10.4 Casings for drilled wells shall be steel, reinforced plastic mortar, plastic, or fiberglass pip 642. Steel casings shall conform to ASTM A 589.

-

1403~~1~~.14.11 Chemical injection equipment.

-

1403~~1~~.14.11.1 Chemical injection equipment shall be constructed of materials capable of withstanding be used only for those chemicals for which it was intended as stated by the injection equipment manu

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1403~~1~~.14.12 Filters and strainers.

-

1403~~1~~.14.12.1 Filtration equipment and strainers constructed of materials resistant to the potential cor prevent the passage of foreign material that would obstruct the sprinkler/emitter outlets in accordance

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Section 1403~~1~~.15 INSTALLATION

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1403~~1~~.15.1 Pipe installation.

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1403~~1~~.15.1.1 Pipe shall be installed at sufficient depth below ground to protect it from hazards such as maintenance of a property. Depths of cover shall meet or exceed NRCS Code 430-DD, Water Conveyan

-

1403~~1~~.15.1.1.1 Vehicle traffic areas.

Pipe Size (inches)

Depth of Cover (inches)

½ – 2 ½

18 - 24

3 - 5

24 - 30

6 and larger

30 - 36

-

1403~~1~~.15.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)

Depth of Cover (inches)

½ – 1 ½

6

2 - 3

12

4 - 6

18

More than 6

24

-

1403~~1~~.15.1.2 All pipe joints and connections shall be made according to manufacturer's specifications. A 2855.

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14031.15.1.3 **Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shal**
treatment and disposal systems, refer to Rule 64E-6.005(2)(b) of the Florida Administrative Code.

-

14031.15.1.4 **Thrust blocks shall be used on all gasketed PVC systems. They must be formed against They shall be constructed of concrete, and the space between the pipe and trench shall be filled to th accordance with ASAE S-376.1.**

-

14031.15.1.5 **The trench bottom shall be uniform, free of debris, and of sufficient width to properly pla be used to backfill the pipe trench. However, the initial backfill material shall be free from rocks or st content of the material shall be such that the required degree of compaction can be obtained with the l the pipe to final grade.**

-

14031.15.1.6. **Pipe sleeves shall be used to protect pipes or wires installed under pavement or road diameter of the wire bundle shall be used under the paving or roadway and extending a minimum of Transportation (FDOT). Pipe sleeves shall be Sch 40. Proper backfill and compaction procedures shall**

-

14031.15.2 **Control valve installation.**

-

14031.15.2.1 **Valve installation shall allow enough clearance for proper operation and maintenance. V box with cover extending from grade to the body of the valve. The top of the valve body should have a r and 18 inches (457 mm) of cover in traffic areas. The valve box shall be installed to minimize the effect or other approved material. If an automatic valve is installed under each sprinkler, then the valve box m**

-

14031.15.2.2 **Valve boxes shall be installed so that they do not rest on the pipe and the box cover does be flush with the ground surface and do not present a tripping hazard or interfere with routine mainten**

-

14031.15.2.3. **Quick coupling valves shall be installed on swing joints or flexible pipe with the top of th**

-

14031.15.2.4 **Any above-ground manually-operated valves on nonpotable water systems shall be adequ on irrigation systems that utilize nonpotable water supplies shall not be permitted.**

-

14031.15.3 **Sprinkler installation.**

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14031.15.3.1. **On flat landscaped areas, sprinklers shall be installed plumb. In areas where they are i Sprinklers shall be adjusted to avoid unnecessary discharge on roads, pavements and structures.**

-

14031.15.3.2. There shall be a minimum separation of 4 inches (102 mm) between sprinklers and pavement. and buildings and other vertical structures. Piping shall be thoroughly flushed before installation of sprinkler polyethylene (PE) nipples or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance equ mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be stabilized.

-

1403~~1~~.15.4 Pump installation.

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1403~~1~~.15.4.1 Pumps shall be installed in accordance with the manufacturer's specifications. Pumps sh or distortion on the pipe and fittings. Pipe and fittings shall be supported to avoid placing undue strain

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1403~~1~~.15.4.2 Pumps shall be installed in a manner to avoid loss of prime. Suction line shall be installec in suction pipe sizes shall be designed to avoid causing air pockets and cavitation.

-

1403~~1~~.15.4.3 Pumps shall be located to facilitate service and ease of removal. Appropriate fittings disconnected. An enclosure shall be provide of adequate size and strength, with proper ventilation, to

-

1403~~1~~.15.5 Low voltage wire installation.

-

1403~~1~~.15.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (3(wire shall be provided at each connection to allow for thermal expansion/shrinkage. As a minimum, a 12- Terminations at valves shall have 24 inches (610 mm) minimum free wire.

-

1403~~1~~.15.5.2 All above-ground wire runs and wire entries into buildings shall be installed in electrical conduit. Commo shall be provided. Connections shall be made using devices conforming to UL 486C specifically designed for direct burial

Exception: When wiring above ground manifolds from the valve to the ground immediately beneath it, n

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1403~~1~~.15.6 Hydraulic control tubing installation

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1403~~1.15.6.1~~. For hydraulic control systems, a water supply shall be used that is filtered and free of dele specifications. A backflow prevention device shall be installed where the hydraulic control system is c

1403~~1~~.15.6.2 Tubing shall be installed in trenches and spaced so that it will not rub against pipe, fitting (305 mm) diameter loop at all turns and connections A minimum depth of cover of 12 inches (305 mm)

-

1403~~1~~.15.6.3 Tubing shall be connected with couplings and collars according to Manufacturer's speci with water to expel entrapped air and tested for leaks prior to installation.

-

1403~~1~~.15.6.4 Exposed tubing shall be installed in a protective conduit manufactured from Schedule 40 U

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1403~~1~~.16 As-Built Drawings.

1403~~1.16.1~~ An As-Built drawing shall be required of all irrigation systems installed on commercial and

1403~~1~~.16.1.1 Location, type, pressure and maximum flow available of all water sources.

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1403~~1~~.16.1.2 Location, type and size of all components including sprinklers, microirrigation, main controllers, pump start relays, backflow devices, pumps, wells, etc.

-

1403~~1~~.16.1.3 The flow rate, application rate (inches per hour), and the operating pressure for the sprin

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1403~~1~~.16.1.4 The name, address, phone, email, professional license or certification number of the inst

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~~1403~~1.16.1.5 Date of installation.

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CHAPTER14
~~SUBSURFACE~~ LANDSCAPE IRRIGATION SYSTEMS
SECTION 1401
GENERAL

1401.1Scope.

The provisions of Chapter 14 shall govern the materials, design, construction and installation of ~~subsurface~~ landscape irrigation systems connected to either potable or nonpotable water ~~from on-site water reuse~~ systems.

SECTION 1402
Subsurface Landscape Irrigation Systems Connected to NonPotable On-site Water Reuse Systems

1402.1 Scope.

The provisions of Section 1402 shall govern the materials, design, construction and installation of subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems.

~~1402.2~~ 1402.2Materials.

Above-ground drain, waste and vent piping for subsurface landscape irrigation systems connected to NonPotabale On-site Water Reuse Systems shall conform to one of the standards listed in Table 702.1. Subsurface landscape irrigation, underground building drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

~~1401.3~~ 1402.3Tests.

Drain, waste and vent piping for subsurface landscape irrigation systems shall be tested in accordance with Section 312.

~~1401.4~~ 1402.4Inspections.

Subsurface landscape irrigation systems shall be inspected in accordance with Section 110 of the *Florida Building Code, Building*.

~~1401.5~~ 1402.5Disinfection.

Disinfection shall not be required for on-site nonpotable water reuse for subsurface landscape irrigation systems.

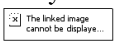
~~1401.6~~ 1402.6Coloring.

On-site nonpotable water reuse for subsurface landscape irrigation systems shall not be required to be dyed.

~~SECTION1402~~
~~SYSTEM DESIGN AND SIZING~~

~~1402.1~~ 1402.7Sizing.

The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface irrigation system. Where gray water collection piping is connected to subsurface landscape irrigation systems, gray water output shall be calculated according to the gallons-per-day-per-occupant number based on the type of fixtures connected. The gray water discharge shall be calculated by the following equation:



(Equation 14-1)

where:

A **= Number of occupants:**

Residential—Number of occupants shall be determined by the actual number of occupants, but not less than two occupants for one bedroom and one occupant for each additional bedroom.

Commercial—Number of occupants shall be determined by the *Florida Building Code, Building*.

B **= Estimated flow demands for each occupant:**

Residential—25 gallons per day (94.6 lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per day (56.7 lpd) per occupant for clothes washers or laundry trays.

Commercial—Based on type of fixture or water use records minus the discharge of fixtures other than those discharging gray water.

C **= Estimated gray water discharge based on the total number of occupants.**

~~1402.2~~ 1402.8Percolation tests.

The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability evaluation.

~~1402.2.1~~ 1402.8.1Percolation tests and procedures.

At least three percolation tests in each system area shall be conducted. The holes shall be spaced uniformly in relation to the bottom depth of the proposed absorption system. More percolation tests shall be made where necessary, depending on system design.

~~1402.2.1.1~~ 1402.8.1.1Percolation test hole.

The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inches (102 mm to 203 mm). The bottom and sides of the hole shall be scratched with a sharp-pointed instrument to expose the natural soil. All loose material shall be removed from the hole and the bottom shall be covered with 2 inches (51 mm) of gravel or coarse sand.

~~1402.2.1.2~~ 1402.8.1.2Test procedure, sandy soils.

The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in sandy soils. The time for this amount of water to seep away shall be determined, and this procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test shall proceed as follows: Water shall be added to a point not more than 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute intervals for a period of 1 hour. Where 6 inches (152 mm) of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 mm). Where 6 inches (152 mm) of water seeps away in less than 2 minutes, the test shall be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the above requirements shall be tested in accordance with Section 1303.7.1.3.

~~1402.2.1.3~~ 1402.8.1.3Test procedure, other soils.

The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above the bottom of the hole for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed to swell not less than 16 hours or more than 30 hours. Immediately after the soil swelling period, the measurements for determining the percolation rate shall be made as follows: any soil sloughed into the hole shall be removed and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do not vary by more than $^{1}/_{16}$ inch (1.59 mm). At least three water level drops shall be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gravel or coarse sand whenever it becomes nearly empty. Adjustments of the water level shall not be made during the three measurement periods except to the limits of the last measured water level drop. When the first 6 inches (152 mm) of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

~~1402.2.1.4~~ 1402.8.1.4Mechanical test equipment.

Mechanical percolation test equipment shall be of an *approved* type.

~~1402.2.2~~ 1402.8.2Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluation practices. Borings shall be made in accordance with Section ~~1402.2.1.1~~ 1402.8.1.1 for evaluating the soil.

~~1402.3~~ 1402.9Subsurface landscape irrigation site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining lot. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table ~~1402.3~~ 1402.9. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

TABLE ~~1402.3~~ 1402.9
LOCATION OF SUBSURFACE IRRIGATION SYSTEM

ELEMENT	Storage tank (feet)

Buildings	5
Lot line adjoining private property	5
Water wells	50
Streams and lakes	50
Seepage pits	5
Septic tanks	0
Water service	5
Public water main	10

For SI: 1 foot = 304.8 mm.

~~SECTION1403~~ ~~INSTALLATION~~

~~1403.1~~ 1402.10Installation.

Absorption systems shall be installed in accordance with Sections ~~1403.1.1~~ 1402.10.1 through ~~1403.1.5~~ 1402.10.1.5 to provide landscape irrigation without surfacing of water.

~~1403.1.1~~ 1402.10.1Absorption area.

The total absorption area required shall be computed from the estimated daily gray water discharge and the design-loading rate based on the percolation rate for the site. The required absorption area equals the estimated gray water discharge divided by the design-loading rate from Table ~~1403.1.1~~ 1402.10.1.

TABLE ~~1403.1.1~~ 1402.10.1
DESIGN LOADING RATE

PERCOLATION RATE(minutes per inch)	DESIG
0 to less than 10	
10 to less than 30	
30 to less than 45	
45 to 60	

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m².

~~1403.1.2~~ 1402.10.1.2 Seepage trench excavations.

Seepage trench excavations shall be not less than 1 foot (304 mm) in width and not greater than 5 feet (1524 mm) in width. Trench excavations shall be spaced not less than 2 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pipe. Individual seepage trenches shall be not greater than 100 feet (30 480 mm) in *developed length.*

~~1403.1.3~~ 1402.10.1.3 Seepage bed excavations.

Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one distribution pipe. The absorption area of a seepage bed shall be computed by using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced not greater than 5 feet (1524 mm) and not less than 3 feet (914 mm) apart, and greater than 3 feet (914 mm) and not less than 1 foot (305 mm) from the sidewall or headwall.

~~1403.1.4~~ 1402.10.1.4 Excavation and construction.

The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soil is so wet that such material rolled between the hands forms a soil wire. All smeared or compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth of smearing or compaction and the loose material removed. Where rain falls on an open excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation bottom is rolled between the hands. The bottom area shall then be scarified and loose material removed.

~~1403.1.5~~ 1402.10.1.5 Aggregate and backfill.

Not less than 6 inches in depth of aggregate, ranging in size from $^1/_2$ to $2^1/_2$ inches (12.7 mm to 64 mm), shall be laid into the trench below the distribution piping elevation. The aggregate shall be evenly distributed not less than 2 inches (51 mm) in depth over the top of the distribution pipe. The aggregate shall be covered with *approved* synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. Not less than 9 inches (229 mm) of soil backfill shall be provided above the covering.

~~1403.2~~ 1402.11Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table ~~1403.2~~ 1402.11. The top of the distribution pipe shall be not less than 8 inches (203 mm) below the original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches (102 mm) per 100 feet (30 480 mm).

TABLE ~~1403.2~~ 1402.11
DISTRIBUTION PIPE

MATERIAL
Polyethylene (PE) plastic pipe
Polyvinyl chloride (PVC) plastic pipe
Polyvinyl chloride (PVC) plastic pipe with a 3.5-inch O.D. and solid cellular core or

For SI: 1 inch=25.4 mm.

1403.2.1Joints.

Joints in distribution pipe shall be made in accordance with Section 705 of this code.

SECTION 1403
Surface and Subsurface Landscape Irrigation Systems

1403.1 Scope.

The provisions ofSection 1403 shall govern the materials, design, construction and installation of turf and landscape irrigation systems that apply potable or nonpotable water by means of permanent above ground or subsurface sprinkler or microsprinkler equipment that move water through various means of mechanical pressure.

1403.1.2 This section shall apply to all irrigation systems used on residential and commercial landscape areas.

1403.1.3 This section shall apply to all new irrigation systems and any new work to existing irrigation systems.

Exemption. This section shall not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

1403.1.4 Nothing contained in this section 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.

1403.2 Permits.

1403.2.1 A permit shall be required for new installation of landscape irrigation systems and for repairs or modifications to the system design that exceed $1000.00 in labor and material based on invoice value.

1403.2.2 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 $1000.00 in labor and material based on invoice value. -

1403.3 Preconstruction submittals.

1403.3.1 Plans or drawings.

1403.3.1.1 Single-family residence. Design drawings or shop drawings, where required, shall be provided for the installation of irrigation systems 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 shall be prepared by a licensed plumbing or irrigation contractor or licensed landscape architect.

1403.3.1.2 Commercial, industrial, municipal and multiple-family. Professionally designed drawings prior to start of construction shall be provided for landscape irrigation systems. 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 there of, 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, precipitation rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves,senors, etc. The plans and specifications shall be prepared in accordance with Section 107 of the Florida Building Code, Building.

1403.4 Definitions. The following definitions are exclusive to this section of the code.

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.

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly water is distributed within an irrigation zone.

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 (AVB). An anti-siphon backflow device which uses a floating seat to allow an air break to interrupt the vacuum effect on water flow.

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 generally range from 0.5 to 2 gpm but are 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 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 or from a reduced pressure assembly or relief valve.

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.

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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.

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

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.

Matched Precipitation. An equal distribution of water over a given area or zone.

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.

Reduced Pressure Principle Backflow Preventer (RPZD) (also known as Reduced Pressure Zone Device RPZ or RPZ Valve). A type of backflow prevention device used to protect water supplies from contamination.

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

Runoff. The result of excess water applied either naturally (precipitation) or mechanically (irrigation) that exceeds the absorption rate of the soil, moving to an area of a lower elevation.

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 elbows 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.

1403.4 DESIGN CRITERIA

1403.4.1 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

1403.4.2 Water supply.

1403.4.2.1 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.

1403.4.2.2 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.

1403.4.3 Application uniformity.

1403.4.3.1 Sprinkler irrigation systems shall be designed with the appropriate uniformity for the type of plants 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 shall be avoided.

1403.4.3.2 Sprinkler head spacing, type and nozzle selection that achieves the highest application uniformity shall be utilized.

1403.4.3.3 Application rates which avoid runoff and permit uniform water infiltration into the soil shall be utilized. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds and sun exposure shall be considered when application rates are specified. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

1403.4 System zoning. The irrigation system shall be divided into zones based on consideration of the following hydrozoning practices.

1403.4.1 Available flow rate.

1403.4.2 Cultural use of the area.

1403.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

1403.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

1403.4.5 Soil characteristics and slope.

1403.4.6 Sun exposure.

1403.5 Sprinkler/emitter spacing and selection.

1403.5.1 Sprinkler/Emitter spacing shall 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.

1403.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahia and no less than 4" in height for Bermuda, Centapede and Seashore Paspalum.

1403.5.3 Sprinklers shall be located in accordance with manufacturer's specifications in each irrigated zone area for a matched precipitation rate objective.

1403.5.4 Single row head spacing shall only occur when an additional row will cause saturated soils at the toe of a slope or other inefficiencies.

1403.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

1403.5.6 Water conservation shall be taken into consideration by minimizing irrigation of non-vegetated areas.

1403.5.7 Microirrigation systems shall be designed using the Emission Uniformity concept. Microirrigation emitters shall be spaced to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.

1403.5.8 Microirrigation or low volume heads shall be required in all areas to be irrigated that are less than 4 feet in any direction from the emitter or nozzle.

1403.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to supply pipelines to protect the emission devices from contamination from a PD main or lateral break.

1403.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properly placed, to meet the plant water requirements for no rainfall.

1403.6 Pipelines. Pipelines shall 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 shall not exceed 5 feet (1524 mm) per second.

1403.7 Wells.

1403.7.1 Well diameters, depths and location shall correspond to the irrigation system demand and in compliance to all applicable state, regulatory agencies and local codes and regulations.

1403.8 Pumps.

1403.8.1 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.

1403.8.2 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.

1403.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

1403.9 Control valves.

1403.9.1 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 assembly shall not exceed 10 percent of the static mainline head.

1403.9.2 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).

1403.9.3 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.

1403.9.4 Manually operated control valves shall be located so that they can be operated without wetting the operator.

1403.9.5 In ground valves shall be located away from large tree and palm root zones.

1403.9.6 A manual shut off valve shall be required to be installed close to the point of connection but downstream from any backflow device (or/unless included in the backflow device) to minimize water loss when the system is shut off for repairs or emergencies.

1403.9.7 An automatic shut-off valve or master valve (normally closed) is required on all systems with a constantly pressurized mainline to confine the water loss from minor main line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

1403.10 Automatic irrigation controller. Automatic irrigation controllers shall conform to UL 1310 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 or other sensors to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.

1403.11 Chemical injection.

1403.11.1 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.

1403.11.2 Injection systems shall 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.

1403.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device shall be required in compliance with ASSE 1013 and Section 1403.12.

1403.12 Backflow prevention methods. Backflow prevention assemblies at all cross connections with all water supplies shall be provided in accordance with county, municipal or other applicable codes. In the event of conflicting regulations the assembly type shall be provided which gives the highest degree of protection.

1403.12.1 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.

1403.12.1.1 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 shall comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

1403.12.1.2 For other water supplies, Florida State law, EPA regulations, or other applicable local codes shall be followed. In the absence of legal guidelines at minimum a PVB shall be required.

SECTION 1403.13 REFERENCED STANDARDS
The standards referenced below are exclusive to this section.

1403.13.1 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.

1403.13.2 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).

1403.13.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

1403.13.4 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 backflow preventers.

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

ASSE 1024: Dual check valve backflow preventers.

1403.13.5 Hydraulic Institute Standards, 14th Edition

1403.13.6 Standards and Specifications for Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

1403.13.7 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.

1403.13.8. Underwriters Laboratories (UL) 333 Pfingsten Road, Northbrook, IL 60062-296 Standards

UL 486C-1995 Splicing Wire Connectors

UL 969-2013 Standard for Marking and Labeling Systems

UL 1310-2011 Standard for Class 2 Power Units

Section 1403.14 MATERIALS
The materials referenced below are exclusive to this section.

1403.14.1 PVC pipe and fittings.

1403.14.1.1 PVC pipe shall 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.

1403.14.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

1403.14.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

1403.14.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

1403.14.1.5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

1403.14.1.6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

1403.14.2 Ductile iron pipe and fittings.

1403.14.2.1 Gasket fittings for iron pipe shall be of materials and type compatible with the piping material being used.

1403.14.3. Steel pipe and fittings.

1403.14.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

1403.14.3.2 Threaded fittings for steel pipe shall be Schedule 40 Malleable Iron.

1403.14.4 Polyethylene pipe.

1403.14.4.1 Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

140314.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

1403.14.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

1403.14.5 Sprinklers, spray heads, and emitters.

1403.14.5.1 Units and nozzles shall be selected in accordance with the size of the area and the type of plant material being irrigated. Sprinklers shall fit the area they are intended to water without excessive overspray. Intentional direct spray onto walkways, buildings, roadways, and driveways is prohibited.

1403.14.5.2 Equipment shall be used that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

1403.14.5.3 Riser-mounted sprinklers shall be supported to minimize movement of the riser resulting from the action of the sprinkler.

1403.14.5.4 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.

1403.14,5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

1403.14.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstructed by the turf grass blades: 6" height for St. Augustine, Zoysia and Bahia and 4" height for Bermuda, Centapede and Seashore Paspalum.

1403.14.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PVC main or lateral break.

1403.14.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or at the point where the drip tubing is attached to the PVC to ensure that all emission devices meet the manufacturer's performance standards.

1403.14.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, properly placed to meet the plant water requirements for no rainfall.

1403.14.5.10 All tubing shall be secured to prevent movement in accordance with manufacturer's specificantion.

1403.14.6 Valves.

1403.14.6.1 Valves shall 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 shall be waived for low mainline pressure systems [30 psi (207 kPa) or less].

1403.14.6.2 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.

1403.14.7 Valve boxes.

1403.14.7.1 Valve boxes shall 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.

1403.14.7.2. Each valve box shall be permanently labeled in accordance with UL 969 to identify its contents.

1403.14.8 Low voltage wiring.

1403.14.8.1 All low voltage wire which is directly buried shall be labeled for direct burial wire. Wire not labeled for direct burial shall be installed in watertight conduits, and be listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a conduit and sleeve.

1403.14.8.2 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.

1403.14.8.3 Connections shall be made using devices conforming to UL 486 specifically designed for direct burial. All splices shall be enclosed within a valve box.

1403.14.9 Irrigation controllers.

1403.14.9.1 All irrigation controllers shall conform to UL 1310 and the provisions of the National Electric Code (NEC) and be grounded in accordance with the manufacturer's specifications. Solid state controls shall be equipped with surge suppressors on the primary and secondary wiring, except single lot residential systems.

1403.14.9.2 The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

1403.14.9.3 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. Soil moisture sensors and ET sensors shall be installed in accordance with manufacturer's specifications and Florida Statutes, Section 373.62.

1403.14.10 Pumps and wells.

1403.14.10.1 Irrigation pump electrical control systems shall conform to the NEC and local building codes.

1403.14.10.2 The pumping system shall be protected from the hazards of the environment in which it is installed.

1403.14.10.3 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.

1403.14.10.4 Casings for drilled wells shall be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. See SCS code FL-642. Steel casings shall conform to ASTM A 589.

1403.14.11 Chemical injection equipment.

1403.14.11.1 Chemical injection equipment shall 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.

1403.14.12 Filters and strainers.

1403.14.12.1 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.

Section 1403.15 INSTALLATION

1403.15.1 Pipe installation.

1403.15.1.1 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:

1403.15.1.1.1 Vehicle traffic areas.

Pipe Size (inches)

Depth of Cover (inches)

½ – 2 ½

18 - 24

3 - 5

24 - 30

6 and larger

30 - 36

1403.15.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)

Depth of Cover (inches)

½ – 1 ½

6

2 - 3

12

4 - 6

18

More than 6

24

1403.15.1.2 All pipe joints and connections shall be made according to manufacturer's specifications. All solvent-weld connections shall be performed in accordance with ASTM D 2855.

1403.15.1.3 Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another.

1403.15.1.4 Thrust blocks shall 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. Thrust blocks shall be sized in accordance with ASAE S-376.1.

1403.15.1.5 The trench bottom shall 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.

1403.15.1.6. Pipe sleeves shall be used to protect pipes or wires installed under pavement or roadways. Pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle shall be used 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). Pipe sleeves shall be Sch 40. Proper backfill and compaction procedures shall be followed.

1403.15.2 Control valve installation.

1403.15.2.1 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. The valve box shall be installed to minimize the effect of soil intrusion within the valve box with the use of filter fabric, pea gravel, or other approved material. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

1403.15.2.2 Valve boxes shall be installed so that they do not rest on the pipe and the box cover does not conflict with the valve stem or interfere with valve operation. They shall be flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

1403.15.2.3. Quick coupling valves shall be installed on swing joints or flexible pipe with the top of the valve at ground level.

1403.15.2.4 Any above-ground manually-operated valves on nonpotable water systems shall be adequately identified with distinctive purple colored paint. Hose bibb connections on irrigation systems that utilize nonpotable water supplies shall not be permitted.

1403.15.3 Sprinkler installation.

1403.15.3.1. On flat landscaped areas, sprinklers shall be installed plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers shall be adjusted to avoid unnecessary discharge on roads, pavements and structures.

1403.15.3.2. There shall be a minimum separation of 4 inches (102 mm) between sprinklers and pavement. There shall be a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping shall be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints, polyethylene (PE) nipples or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance equipment traffic areas or alongside roadways and driveways. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be stabilized.

1403.15.4 Pump installation.

1403.15.4.1 Pumps shall be installed in accordance with the manufacturer's specifications. Pumps shall be set plumb and secure to a firm concrete base. There shall be no strain or distortion on the pipe and fittings. Pipe and fittings shall be supported to avoid placing undue strain on the pump. Steel pipe shall be used on pumps 5 horsepower (hp) or larger.

1403.15.4.2 Pumps shall be installed in a manner to avoid loss of prime. Suction line shall be installed to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes shall be designed to avoid causing air pockets and cavitation.

1403.15.4.3 Pumps shall be located to facilitate service and ease of removal. Appropriate fittings shall be provided to allow the pump to readily be primed, serviced, and disconnected. An enclosure shall be provide of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

1403.15.5 Low voltage wire installation.

1403.15.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 mm) where not installed directly under the mainline. A sufficient length of wire shall be provided at each connection to allow for thermal expansion/shrinkage. As a minimum, a 12-inch (305 mm) diameter loop shall be provided at all splices and connections. Terminations at valves shall have 24 inches (610 mm) minimum free wire.

1403.15.5.2 All above-ground wire runs and wire entries into buildings shall be installed in electrical conduit. Common wires with a different color than the power wires (white shall be used for common wires) shall be provided. Connections shall be made using devices conforming to UL 486C specifically designed for direct burial. All splices shall be enclosed within a valve box.

Exception: When wiring above ground manifolds from the valve to the ground immediately beneath it, no conduit is required.

1403.15.6 Hydraulic control tubing installation

1403.15.6.1. For hydraulic control systems, a water supply shall be used that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer's specifications. A backflow prevention device shall be installed where the hydraulic control system is connected to potable water supplies.

1403.15.6.2 Tubing shall be installed in trenches 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 A minimum depth of cover of 12 inches (305 mm) shall be provided.

1403.15.6.3 Tubing shall be connected with couplings and collars according to Manufacturer's specifications. All splices shall be made in valve boxes. Tubing shall be prefilled with water to expel entrapped air and tested for leaks prior to installation.

1403.15.6.4 Exposed tubing shall be installed in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

1403.16 As-Built Drawings.

1403.16.1 An As-Built drawing shall be required of all irrigation systems installed on commercial and residential developments and shall contain the following information:

1403.16.1.1 Location, type, pressure and maximum flow available of all water sources.

1403.16.1.2 Location, type and size of all components including sprinklers, microirrigation, main and lateral piping, master valves, valves, moisture sensors, rain sensors, controllers, pump start relays, backflow devices, pumps, wells, etc.

1403.16.1.3 The flow rate, application rate (inches per hour), and the operating pressure for the sprinklers and micro irrigation within each zone.

1403.16.1.4 The name, address, phone, email, professional license or certification number of the installation contractor.

1403.16.1.5 Date of installation.

P8091 amended

Summary of Modification

Modification adds Surface and Subsurface Landscape Irrigation Systems connected to either potable or nonpotable water supplies and modifies the current Chapter 14 numbering system to integrate into the new section. Current code addresses subsurface irrigation connected to nonpotable water supply.

Text of Modification

CHAPTER14
LANDSCAPE IRRIGATION SYSTEMS
SECTION 1401
GENERAL

1401.1Scope.

The provisions of Chapter 14 shall govern the materials, design, construction and installation of ~~subsurface~~ turf and landscape irrigation systems connected to either potable or nonpotable water ~~from on-site water reuse~~ systems.

Exception: Landscape irrigation systems connected to onsite sewage treatment and disposal systems shall be regulated by Chapter 64E-6, Florida Administrative Code, Standards for Onsite Sewage Treatment and Disposal Systems.

~~SECTION 1402~~
~~Subsurface Landscape Irrigation Systems Connected to NonPotable On-site Water Reuse Systems~~

~~**1402.1 Scope.**~~

~~The provisions of Section 1402 shall govern the materials, design, construction and installation of subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems.~~

~~**1402.2 1402.2Materials.**~~

~~Above-ground drain, waste and vent piping for subsurface landscape irrigation systems connected to NonPotabale On-site Water Reuse Systems shall conform to one of the standards listed in Table 702.1. Subsurface landscape irrigation, underground building drainage and vent pipe shall conform to one of the standards listed in Table 702.2.~~

~~**1401.3 1402.3Tests.**~~

~~Drain, waste and vent piping for subsurface landscape irrigation systems shall be tested in accordance with Section 312.~~

~~**1401.4 1402.4Inspections.**~~

~~Subsurface landscape irrigation systems shall be inspected in accordance with Section 110 of the *Florida Building Code, Building*.~~

~~**1401.5 1402.5Disinfection.**~~

Disinfection shall not be required for on-site nonpotable water reuse for subsurface landscape irrigation systems.

1401.6 1402.6Coloring.

On-site nonpotable water reuse for subsurface landscape irrigation systems shall not be required to be dyed.

SECTION1402
SYSTEM DESIGN AND SIZING

1402.1 1402.7Sizing.

The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface irrigation system. Where gray water collection piping is connected to subsurface landscape irrigation systems, gray water output shall be calculated according to the gallons per day per occupant number based on the type of fixtures connected. The gray water discharge shall be calculated by the following equation:

$$\_\_\_\_\_$$

(Equation 14-1)

where:

***A* = Number of occupants:**

Residential—Number of occupants shall be determined by the actual number of occupants, but not less than two occupants for one bedroom and one occupant for each additional bedroom.

Commercial—Number of occupants shall be determined by the *Florida Building Code, Building*.

***B* = Estimated flow demands for each occupant:**

Residential—25 gallons per day (94.6 lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per day (56.7 lpd) per occupant for clothes washers or laundry trays.

Commercial—Based on type of fixture or water use records minus the discharge of fixtures other than those discharging gray water.

***C* = Estimated gray water discharge based on the total number of occupants.**

1402.2 1402.8Percolation tests.

The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability evaluation.

1402.2.1 1402.8.1Percolation tests and procedures.

At least three percolation tests in each system area shall be conducted. The holes shall be spaced uniformly in relation to the bottom depth of the proposed absorption system. More percolation tests shall be made where necessary, depending on system design.

1402.2.1.1 1402.8.1.1Percolation test hole.

The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inches (102 mm to 203 mm). The bottom and sides of the hole shall be scratched with a sharp pointed instrument to expose the natural soil. All loose material shall be removed from the hole and the bottom shall be covered with 2 inches (51 mm) of gravel or coarse sand.

1402.2.1.2 1402.8.1.2Test procedure, sandy soils.

The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in sandy soils. The time for this amount of water to seep away shall be determined, and this procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test shall proceed as follows: Water shall be added to a

point not more than 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute intervals for a period of 1 hour. Where 6 inches (152 mm) of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 mm). Where 6 inches (152 mm) of water seeps away in less than 2 minutes, the test shall be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the above requirements shall be tested in accordance with Section 1303.7.1.3.

1402.2.1.3 1402.8.1.3Test procedure, other soils.

The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above the bottom of the hole for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed to swell not less than 16 hours or more than 30 hours. Immediately after the soil swelling period, the measurements for determining the percolation rate shall be made as follows: any soil sloughed into the hole shall be removed and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do not vary by more than 1/4 inch (1.59 mm). At least three water level drops shall be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gravel or coarse sand whenever it becomes nearly empty. Adjustments of the water level shall not be made during the three measurement periods except to the limits of the last measured water level drop. When the first 6 inches (152 mm) of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

1402.2.1.4 1402.8.1.4Mechanical test equipment.

Mechanical percolation test equipment shall be of an *approved* type.

1402.2.2 1402.8.2Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluation practices. Borings shall be made in accordance with Section 1402.2.1.1–1402.8.1.1 for evaluating the soil.

1402.3 1402.9Subsurface landscape irrigation site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining lot. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table 1402.3 1402.9. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

TABLE 1402.3 1402.9

LOCATION OF SUBSURFACE IRRIGATION SYSTEM

ELEMENT
Buildings
Lot line adjoining private property

Water wells

Streams and lakes

Seepage pits

Septic tanks

Water service

Public water main

For SI: 1 foot = 304.8 mm.

SECTION14031 INSTALLATION

14031.1 1402.10Installation.

Absorption systems shall be installed in accordance with Sections 14031.1.1 1402.10.1 through 14031.1.5 1402.10.1.5 to provide landscape irrigation without surfacing of water.

14031.1.1 1402.10.1Absorption area.

The total absorption area required shall be computed from the estimated daily gray water discharge and the design loading rate based on the percolation rate for the site. The required absorption area equals the estimated gray water discharge divided by the design loading rate from Table 14031.1.1 1402.10.1.

TABLE 14031.1.1 1402.10.1
DESIGN LOADING RATE

PERCOLATION RATE(minutes per inch)
0 to less than 10
10 to less than 30
30 to less than 45
45 to 60

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m².

14031.1.2 1402.10.1.2 Seepage trench excavations.

Seepage trench excavations shall be not less than 1 foot (304 mm) in width and not greater than 5 feet (1524 mm) in width. Trench excavations shall be spaced not less than 2 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pipe. Individual seepage trenches shall be not greater than 100 feet (30 480 mm) in *developed length*.

14031.1.3 1402.10.1.3 Seepage bed excavations.

Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one distribution pipe. The absorption area of a seepage bed shall be computed by using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced not greater than 5 feet (1524 mm) and not less than 3 feet (914 mm) apart, and greater than 3 feet (914 mm) and not less than 1 foot (305 mm) from the sidewall or headwall.

14031.1.4 1402.10.1.4 Excavation and construction.

The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soil is so wet that such material rolled between the hands forms a soil wire. All smeared or compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth of smearing or compaction and the loose material removed. Where rain falls on an open excavation, the soil shall be left until sufficiently dry so a

soil wire will not form when soil from the excavation bottom is rolled between the hands. The bottom area shall then be scarified and loose material removed.

14031.1.5 1402.10.1.5 Aggregate and backfill.

Not less than 6 inches in depth of aggregate, ranging in size from ¼ to 2½ inches (12.7 mm to 64 mm), shall be laid into the trench below the distribution piping elevation. The aggregate shall be evenly distributed not less than 2 inches (51 mm) in depth over the top of the distribution pipe. The aggregate shall be covered with *approved* synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. Not less than 9 inches (229 mm) of soil backfill shall be provided above the covering.

14031.2 1402.11Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table 14031.2 1402.11. The top of the distribution pipe shall be not less than 8 inches (203 mm) below the original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches (102 mm) per 100 feet (30 480 mm).

TABLE 14031.2 1402.11
DISTRIBUTION PIPE

MATERIAl
Polyethylene (PE) pl
Polyvinyl chloride (PVC
Polyvinyl chloride (PVC) plastic pipe with a 3.5 inch O

For SI: 1 inch=25.4 mm.

14031.2.1Joints.

Joints in distribution pipe shall be made in accordance with Section 705 of this code.

SECTION 14031
Surface and Subsurface Landscape Irrigation Systems

14031.1 Scope.

The provisions of Section 14031 shall govern the materials, design, construction and installation of turf and landscape irrigation systems that apply potable or nonpotable water by means of permanent above ground or subsurface sprinkler or microsprinkler equipment that move water through various means of mechanical pressure.

14031.1.2 This section shall apply to all irrigation systems used on residential and commercial landscape areas.

14031.1.3 This section shall apply to all new irrigation systems and any new work to existing irrigation systems.

> Exception. This section shall not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

1403~~1~~.1.4 Nothing contained in this section 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.

1403~~1~~.2 Permits.

1403~~1~~.2.1 A permit shall be required for new installation of landscape irrigation systems and for repairs or modifications to the system design that exceed $1000.00 in labor and material based on invoice value.

1403~~1~~.2.2 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 $1000.00 in labor and material based on invoice value. -

1403~~1~~.3 Preconstruction submittals.

1403~~1~~.3.1 Plans or drawings.

1403~~1~~.3.1.1 Single-family residence. Design drawings or shop drawings, where required, shall be provided for the installation of irrigation systems 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 shall be prepared by a licensed plumbing or irrigation contractor or licensed landscape architect.

1403~~1~~.3.1.2 Commercial, industrial, municipal and multiple-family. Professionally designed drawings prior to start of construction shall be provided for landscape irrigation systems. 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 there of, 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, precipitation rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, sensors, etc. The plans and specifications shall be prepared in accordance with Section 107 of the Florida Building Code, Building.

1403~~1~~.4 Definitions. The following definitions are exclusive to this section of the code.

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.

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly water is distributed within an irrigation zone.

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 (AVB). An anti-siphon backflow device which uses a floating seat to allow an air break to interrupt the vacuum effect on water flow.

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 generally range from 0.5 to 2 gpm but are 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 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 or from a reduced pressure assembly or relief valve.

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.

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

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.

Matched Precipitation. An equal distribution of water over a given area or zone.

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.

Reduced Pressure Principle Backflow Preventer (RPZD) (also known as Reduced Pressure Zone Device RPZ or RPZ Valve). A type of backflow prevention device used to protect water supplies from contamination.

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

Runoff. The result of excess water applied either naturally (precipitation) or mechanically (irrigation) that exceeds the absorption rate of the soil, moving to an area of a lower elevation.

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 elbows 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.

1403~~1~~.4 DESIGN CRITERIA

1403~~1~~.4.1 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

1403~~1~~.4.2 Water supply.

1403~~1~~.4.2.1 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.

1403~~1~~.4.2.2 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.

1403~~1~~.4.3 Application uniformity.

1403~~1~~.4.3.1 Sprinkler irrigation systems shall be designed with the appropriate uniformity for the type of plants 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 shall be avoided.

1403~~1~~.4.3.2 Sprinkler head spacing, type and nozzle selection that achieves the highest application uniformity shall be utilized.

1403~~1~~.4.3.3 Application rates which avoid runoff and permit uniform water infiltration into the soil shall be utilized. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds and sun exposure shall be considered when application rates are specified. Different types

of sprinklers with different application rates, i.e., spray heads vs. rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

1403~~1~~.4 System zoning. The irrigation system shall be divided into zones based on consideration of the following hydrozoning practices.

1403~~1~~.4.1 Available flow rate.

1403~~1~~.4.2 Cultural use of the area.

1403~~1~~.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

1403~~1~~.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

1403~~1~~.4.5 Soil characteristics and slope.

1403~~1~~.4.6 Sun exposure.

1403~~1~~.5 Sprinkler/emitter spacing and selection.

1403~~1~~.5.1 Sprinkler/Emitter spacing shall 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.

1403~~1~~.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahia and no less than 4" in height for Bermuda, Centapede and Seashore Paspalum.

1403~~1~~.5.3 Sprinklers shall be located in accordance with manufacturer's specifications in each irrigated zone area for a matched precipitation rate objective.

1403~~1~~.5.4 Single row head spacing shall only occur when an additional row will cause saturated soils at the toe of a slope or other inefficiencies.

1403~~1~~.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

1403~~1~~.5.6 Water conservation shall be taken into consideration by minimizing irrigation of non-vegetated areas.

1403~~1~~.5.7 Microirrigation systems shall be designed using the Emission Uniformity concept. Microirrigation emitters shall be spaced to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.

1403~~1~~.5.8 Microirrigation or low volume heads shall be required in all areas to be irrigated that are less than 4 feet in any direction from the emitter or nozzle.

1403~~1~~.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to supply pipelines to protect the emission devices from contamination from a ~~PD~~ main or lateral break.

1403~~1~~.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properly placed, to meet the plant water requirements for no rainfall.

1403~~1~~.6 Pipelines. Pipelines shall 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 shall not exceed 5 feet (1524 mm) per second.

1403~~1~~.7 Wells.

1403~~1~~.7.1 Well diameters, depths and location shall correspond to the irrigation system demand and in compliance to all applicable state, regulatory agencies and local codes and regulations.

1403~~1~~.8 Pumps.

1403~~1~~.8.1 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.

1403~~1~~.8.2 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.

1403~~1~~.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

1403~~1~~.9 Control valves.

1403~~1~~.9.1 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 assembly shall not exceed 10 percent of the static mainline head.

1403~~1~~.9.2 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).

1403~~1~~.9.3 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.

1403~~1~~.9.4 Manually operated control valves shall be located so that they can be operated without wetting the operator.

1403~~1~~.9.5 In ground valves shall be located away from large tree and palm root zones.

14031.9.6 A manual shut off valve shall be required to be installed close to the point of connection but downstream from any backflow device (or/unless included in the backflow device) to minimize water loss when the system is shut off for repairs or emergencies.

1403~~1~~.9.7 An automatic shut-off valve or master valve (normally closed) is required on all systems with a constantly pressurized mainline to confine the water loss from minor main line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

1403~~1~~.10 Automatic irrigation controller. Automatic irrigation controllers shall conform to UL 1310 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 or other sensors to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.

1403~~1~~.11 Chemical injection.

1403~~1~~.11.1 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.

1403~~1~~.11.2 Injection systems shall 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.

1403~~1~~.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device shall be required in compliance with ASSE 1013 and Section 14031.12.

1403~~1~~.12 Backflow prevention methods. Backflow prevention assemblies at all cross connections with all water supplies shall be provided in accordance with county, municipal or other applicable codes. In the event of conflicting regulations the assembly type shall be provided which gives the highest degree of protection.

1403~~1~~.12.1 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.

1403~~1~~.12.1.1 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 shall comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

1403~~1~~.12.1.2 For other water supplies, Florida State law, EPA regulations, or other applicable local codes shall be followed. In the absence of legal guidelines, at minimum, a ~~PVD~~ Pressure Vacuum Breaker shall be required.

SECTION 14031.13 REFERENCED STANDARDS
The standards referenced below are exclusive to this section.

1403~~1~~.13.1 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.

1403~~1~~.13.2 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).

1403~~1~~.13.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

1403~~1~~.13.4 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 backflow preventers.

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

ASSE 1024: Dual check valve backflow preventers.

1403~~1~~.13.5 Hydraulic Institute Standards, 14th Edition

1403~~1~~.13.6 Standards and Specifications for Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

1403~~1~~.13.~~7 Soil Conservation Service (SCS)~~ Natural Resources Conservation Service (NRCS) Field Office Technical Guide, Section IV-A — Cropland Codes:

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

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

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

~~SCS~~ NRCS Code 441-1: Irrigation system, trickle.

~~SCS~~ NRCS Code 442: Irrigation system sprinkler.

~~SCS~~ NRCS Code 449: Irrigation water management.

~~SCS~~ NRCS Code 533: Pumping plant for water control.

~~SCS~~ NRCS Code 642: Well.

1403~~1~~.13.8. Underwriters Laboratories (UL) 333 Pfingsten Road, Northbrook, IL 60062-296 Standards

UL 486C-1995 Splicing Wire Connectors

UL 969-2013 Standard for Marking and Labeling Systems

UL 1310-2011 Standard for Class 2 Power Units

Section 1403~~1~~.14 MATERIALS
The materials referenced below are exclusive to this section.

1403~~1~~.14.1 PVC pipe and fittings.

1403~~1~~.14.1.1 PVC pipe shall 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.

1403~~1~~.14.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

1403~~1~~.14.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

1403~~1~~.14.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

1403~~1~~.14.1.5. PVC flexible pipe ~~should~~ shall be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

14031.14.1.6. PVC cement ~~should~~ shall meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

1403~~1~~.14.2 Ductile iron pipe and fittings.

1403~~1~~.14.2.1 Gasket fittings for iron pipe shall be of materials and type compatible with the piping material being used.

1403~~1~~.14.3. Steel pipe and fittings.

1403~~1~~.14.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

1403~~1~~.14.3.2 Threaded fittings for steel pipe shall be Schedule 40 Malleable Iron.

1403~~1~~.14.4 Polyethylene pipe.

14031.14.4.1 Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

1403~~1~~.14.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

1403~~1~~.14.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

1403~~1~~.14.5 Sprinklers, spray heads, and emitters.

1403~~1~~.14.5.1 Units and nozzles shall be selected in accordance with the size of the area and the type of plant material being irrigated. Sprinklers shall fit the area they are intended to water without excessive overspray. Intentional direct spray onto walkways, buildings, roadways, and driveways is prohibited.

1403~~1~~.14.5.2 Equipment shall be used that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

1403~~1~~.14.5.3 Riser-mounted sprinklers shall be supported to minimize movement of the riser resulting from the action of the sprinkler.

1403~~1~~.14.5.4 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.

1403~~1~~.14,5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

1403~~1~~.14.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstructed by the turf grass blades: 6" height for St. Augustine, Zoysia and Bahia and 4" height for Bermuda, Centapede and Seashore Paspalum.

1403~~1~~.14.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PVC main or lateral break.

1403~~1~~.14.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or at the point where the drip tubing is attached to the PVC to ensure that all emission devices meet the manufacturer's performance standards.

1403~~1~~.14.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, properly placed to meet the plant water requirements for no rainfall.

1403~~1~~.14.5.10 All tubing shall be secured to prevent movement in accordance with manufacturer's specifica~~n~~tion.

1403~~1~~.14.6 Valves.

1403~~1~~.14.6.1 Valves shall 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 shall be waived for low mainline pressure systems [30 psi (207 kPa) or less].

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1403~~1~~.14.6.2 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.

1403~~1~~.14.7 Valve boxes.

1403~~1~~.14.7.1 Valve boxes shall 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.

1403~~1~~.14.7.2. Each valve box shall be permanently labeled in accordance with UL 969 to identify its contents.

1403~~1~~.14.8 Low voltage wiring.

1403~~1~~.14.8.1 All low voltage wire which is directly buried shall be labeled for direct burial wire. Wire not labeled for direct burial shall be installed in watertight conduits, and be listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a conduit and sleeve.

1403~~1~~.14.8.2 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.

1403~~1~~.14.8.3 Connections shall be made using devices conforming to UL 486 specifically designed for direct burial. All splices shall be enclosed within a valve box.

1403~~1~~.14.9 Irrigation controllers.

1403~~1~~.14.9.1 All irrigation controllers shall conform to UL 1310 and the provisions of the National Electric Code (NEC) and be grounded in accordance with the manufacturer's specifications. Solid state controls shall be equipped with surge suppressors on the primary and secondary wiring, except single lot residential systems.

1403~~1~~.14.9.2 The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

1403~~1~~.14.9.3 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. Soil moisture sensors and ET sensors shall be installed in accordance with manufacturer's specifications and Florida Statutes, Section 373.62.

1403~~1~~.14.10 Pumps and wells.

1403~~1~~.14.10.1 Irrigation pump electrical control systems shall conform to the NEC and local building codes.

1403~~1~~.14.10.2 The pumping system shall be protected from the hazards of the environment in which it is installed.

1403~~1~~.14.10.3 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.

1403~~1~~.14.10.4 Casings for drilled wells shall be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. See NRCS code FL-642. Steel casings shall conform to ASTM A 589.

1403~~1~~.14.11 Chemical injection equipment.

1403~~1~~.14.11.1 Chemical injection equipment shall 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.

1403~~1~~.14.12 Filters and strainers.

1403~~1~~.14.12.1 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.

Section 1403~~1~~.15 INSTALLATION

1403~~1~~.15.1 Pipe installation.

1403~~1~~.15.1.1 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 NRCS Code 430-DD, Water Conveyance, as follows:

1403~~1~~.15.1.1.1 Vehicle traffic areas.

Pipe Size (inches)

Depth of Cover (inches)

½ – 2 ½

18 - 24

3 - 5

24 - 30

6 and larger

30 - 36

1403~~1~~.15.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)

Depth of Cover (inches)

½ – 1 ½

6

2 - 3

12

4 - 6

18

More than 6

24

1403~~1~~.15.1.2 All pipe joints and connections shall be made according to manufacturer's specifications. All solvent-weld connections shall be performed in accordance with ASTM D 2855.

1403~~1~~.15.1.3 Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another.

1403~~1~~.15.1.4 Thrust blocks shall 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. Thrust blocks shall be sized in accordance with ASAE S-376.1.

1403~~1~~.15.1.5 The trench bottom shall 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.

1403~~1~~.15.1.6. Pipe sleeves shall be used to protect pipes or wires installed under pavement or roadways. Pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle shall be used 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). Pipe sleeves shall be Sch 40. Proper backfill and compaction procedures shall be followed.

1403~~1~~.15.2 Control valve installation.

1403~~1~~.15.2.1 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. The valve box shall be installed to minimize the effect of soil intrusion within the valve box with the use of filter fabric, pea gravel, or other approved material. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

1403~~1~~.15.2.2 Valve boxes shall be installed so that they do not rest on the pipe and the box cover does not conflict with the valve stem or interfere with valve operation. They shall be flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

1403~~1~~.15.2.3. Quick coupling valves shall be installed on swing joints or flexible pipe with the top of the valve at ground level.

1403~~1~~.15.2.4 Any above-ground manually-operated valves on nonpotable water systems shall be adequately identified with distinctive purple colored paint. Hose bibb connections on irrigation systems that utilize nonpotable water supplies shall not be permitted.

1403~~1~~.15.3 Sprinkler installation.

1403~~1~~.15.3.1. On flat landscaped areas, sprinklers shall be installed plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers shall be adjusted to avoid unnecessary discharge on roads, pavements and structures.

1403~~1~~.15.3.2. There shall be a minimum separation of 4 inches (102 mm) between sprinklers and pavement. There shall be a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping shall be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints, polyethylene (PE) nipples or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance equipment traffic areas or alongside roadways and driveways. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be stabilized.

1403~~1~~.15.4 Pump installation.

1403~~1~~.15.4.1 Pumps shall be installed in accordance with the manufacturer's specifications. Pumps shall be set plumb and secure to a firm concrete base. There shall be no strain or distortion on the pipe and fittings. Pipe and fittings shall be supported to avoid placing undue strain on the pump. Steel pipe shall be used on pumps 5 horsepower (hp) or larger.

1403~~1~~.15.4.2 Pumps shall be installed in a manner to avoid loss of prime. Suction line shall be installed to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes shall be designed to avoid causing air pockets and cavitation.

1403~~1~~.15.4.3 Pumps shall be located to facilitate service and ease of removal. Appropriate fittings shall be provided to allow the pump to readily be primed, serviced, and disconnected. An

enclosure shall be provide of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

1403~~1~~.15.5 Low voltage wire installation.

1403~~1~~.15.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 mm) where not installed directly under the mainline. A sufficient length of wire shall be provided at each connection to allow for thermal expansion/shrinkage. As a minimum, a 12-inch (305 mm) diameter loop shall be provided at all splices and connections. Terminations at valves shall have 24 inches (610 mm) minimum free wire.

1403~~1~~.15.5.2 All above-ground wire runs and wire entries into buildings shall be installed in electrical conduit. Common wires with a different color than the power wires (white shall be used for common wires) shall be provided. Connections shall be made using devices conforming to UL 486C specifically designed for direct burial. All splices shall be enclosed within a valve box.

Exception: When wiring above ground manifolds from the valve to the ground immediately beneath it, no conduit is required.

1403~~1~~.15.6 Hydraulic control tubing installation

1403~~1~~.15.6.1. For hydraulic control systems, a water supply shall be used that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer's specifications. A backflow prevention device shall be installed where the hydraulic control system is connected to potable water supplies.

1403~~1~~.15.6.2 Tubing shall be installed in trenches 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 A minimum depth of cover of 12 inches (305 mm) shall be provided.

1403~~1~~.15.6.3 Tubing shall be connected with couplings and collars according to Manufacturer's specifications. All splices shall be made in valve boxes. Tubing shall be prefilled with water to expel entrapped air and tested for leaks prior to installation.

1403~~1~~.15.6.4 Exposed tubing shall be installed in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

1403~~1~~.16 As-Built Drawings.

1403~~1~~.16.1 An As-Built drawing shall be required of all irrigation systems installed on commercial and residential developments and shall contain the following information:

1403~~1~~.16.1.1 Location, type, pressure and maximum flow available of all water sources.

1403~~1~~.16.1.2 Location, type and size of all components including sprinklers, microirrigation, main and lateral piping, master valves, valves, moisture sensors, rain sensors, controllers, pump start relays, backflow devices, pumps, wells, etc.

1403~~1~~.16.1.3 The flow rate, application rate (inches per hour), and the operating pressure for the sprinklers and micro irrigation within each zone.

1403~~1~~.16.1.4 The name, address, phone, email, professional license or certification number of the installation contractor.

1403~~1~~.16.1.5 Date of installation.

SECTION 1403
Surface and Subsurface Landscape Irrigation Systems

1403.1 Scope.

The provisions of Section 1403 shall govern the materials, design, construction and installation of turf and landscape irrigation systems that apply potable or nonpotable water by means of permanent above ground or subsurface sprinkler or microsprinkler equipment that move water through various means of mechanical pressure.

1403.1.2 This section shall apply to all irrigation systems used on residential and commercial landscape areas.

1403.1.3 This section shall apply to all new irrigation systems and any new work to existing irrigation systems.

> Exemption. This section shall not apply to irrigation systems for golf courses, nurseries, greenhouses, or agricultural production systems.

1403.1.4 Nothing contained in this section 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.

1403.2 Permits.

1403.2.1 A permit shall be required for new installation of landscape irrigation systems and for repairs or modifications to the system design that exceed $1000.00 in labor and material based on invoice value.

1403.2.2 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 $1000.00 in labor and material based on invoice value.

1403.3 Preconstruction submittals.

1403.3.1 Plans or drawings.

1403.3.1.1 Single-family residence. Design drawings or shop drawings, where required, shall be provided for the installation of irrigation systems 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 shall be prepared by a licensed plumbing or irrigation contractor or licensed landscape architect.

1403.3.1.2 Commercial, industrial, municipal and multiple-family. Professionally designed drawings prior to start of construction shall be provided for landscape irrigation systems. 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 there of, 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, precipitation rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves,senors, etc. The plans and specifications shall be prepared in accordance with Section 107 of the Florida Building Code, Building.

1403.4 Definitions. The following definitions are exclusive to this section of the code.

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.

Application uniformity. Irrigation application uniformity (also known as distribution uniformity) describes how evenly water is distributed within an irrigation zone.

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 (AVB). An anti-siphon backflow device which uses a floating seat to allow an air break to interrupt the vacuum effect on water flow.

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 generally range from 0.5 to 2 gpm but are 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 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 or from a reduced pressure assembly or relief valve.

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.

Low Volume Sprinklers. Sprinkler heads that emit less than .5 gallons per minute.

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.

Matched Precipitation. An equal distribution of water over a given area or zone.

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.

Reduced Pressure Principle Backflow Preventer (RPZD) (also known as Reduced Pressure Zone Device RPZ or RPZ Valve). A type of backflow prevention device used to protect water supplies from contamination.

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

Runoff. The result of excess water applied either naturally (precipitation) or mechanically (irrigation) that exceeds the absorption rate of the soil, moving to an area of a lower elevation.

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 elbows 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.

1403.4 DESIGN CRITERIA

1403.4.1 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

1403.4.2 Water supply.

1403.4.2.1 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.

1403.4.2.2 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.

1403.4.3 Application uniformity.

1403.4.3.1 Sprinkler irrigation systems shall be designed with the appropriate uniformity for the type of plants 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 shall be avoided.

1403.4.3.2 Sprinkler head spacing, type and nozzle selection that achieves the highest application uniformity shall be utilized.

1403.4.3.3 Application rates which avoid runoff and permit uniform water infiltration into the soil shall be utilized. Land slope, soil hydraulic properties, vegetative ground cover, and prevailing winds and sun exposure shall be considered when application rates are specified. Different types of sprinklers with different application rates, i.e., spray heads vs. rotor heads, bubbler heads vs rotor heads, shall not be combined on the same zone or circuit.

1403.4 System zoning. The irrigation system shall be divided into zones based on consideration of the following hydrozoning practices.

1403.4.1 Available flow rate.

1403.4.2 Cultural use of the area.

1403.4.3 Type of vegetation irrigated, i.e., turf, shrubs, native plants, etc.

1403.4.4 Type of sprinkler, i.e., sprinklers with matching precipitation rates.

1403.4.5 Soil characteristics and slope.

1403.4.6 Sun exposure.

1403.5 Sprinkler/emitter spacing and selection.

1403.5.1 Sprinkler/Emitter spacing shall 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.

1403.5.2 All pop-up spray head bodies in turf areas shall be no less than 6" in height for St. Augustine, Zoysia and Bahia and no less than 4" in height for Bermuda, Centapede and Seashore Paspalum.

1403.5.3 Sprinklers shall be located in accordance with manufacturer's specifications in each irrigated zone area for a matched precipitation rate objective.

1403.5.4 Single row head spacing shall only occur when an additional row will cause saturated soils at the toe of a slope or other inefficiencies.

1403.5.5 All heads shall not exceed 50% of manufacturer's specified diameters of coverage.

1403.5.6 Water conservation shall be taken into consideration by minimizing irrigation of non-vegetated areas.

1403.5.7 Microirrigation systems shall be designed using the Emission Uniformity concept. Microirrigation emitters shall be spaced to wet 100 percent of the root zone in turf areas and 50 percent of the root zone for shrubs and trees.

1403.5.8 Microirrigation or low volume heads shall be required in all areas to be irrigated that are less than 4 feet in any direction from the emitter or nozzle.

1403.5.9 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to supply pipelines to protect the emission devices from contamination from a PD main or lateral break.

1403.5.10 Each plant shall have an adequate number and size (gph) of microirrigation devices, properly placed, to meet the plant water requirements for no rainfall.

1403.6 Pipelines. Pipelines shall 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 shall not exceed 5 feet (1524 mm) per second.

1403.7 Wells.

1403.7.1 Well diameters, depths and location shall correspond to the irrigation system demand and in compliance to all applicable state, regulatory agencies and local codes and regulations.

1403.8 Pumps.

1403.8.1 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.

1403.8.2 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.

1403.8.3 The pumping system shall be protected against the effects of the interruption of water flow.

1403.9 Control valves.

1403.9.1 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 assembly shall not exceed 10 percent of the static mainline head.

1403.9.2 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).

1403.9.3 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.

1403.9.4 Manually operated control valves shall be located so that they can be operated without wetting the operator.

1403.9.5 In ground valves shall be located away from large tree and palm root zones.

1403.9.6 A manual shut off valve shall be required to be installed close to the point of connection but downstream from any backflow device (or/unless included in the backflow device) to minimize water loss when the system is shut off for repairs or emergencies.

1403.9.7 An automatic shut-off valve or master valve (normally closed) is required on all systems with a constantly pressurized mainline to confine the water loss from minor main line leaks, weeping valves, or stuck on valves to just the time the system is operating automatically.

1403.10 Automatic irrigation controller. Automatic irrigation controllers shall conform to UL 1310 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 or other sensors to override the irrigation cycle when adequate rainfall has occurred, as required by Florida Statutes, Section 373.62.

1403.11 Chemical injection.

1403.11.1 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.

1403.11.2 Injection systems shall 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.

1403.11.3 If an irrigation water supply is also used for human consumption, an air gap separation or an approved reduced pressure principal backflow prevention device shall be required in compliance with ASSE 1013 and Section 1403.12.

1403.12 Backflow prevention methods. Backflow prevention assemblies at all cross connections with all water supplies shall be provided in accordance with county, municipal or other applicable codes. In the event of conflicting regulations the assembly type shall be provided which gives the highest degree of protection.

1403.12.1 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.

1403.12.1.1 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 shall comply with ASSE 1013 to protect the water supply from back-siphonage and back-pressure.

1403.12.1.2 For other water supplies, Florida State law, EPA regulations, or other applicable local codes shall be followed. In the absence of legal guidelines at minimum a PVB shall be required.

SECTION 1403.13 REFERENCED STANDARDS

The standards referenced below are exclusive to this section.

1403.13.1 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.

1403.13.2 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).

1403.13.3 American Water Works Association (AWWA) standards:

AWWA C-900: PVC pipe standards and specifications

1403.13.4 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 backflow preventers.

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

ASSE 1024: Dual check valve backflow preventers.

1403.13.5 Hydraulic Institute Standards, 14th Edition

1403.13.6 Standards and Specifications for Turf and Landscape Irrigation Systems Florida Irrigation Society (FIS) Standards

1403.13.7 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.

1403.13.8. Underwriters Laboratories (UL) 333 Pfingsten Road, Northbrook, IL 60062-296 Standards

UL 486C-1995 Splicing Wire Connectors

UL 969-2013 Standard for Marking and Labeling Systems

UL 1310-2011 Standard for Class 2 Power Units

Section 1403.14 MATERIALS
The materials referenced below are exclusive to this section.

1403.14.1 PVC pipe and fittings.

1403.14.1.1 PVC pipe shall 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.

1403.14.1.2 All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.

1403.14.1.3. Threaded PVC pipe firings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.

1403.14.1.4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.

1403.14.1.5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.

1403.14.1.6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

1403.14.2 Ductile iron pipe and fittings.

1403.14.2.1 Gasket fittings for iron pipe shall be of materials and type compatible with the piping material being used.

1403.14.3. Steel pipe and fittings.

1403.14.3.1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.

1403.14.3.2 Threaded fittings for steel pipe shall be Schedule 40 Malleable Iron.

1403.14.4 Polyethylene pipe.

1403.14.4.1 Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.

140314.4.2 Low pressure polyethylene pipe for micro-irrigation systems shall conform with ASAE S-435.

1403.14.4.3 Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

1403.14.5 Sprinklers, spray heads, and emitters.

1403.14.5.1 Units and nozzles shall be selected in accordance with the size of the area and the type of plant material being irrigated. Sprinklers shall fit the area they are intended to water without excessive overspray. Intentional direct spray onto walkways, buildings, roadways, and driveways is prohibited.

1403.14.5.2 Equipment shall be used that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.

1403.14.5.3 Riser-mounted sprinklers shall be supported to minimize movement of the riser resulting from the action of the sprinkler.

1403.14.5.4 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.

1403.14,5.5 Check valves shall be installed on any sprinkler where low point drainage occurs.

1403.14.5.6 The pop-up height for sprays and rotator nozzles shall be adequate to prevent being obstructed by the turf grass blades: 6" height for St. Augustine, Zoysia and Bahia and 4" height for Bermuda, Centapede and Seashore Paspalum.

1403.14.5.7 All microirrigation zones shall have adequate filtration installed at the zone valve or at the point where the drip tubing is attached to PVC pipe to protect the emission devices from contamination from a PVC main or lateral break.

1403.14.5.8 All microirrigation zones shall have adequate pressure regulation installed at the zone valve or at the point where the drip tubing is attached to the PVC to ensure that all emission devices meet the manufacturer's performance standards.

1403.14.5.9 Each plant shall have a adequate number and size(gph) of microirrigation devices, properly placed to meet the plant water requirements for no rainfall.

1403.14.5.10 All tubing shall be secured to prevent movement in accordance with manufacturer's specificantion.

1403.14.6 Valves.

1403.14.6.1 Valves shall 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 shall be waived for low mainline pressure systems [30 psi (207 kPa) or less].

1403.14.6.2 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.

1403.14.7 Valve boxes.

1403.14.7.1 Valve boxes shall 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.

1403.14.7.2. Each valve box shall be permanently labeled in accordance with UL 969 to identify its contents.

1403.14.8 Low voltage wiring.

1403.14.8.1 All low voltage wire which is directly buried shall be labeled for direct burial wire. Wire not labeled for direct burial shall be installed in watertight conduits, and be listed TWN or THHN type wire as described in the NEC. All wire traveling under any hardscape or roadway must installed within a conduit and sleeve.

1403.14.8.2 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.

1403.14.8.3 Connections shall be made using devices conforming to UL 486 specifically designed for direct burial. All splices shall be enclosed within a valve box.

1403.14.9 Irrigation controllers.

1403.14.9.1 All irrigation controllers shall conform to UL 1310 and the provisions of the National Electric Code (NEC) and be grounded in accordance with the manufacturer's specifications. Solid state controls shall be equipped with surge suppressors on the primary and secondary wiring, except single lot residential systems.

1403.14.9.2 The controller housing or enclosure shall protect the controller from the hazards of the environment in which it is installed.

1403.14.9.3 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. Soil moisture sensors and ET sensors shall be installed in accordance with manufacturer's specifications and Florida Statutes, Section 373.62.

1403.14.10 Pumps and wells.

1403.14.10.1 Irrigation pump electrical control systems shall conform to the NEC and local building codes.

1403.14.10.2 The pumping system shall be protected from the hazards of the environment in which it is installed.

1403.14.10.3 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.

1403.14.10.4 Casings for drilled wells shall be steel, reinforced plastic mortar, plastic, or fiberglass pipe. Only steel pipe casings shall be used in driven wells. See SCS code FL-642. Steel casings shall conform to ASTM A 589.

1403.14.11 Chemical injection equipment.

1403.14.11.1 Chemical injection equipment shall 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.

1403.14.12 Filters and strainers.

1403.14.12.1 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.

Section 1403.15 INSTALLATION

1403.15.1 Pipe installation.

1403.15.1.1 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:

1403.15.1.1.1 Vehicle traffic areas.

Pipe Size (inches)

Depth of Cover (inches)

½ – 2 ½

18 - 24

3 - 5

24 - 30

6 and larger

30 - 36

1403.15.1.1.2 All areas except vehicle traffic:

Pipe Size (inches)

Depth of Cover (inches)

½ – 1 ½

6

2 - 3

12

4 - 6

18

More than 6

24

1403.15.1.2 All pipe joints and connections shall be made according to manufacturer's specifications. All solvent-weld connections shall be performed in accordance with ASTM D 2855.

1403.15.1.3 Minimum clearances shall be maintained between irrigation lines and other utilities. In no case shall one irrigation pipe rest upon another.

1403.15.1.4 Thrust blocks shall 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. Thrust blocks shall be sized in accordance with ASAE S-376.1.

1403.15.1.5 The trench bottom shall 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.

1403.15.1.6. Pipe sleeves shall be used to protect pipes or wires installed under pavement or roadways. Pipe sleeves two pipe sizes larger than the carrier pipe or twice the diameter of the wire bundle shall be used 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). Pipe sleeves shall be Sch 40. Proper backfill and compaction procedures shall be followed.

1403.15.2 Control valve installation.

1403.15.2.1 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. The valve box shall be installed to minimize the effect of soil intrusion within the valve box with the use of filter fabric, pea gravel, or other approved material. If an automatic valve is installed under each sprinkler, then the valve box may be omitted.

1403.15.2.2 Valve boxes shall be installed so that they do not rest on the pipe and the box cover does not conflict with the valve stem or interfere with valve operation. They shall be flush with the ground surface and do not present a tripping hazard or interfere with routine maintenance of the landscape.

1403.15.2.3. Quick coupling valves shall be installed on swing joints or flexible pipe with the top of the valve at ground level.

1403.15.2.4 Any above-ground manually-operated valves on nonpotable water systems shall be adequately identified with distinctive purple colored paint. Hose bibb connections on irrigation systems that utilize nonpotable water supplies shall not be permitted.

1403.15.3 Sprinkler installation.

1403.15.3.1. On flat landscaped areas, sprinklers shall be installed plumb. In areas where they are installed on slopes, sprinklers may be tilted as required to prevent erosion. Sprinklers shall be adjusted to avoid unnecessary discharge on roads, pavements and structures.

1403.15.3.2. There shall be a minimum separation of 4 inches (102 mm) between sprinklers and pavement. There shall be a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping shall be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints, polyethylene (PE) nipples or flexible pipe. Polyethylene (PE) nipples shall not be used in maintenance equipment traffic areas or alongside roadways and driveways. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be stabilized.

1403.15.4 Pump installation.

1403.15.4.1 Pumps shall be installed in accordance with the manufacturer's specifications. Pumps shall be set plumb and secure to a firm concrete base. There shall be no strain or distortion on the pipe and fittings. Pipe and fittings shall be supported to avoid placing undue strain on the pump. Steel pipe shall be used on pumps 5 horsepower (hp) or larger.

1403.15.4.2 Pumps shall be installed in a manner to avoid loss of prime. Suction line shall be installed to prevent the accumulation of air pockets. All connections and reductions in suction pipe sizes shall be designed to avoid causing air pockets and cavitation.

1403.15.4.3 Pumps shall be located to facilitate service and ease of removal. Appropriate fittings shall be provided to allow the pump to readily be primed, serviced, and disconnected. An enclosure shall be provide of adequate size and strength, with proper ventilation, to protect the pump from the elements (except residential systems).

1403.15.5 Low voltage wire installation.

1403.15.5.1 Install low voltage wire (less than 98 volts) with a minimum depth of cover of 12 inches (305 mm) where not installed directly under the mainline. A sufficient length of wire shall be provided at each connection to allow for thermal expansion/shrinkage. As a minimum, a 12-inch (305 mm) diameter loop shall be provided at all splices and connections. Terminations at valves shall have 24 inches (610 mm) minimum free wire.

1403.15.5.2 All above-ground wire runs and wire entries into buildings shall be installed in electrical conduit. Common wires with a different color than the power wires (white shall be used for common wires) shall be provided. Connections shall be made using devices conforming to UL 486C specifically designed for direct burial. All splices shall be enclosed within a valve box.

Exception: When wiring above ground manifolds from the valve to the ground immediately beneath it, no conduit is required.

1403.15.6 Hydraulic control tubing installation

1403.15.6.1. For hydraulic control systems, a water supply shall be used that is filtered and free of deleterious materials, as defined by the hydraulic control system manufacturer's specifications. A backflow prevention device shall be installed where the hydraulic control system is connected to potable water supplies.

1403.15.6.2 Tubing shall be installed in trenches 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 A minimum depth of cover of 12 inches (305 mm) shall be provided.

1403.15.6.3 Tubing shall be connected with couplings and collars according to Manufacturer's specifications. All splices shall be made in valve boxes. Tubing shall be prefilled with water to expel entrapped air and tested for leaks prior to installation.

1403.15.6.4 Exposed tubing shall be installed in a protective conduit manufactured from Schedule 40 UV protected PVC or electrical conduit.

1403.16 As-Built Drawings.

1403.16.1 An As-Built drawing shall be required of all irrigation systems installed on commercial and residential developments and shall contain the following information:

1403.16.1.1 Location, type, pressure and maximum flow available of all water sources.

1403.16.1.2 Location, type and size of all components including sprinklers, microirrigation, main and lateral piping, master valves, valves, moisture sensors, rain sensors, controllers, pump start relays, backflow devices, pumps, wells, etc.

1403.16.1.3 The flow rate, application rate (inches per hour), and the operating pressure for the sprinklers and micro irrigation within each zone.

1403.16.1.4 The name, address, phone, email, professional license or certification number of the installation contractor.

1403.16.1.5 Date of installation.

CHAPTER14
~~SUBSURFACE~~ LANDSCAPE IRRIGATION SYSTEMS
SECTION 1401
GENERAL

1401.1Scope.
The provisions of Chapter 14 shall govern the materials, design, construction and installation of ~~subsurface~~ landscape irrigation systems connected to either potable or nonpotable water ~~from on-site water reuse~~ systems.

SECTION 1402
Subsurface Landscape Irrigation Systems Connected to NonPotable On-site Water Reuse Systems

1402.1 Scope.
The provisions of Section 1402 shall govern the materials, design, construction and installation of subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems.

~~1402.2~~ 1402.2Materials.
Above-ground drain, waste and vent piping for subsurface landscape irrigation systems connected to NonPotabale On-site Water Reuse Systems shall conform to one of the standards listed in Table 702.1. Subsurface landscape irrigation, underground building drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

~~1401.3~~ 1402.3Tests.
Drain, waste and vent piping for subsurface landscape irrigation systems shall be tested in accordance with Section 312.

~~1401.4~~ 1402.4Inspections.
Subsurface landscape irrigation systems shall be inspected in accordance with Section 110 of the *Florida Building Code, Building*.

~~1401.5~~ 1402.5Disinfection.
Disinfection shall not be required for on-site nonpotable water reuse for subsurface landscape irrigation systems.

~~1401.6~~ 1402.6Coloring.
On-site nonpotable water reuse for subsurface landscape irrigation systems shall not be required to be dyed.

~~SECTION1402~~
~~SYSTEM DESIGN AND SIZING~~

~~1402.1~~ 1402.7Sizing.
The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface irrigation system. Where gray water collection piping is connected to subsurface landscape irrigation systems, gray water output shall be calculated according to the gallons-per-day-per-occupant number based on the type of fixtures connected. The gray water discharge shall be calculated by the following equation:

$$C = A \times B$$

(Equation 14-1)

where:

A **= Number of occupants:**
Residential—Number of occupants shall be determined by the actual number of occupants, but not less than two occupants for one bedroom and one occupant for each additional bedroom.
Commercial—Number of occupants shall be determined by the *Florida Building Code, Building*.
B **= Estimated flow demands for each occupant:**
Residential—25 gallons per day (94.6 lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per day (56.7 lpd) per occupant for clothes washers or laundry trays.
Commercial—Based on type of fixture or water use records minus the discharge of fixtures other than those discharging gray water.
C **= Estimated gray water discharge based on the total number of occupants.**

~~1402.2~~ 1402.8Percolation tests.
The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability evaluation.

~~1402.2.1~~ 1402.8.1Percolation tests and procedures.
At least three percolation tests in each system area shall be conducted. The holes shall be spaced uniformly in relation to the bottom depth of the proposed absorption system. More percolation tests shall be made where necessary, depending on system design.

~~1402.2.1.1~~ 1402.8.1.1Percolation test hole.
The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inches (102 mm to 203 mm). The bottom and sides of the hole shall be scratched with a sharp-pointed instrument to expose the natural soil. All loose material shall be removed from the hole and the bottom shall be covered with 2 inches (51 mm) of gravel or coarse sand.

~~1402.2.1.2~~ 1402.8.1.2Test procedure, sandy soils.
The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in sandy soils. The time for this amount of water to seep away shall be determined, and this procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test shall proceed as follows: Water shall be added to a point not more than 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute intervals for a period of 1 hour. Where 6 inches (152 mm) of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 mm). Where 6 inches (152 mm) of water seeps away in less than 2 minutes, the test shall be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the above requirements shall be tested in accordance with Section 1303.7.1.3.

~~1402.2.1.3~~ 1402.8.1.3Test procedure, other soils.
The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above the bottom of the hole for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed to swell not less than 16 hours or more than 30 hours. Immediately after the soil swelling period, the measurements for determining the percolation rate

shall be made as follows: any soil sloughed into the hole shall be removed and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do not vary by more than 1/16 inch (1.59 mm). At least three water level drops shall be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gravel or coarse sand whenever it becomes nearly empty. Adjustments of the water level shall not be made during the three measurement periods except to the limits of the last measured water level drop. When the first 6 inches (152 mm) of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

~~1402.2.1.4~~ 1402.8.1.4Mechanical test equipment.

Mechanical percolation test equipment shall be of an *approved* type.

~~1402.2.2~~ 1402.8.2Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluation practices. Borings shall be made in accordance with Section ~~1402.2.1.1~~ 1402.8.1.1 for evaluating the soil.

~~1402.3~~ 1402.9Subsurface landscape irrigation site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining lot. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table ~~1402.3~~ 1402.9. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

TABLE ~~1402.3~~ 1402.9
LOCATION OF SUBSURFACE IRRIGATION SYSTEM

ELEMENT	Storage tank (I
Buildings	5
Lot line adjoining private property	5
Water wells	50
Streams and lakes	50
Seepage pits	5
Septic tanks	0
Water service	5
Public water main	10

For SI: 1 foot = 304.8 mm.

~~SECTION1403~~ ~~INSTALLATION~~

~~1403.1~~ 1402.10Installation.

Absorption systems shall be installed in accordance with Sections ~~1403.1.1~~ 1402.10.1 through ~~1403.1.5~~ 1402.10.1.5 to provide landscape irrigation without surfacing of water.

~~1403.1.1~~ 1402.10.1Absorption area.
The total absorption area required shall be computed from the estimated daily gray water discharge and the design-loading rate based on the percolation rate for the site. The required absorption area equals the estimated gray water discharge divided by the design-loading rate from Table ~~1403.1.1~~ 1402.10.1.

TABLE ~~1403.1.1~~ 1402.10.1
DESIGN LOADING RATE

PERCOLATION RATE(minutes per inch)
0 to less than 10
10 to less than 30
30 to less than 45
45 to 60

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m².

~~1403.1.2~~ 1402.10.1.2 Seepage trench excavations.
Seepage trench excavations shall be not less than 1 foot (304 mm) in width and not greater than 5 feet (1524 mm) in width. Trench excavations shall be spaced not less than 2 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pipe. Individual seepage trenches shall be not greater than 100 feet (30 480 mm) in *developed length*.

~~1403.1.3~~ 1402.10.1.3 Seepage bed excavations.
Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one distribution pipe. The absorption area of a seepage bed shall be computed by using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced not greater than 5 feet (1524 mm) and not less than 3 feet (914 mm) apart, and greater than 3 feet (914 mm) and not less than 1 foot (305 mm) from the sidewall or headwall.

~~1403.1.4~~ 1402.10.1.4 Excavation and construction.
The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soil is so wet that such material rolled between the hands forms a soil wire. All smeared or compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth of smearing or compaction and the loose material removed. Where rain falls on an open excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation bottom is rolled between the hands. The bottom area shall then be scarified and loose material removed.

~~1403.1.5~~ 1402.10.1.5 Aggregate and backfill.
Not less than 6 inches in depth of aggregate, ranging in size from ½ to 2½ inches (12.7 mm to 64 mm), shall be laid into the trench below the distribution piping elevation. The aggregate shall be evenly distributed not less than 2 inches (51 mm) in depth over the top of the distribution pipe. The aggregate shall be covered with *approved* synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. Not less than 9 inches (229 mm) of soil backfill shall be provided above the covering.

~~1403.2~~ 1402.11 Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table ~~1403.2~~ 1402.11. The top of the distribution pipe shall be not less than 8 inches (203 mm) below the original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches (102 mm) per 100 feet (30 480 mm).

TABLE ~~1403.2~~ 1402.11
DISTRIBUTION PIPE

MATERIAL
Polyethylene (PE) plastic pipe
Polyvinyl chloride (PVC) plastic pipe
Polyvinyl chloride (PVC) plastic pipe with a 3.5-inch O.D. and solid cell

For SI: 1 inch=25.4 mm.

1403.2.1 Joints.

Joints in distribution pipe shall be made in accordance with Section 705 of this code.