Broward County Edition
Loose-leaf Supplement


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**Highlight of changes:**

1. Modifications to Section 604.3- Exception – Section 604.4 Table
2. Modifications to Section [M] 314.2.12
3. Modifications to Appendix F - 4 pages
2. Tests requiring a pressure of greater than 10 psi (69 kPa) but less than or equal to 100 psi (689 kPa) shall utilize a testing gauge having increments of 1 psi (6.9 kPa) or less.

3. Tests requiring a pressure of greater than 100 psi (689 kPa) shall utilize a testing gauge having increments of 2 psi (14 kPa) or less.

312.2 Drainage and vent water test. A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10-foot (3048 mm) head of water. In testing successive sections, at least the upper 10 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a 10-foot (3048 mm) head of water. This pressure shall be held for not less than 15 minutes. The system shall then be tight at all points.

312.3 Drainage and vent air test. Plastic piping shall not be tested using air. An air test shall be made by forcing air into the system until there is a uniform gauge pressure of 5 psi (34.5 kPa) or sufficient to balance a 10-inch (254 mm) column of mercury. This pressure shall be held for a test period of not less than 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperatures or the seating of gaskets shall be made prior to the beginning of the test period.

312.4 Drainage and vent final test. The final test of the completed drainage and vent systems shall be visual and in sufficient detail to determine compliance with the provisions of this code. Where a smoke test is utilized, it shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1-inch water column (248.8 Pa) shall be held for a test period of not less than 15 minutes.

312.5 Water supply system test. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping systems other than plastic, by an air test of not less than 50 psi (344 kPa). This pressure shall be held for not less than 15 minutes. The water utilized for tests shall be obtained from a potable source of supply. The required tests shall be performed in accordance with this section and Section 107.

312.6 Gravity sewer test. Gravity sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer, filling the building sewer with water, testing with not less than a 10-foot (3048 mm) head of water and maintaining such pressure for 15 minutes.

312.7 Forced sewer test. Forced sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer and applying a pressure of 5 psi (34.5 kPa) greater than the pump rating, and maintaining such pressure for 15 minutes.

312.8 Storm drainage system test. Storm drain systems within a building shall be tested by water or air in accordance with Section 312.2 or 312.3.

312.9 Shower liner test. Where shower floors and receptors are made water-tight by the application of materials required by Section 417.5.2, the completed liner installation shall be tested. The pipe from the shower drain shall be plugged water tight for the test. The floor and receptor area shall be filled with potable water to a depth of not less than 2 inches (51 mm) measured at the threshold. Where a threshold of at least 2 inches (51 mm) high does not exist, a temporary threshold shall be constructed to retain the test water in the lined floor or receptor area to a level not less than 2 inches (51 mm) deep measured at the threshold. The water shall be retained for a test period of not less than 15 minutes, and there shall not be evidence of leakage.

312.10 Inspection and testing of backflow prevention assemblies. Inspection and testing shall comply with Sections 312.10.1 and 312.10.2.

312.10.1 Inspections. Inspections shall be made of all backflow prevention assemblies and air gaps to determine whether they are operable.

312.10.2 Testing. Reduced pressure principle, double check, pressure vacuum breaker, reduced pressure detector fire protection, double check detector fire protection, and spill-resistant vacuum breaker backflow preventer assemblies and hose connection backflow preventers shall be tested at the time of installation and immediately after repairs or relocation. The testing procedure shall be performed in accordance with one of the following standards: ASSE 5013, ASSE 5015, ASSE 5020, ASSE 5047, ASSE 5048, ASSE 5052, ASSE 5056, CSA B64.10 or CSA B64.10.1.

SECTION 313
EQUIPMENT EFFICIENCIES

313.1 General. Equipment efficiencies shall be in accordance with the Florida Building Code, Energy Conservation.

SECTION 314
CONDENSATE DISPOSAL

[M] 314.1 Fuel-burning appliances. Liquid combustion by-products of condensing appliances shall be collected and discharged to an approved plumbing fixture or disposal area in accordance with the manufacturer’s instructions. Condensate piping shall be of approved corrosion-resistant material and shall not be smaller than the drain connection on the appliance. Such piping shall maintain a horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope).

[M] 314.2 Evaporators and cooling coils. Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain sys-
3.6 FLORIDA BUILDING CODE—PLUMBING, 5TH EDITION (2014)

[M] 314.2.1 Condensate drainage collection, use or disposal. Condensate from all cooling coils and evaporators of equipment served by an onsite cooling tower in a building or structure wherein the aggregate cooling capacity of the equipment exceeds 65,000 Btu/hr shall be collected and conveyed from the drain pan outlet and discharged to the cooling tower. Where an on-site cooling tower is not installed the condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. Such piping shall maintain a horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

Exceptions:
1. Condensate from cooling coils and evaporators is not required to be collected and conveyed to an on-site cooling tower; provided 1.1 through 1.3 are met:
   1.1 The equipment comprises 10% or less of the total capacity of the cooling tower system;
   1.2 The equipment is located in an isolated or remote area;
   1.3 The size of the equipment is 65,000 Btu/hr or less.
2. In existing buildings condensate may be collected and conveyed to a cooling tower or discharged to an approved place of disposal.

[M] 314.2.2 Drain pipe materials and sizes. Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 relative to the material type. Condensate waste and drain line size shall be not less than \( \frac{3}{8} \) inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 314.2.2.

[M] TABLE 314.2.2

<table>
<thead>
<tr>
<th>EQUIPMENT CAPACITY</th>
<th>MINIMUM CONDENSATE PIPE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20 tons of refrigeration</td>
<td>( \frac{3}{8} ) inch</td>
</tr>
<tr>
<td>Over 20 tons to 40 tons of refrigeration</td>
<td>1 inch</td>
</tr>
<tr>
<td>Over 40 tons to 90 tons of refrigeration</td>
<td>( \frac{3}{4} ) inch</td>
</tr>
<tr>
<td>Over 90 tons to 125 tons of refrigeration</td>
<td>( \frac{1}{2} ) inch</td>
</tr>
<tr>
<td>Over 125 tons to 250 tons of refrigeration</td>
<td>2 inch</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 ton of capacity = 3.517 kW.

[M] 314.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 314.2.1, where damage to any building components could occur as a result of overflow from the equipment primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired appliance that produces condensate:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a depth of not less than 1\( \frac{1}{4} \) inches (38 mm), shall be not less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Galvanized sheet metal pans shall have a thickness of not less than 0.0236-inch (0.6010 mm) (No. 24 gauge) galvanized sheet metal. Nonmetallic pans shall have a thickness of not less than 0.0625 inch (1.6 mm).
2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.

3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

4. A water-level detection device conforming to UL 508 shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.

Exception: Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

[M] 314.2.3.1 Water-level monitoring devices. On down-flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.

[M] 314.2.3.2 Appliance, equipment and insulation in pans. Where appliances, equipment or insulation are subject to water damage when auxiliary drain pans fill such portions of the appliances, equipment and insulation shall be installed above the flood level rim of the pan. Supports placed inside of the pan to support the appliance or equipment shall be water resistant and approved.

[M] 314.2.4 Traps. Condensate drains shall be trapped as required by the equipment or appliance manufacturer.

SECTION 315

PENETRATIONS

315.1 Sealing of annular spaces. The annular space between the outside of a pipe and the inside of a pipe sleeve or between the outside of a pipe and an opening in a building envelope wall, floor, or ceiling assembly penetrated by a pipe shall be sealed in an approved manner with caulkling material, foam sealant or closed with a gasketing system. The caulking material, foam sealant or gasketing system shall be designed for the conditions at the penetration location and shall be compatible with the pipe, sleeve and building materials in contact with the sealing materials. Annular spaces created by pipes penetrating fire-resistance-rated assemblies or membranes of such assemblies shall be sealed or closed in accor-
CHAPTER 6
WATER SUPPLY AND DISTRIBUTION

SECTION 601
GENERAL
601.1 Scope. This chapter shall govern the materials, design and installation of water supply systems, both hot and cold, for utilization in connection with human occupancy and habitation and shall govern the installation of individual water supply systems.

601.2 Solar energy utilization. Solar energy systems used for heating potable water or using an independent medium for heating potable water shall comply with the applicable requirements of this code. The use of solar energy shall not compromise the requirements for cross connection or protection of the potable water supply system required by this code.

601.3 Existing piping used for grounding. Existing metallic water service piping used for electrical grounding shall not be replaced with nonmetallic pipe or tubing until other approved means of grounding is provided.

601.4 Tests. The potable water distribution system shall be tested in accordance with Section 312.5.

SECTION 602
WATER REQUIRED
602.1 General. Structures equipped with plumbing fixtures and utilized for human occupancy or habitation shall be provided with a potable supply of water in the amounts and at the pressures specified in this chapter.

602.2 Potable water required. Only potable water shall be supplied to plumbing fixtures that provide water for drinking, bathing or culinary purposes, or for the processing of food, medical or pharmaceutical products. Unless otherwise provided in this code, potable water shall be supplied to all plumbing fixtures.

602.3 Individual water supply. Where a potable public water supply is not available, individual sources of potable water supply meeting the requirements of Chapter 373, Florida Statutes shall be utilized.

602.3.1 Sources. Dependent on geological and soil conditions and the amount of rainfall, individual water supplies are of the following types: drilled well, driven well, dug well, bored well, spring, stream or cistern. Surface bodies of water and land cisterns shall not be sources of individual water supply unless properly treated by approved means to prevent contamination.

602.3.2 Minimum quantity. The combined capacity of the source and storage in an individual water supply system shall supply the fixtures with water at rates and pressures as required by this chapter.

602.3.3 Water quality. Water from an individual water supply shall be approved as potable by the authority having jurisdiction prior to connection to the plumbing system.

602.3.4 Disinfection of system. After construction or major repair, the individual water supply system shall be purged of deleterious matter and disinfected in accordance with Section 610.

602.3.5 Pumps. Pumps shall be rated for the transport of potable water. Pumps in an individual water supply system shall be constructed and installed so as to prevent contamination from entering a potable water supply through the pump units. Pumps shall be sealed to the well casing or covered with a water-tight seal. Pumps shall be designed to maintain a prime and installed such that ready access is provided to the pump parts of the entire assembly for repairs.

602.3.5.1 Pump enclosure. The pump room or enclosure around a well pump shall be drained and protected from freezing by heating or other approved means. Where pumps are installed in basements, such pumps shall be mounted on a block or shelf not less than 18 inches (457 mm) above the basement floor. Well pits shall be prohibited.

602.4 Reclaimed water. Reclaimed water shall be permitted to be used for flushing water closets and urinals and other fixtures which do not require potable water in accordance with Florida Department of Environmental Protection (DEP) Chapter 62-610, Florida Administrative Code (FAC). Reuse of reclaimed water activities shall comply with the requirements of DEP Chapter 62-610, FAC.
SECTION 603
WATER SERVICE

603.1 Size of water service pipe. The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in this code. The water service pipe shall be not less than 7/8 inch (19.1 mm) in diameter.

603.2 Separation of water service and building sewer. Water service pipe and the building sewer shall be separated by not less than 5 feet (1524 mm) of undisturbed or compacted earth.

Exceptions:
1. The required separation distance shall not apply where the bottom of the water service pipe within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials conform to Table 702.3.
2. Water service pipe is permitted to be located in the same trench with a building sewer, provided such sewer is constructed of materials listed in Table 702.2.
3. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided the water service pipe is sleeved to a point not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing with pipe materials listed in Table 605.3, 702.2 or 702.3.

603.2.1 Water service near sources of pollution. Potable water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits (see Section 605.1 for soil and groundwater conditions).

SECTION 604
DESIGN OF BUILDING WATER DISTRIBUTION SYSTEM

604.1 General. The design of the water distribution system shall conform to accepted engineering practice. Methods utilized to determine pipe sizes shall be approved.

604.2 System interconnection. At the points of interconnection between the hot and cold water supply piping systems and the individual fixtures, appliances or devices, provisions shall be made to prevent flow between such piping systems.

604.3 Water distribution system design criteria. The water distribution system shall be designed, and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply pipe outlets shall not be less than shown in Table 604.3. The minimum flow rate and flow pressure provided to fixtures and appliances not listed in Table 604.3 shall be in accordance with the manufacturer’s installation instructions.

### TABLE 604.3
WATER DISTRIBUTION SYSTEM DESIGN CRITERIA REQUIRED CAPACITY AT FIXTURE SUPPLY PIPE OUTLETS

<table>
<thead>
<tr>
<th>FIXTURE SUPPLY OUTLET SERVING</th>
<th>FLOW RATE* (gpm)</th>
<th>FLOW PRESSURE (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub, balanced-pressure, thermo-static or combination balanced-pressure/thermo-static mixing valve</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Bidet, thermo-static mixing valve</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Combination fixture</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Dishwasher, residential</td>
<td>2.75</td>
<td>8</td>
</tr>
<tr>
<td>Drinking fountain</td>
<td>0.75</td>
<td>8</td>
</tr>
<tr>
<td>Laundry tray</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Lavatory</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Shower</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Shower, balanced-pressure, thermo-static or combination balanced-pressure/thermo-static mixing valve</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Silicock, hose bibb</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Sink, residential</td>
<td>2.5</td>
<td>8</td>
</tr>
<tr>
<td>Sink, service</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Urinal, valve</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Water closet, blow out, flushometer valve</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Water closet, flushometer tank</td>
<td>1.6</td>
<td>20</td>
</tr>
<tr>
<td>Water closet, siphonic, flushometer valve</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Water closet, tank, close coupled</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Water closet, tank, one piece</td>
<td>6</td>
<td>20</td>
</tr>
</tbody>
</table>

For SI: 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 3.785 L/min.
a. For additional requirements for flow rates and quantities, see Section 604.4.

604.4 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table 604.4.

Exceptions:
1. Blowout design water closets having a water consumption not greater than 3 1/2 gallons (13 L) per flushing cycle.
2. Vegetable sprays.
3. Clinical sinks having a water consumption not greater than 4 1/2 gallons (17 L) per flushing cycle.
4. Service sinks.
5. Emergency showers.
6. All fixtures, fittings and appliances with U.S. Environmental Agency WaterSense ® (EPA) label.
TABLE 604.4
MAXIMUM FLOW RATES AND CONSUMPTION
FOR PLUMBING FIXTURES,
AND FIXTURE FITTINGS AND APPLIANCES

<table>
<thead>
<tr>
<th>PLUMBING FIXTURE OR FIXTURE FITTING</th>
<th>MAXIMUM FLOW RATE OR QUANTITY b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory, private</td>
<td>2.2 1.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Lavatory, public, (metering)</td>
<td>0.25 gallon per metering cycle</td>
</tr>
<tr>
<td>Lavatory, public (other than metering)</td>
<td>0.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Shower head a</td>
<td>2.0 2.5 gpm at 80 psi</td>
</tr>
<tr>
<td>Sink faucet</td>
<td>2.2 gpm at 60 psi</td>
</tr>
<tr>
<td>Urinal</td>
<td>4.0 0.5 gallon per flushing</td>
</tr>
<tr>
<td>Water closet</td>
<td>4.6 1.28 gallons per flushing cycle</td>
</tr>
<tr>
<td>Dishwasher (Residential) a</td>
<td>6.5 gallons per cycle or less</td>
</tr>
<tr>
<td>Dishwasher (Commercial)</td>
<td>Less than 1.2 gallons per rack</td>
</tr>
<tr>
<td></td>
<td>for fill and dump machines and</td>
</tr>
<tr>
<td></td>
<td>less than 0.9 gallons per rack</td>
</tr>
<tr>
<td></td>
<td>for low temperature machines.</td>
</tr>
<tr>
<td>Dishwasher (Under the counter machines commercial)</td>
<td>1.0 gallons per rack for high temperature machines and 1.7 gallons per rack for low temperature machines</td>
</tr>
<tr>
<td>Washing Machine *</td>
<td>Water factor of 8 or lower (Energy Star/WaterSense Certified)</td>
</tr>
</tbody>
</table>

For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m,
1 pound per square inch = 6.895 kPa.
a. A hand-held shower spray is a shower head.
b. Consumption tolerance shall be determined from referenced standards.
c. Water factor in gallons per cycle per cubic foot

604.5 Size of fixture supply. The minimum size of a fixture supply pipe shall be as shown in Table 604.5. The fixture supply pipe shall terminate not more than 30 inches (762 mm) from the point of connection to the fixture. A reduced-size flexible water connector installed between the supply pipe and the fixture shall be of an approved type. The supply pipe shall extend to the floor or wall adjacent to the fixture. The minimum size of individual distribution lines utilized in gridded or parallel water distribution systems shall be as shown in Table 604.5.

604.6 Variable street pressures. Where street water main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

604.7 Inadequate water pressure. Wherever water pressure from the street main or other source of supply is insufficient to provide flow pressures at fixture outlets as required under Table 604.3, a water pressure booster system conforming to Section 606.5 shall be installed on the building water supply system.

604.8 Water pressure reducing valve or regulator. Where water pressure within a building exceeds 80 psi (552 kPa) static, an approved water-pressure reducing valve conforming to ASSE 1003 or CSA B356 with strainer shall be installed to reduce the pressure in the building water distribution piping to not greater than 80 psi (552 kPa) static.

Exception: Service lines to sill cocks and outside hydrants, and main supply risers where pressure from the mains is reduced to 80 psi (552 kPa) or less at individual fixtures.

604.8.1 Valve design. The pressure-reducing valve shall be designed to remain open to permit uninterrupted water flow in case of valve failure.

604.8.2 Repair and removal. Water-pressure reducing valves, regulators and strainers shall be so constructed and installed as to permit repair or removal of parts without breaking a pipeline or removing the valve and strainer from the pipeline.

TABLE 604.5
MINIMUM SIZES OF FIXTURE WATER SUPPLY PIPES

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>MINIMUM PIPE SIZE (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bath tubs (60&quot; × 32&quot; and smaller)</td>
<td>1/2</td>
</tr>
<tr>
<td>Bath tubs (larger than 60&quot; × 32&quot;)</td>
<td>1/2</td>
</tr>
<tr>
<td>Bidet</td>
<td>1/8</td>
</tr>
<tr>
<td>Combination sink and tray</td>
<td>1/2</td>
</tr>
<tr>
<td>Dishwasher, domestic a</td>
<td>1/4</td>
</tr>
<tr>
<td>Drinking fountain</td>
<td>1/2</td>
</tr>
<tr>
<td>Hose bibs</td>
<td>1/4</td>
</tr>
<tr>
<td>Kitchen sink a</td>
<td>1/4</td>
</tr>
<tr>
<td>Laundry, 1, 2 or 3 compartments a</td>
<td>1/2</td>
</tr>
<tr>
<td>Lavatory</td>
<td>1/8</td>
</tr>
<tr>
<td>Shower, single head a</td>
<td>1/2</td>
</tr>
<tr>
<td>Sinks, flushing rim</td>
<td>1/4</td>
</tr>
<tr>
<td>Sinks, service</td>
<td>1/2</td>
</tr>
<tr>
<td>Urinal, flush tank</td>
<td>1/2</td>
</tr>
<tr>
<td>Urinal, flushometer valve</td>
<td>1/4</td>
</tr>
<tr>
<td>Wall hydrant</td>
<td>1/2</td>
</tr>
<tr>
<td>Water closet, flush tank</td>
<td>1/8</td>
</tr>
<tr>
<td>Water closet, flushometer valve</td>
<td>1</td>
</tr>
<tr>
<td>Water closet, one piece a</td>
<td>1/2</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm,
1 pound per square inch = 6.895 kPa.
a. Where the developed length of the distribution line is 60 feet or less, and the available pressure at the meter is 35 psi or greater, the minimum size of an individual distribution line supplied from a manifold and installed as part of a parallel water distribution system shall be one nominal tube size smaller than the sizes indicated.

604.9 Water hammer. The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer’s instructions. Water-hammer arrestors shall conform to ASSE 1010.

604.10 Gridded and parallel water distribution system manifolds. Hot water and cold water manifolds installed with gridded or parallel connected individual distribution lines to each fixture or fixture fitting shall be designed in accordance with Sections 604.10.1 through 604.10.3.

604.10.1 Manifold sizing. Hot water and cold water manifolds shall be sized in accordance with Table 604.10.1. The total gallons per minute is the demand of all outlets supplied.

FLORIDA BUILDING CODE – PLUMBING, 5TH EDITION (2014) 6.3
WATER SUPPLY AND DISTRIBUTION

<table>
<thead>
<tr>
<th>TABLE 604.10.1</th>
<th>MANIFOLD SIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOMINAL SIZE</strong></td>
<td><strong>MAXIMUM DEMAND (gpm)</strong></td>
</tr>
<tr>
<td><strong>INTERNAL DIAMETER</strong></td>
<td><strong>Velocity at 4 feet</strong></td>
</tr>
<tr>
<td>(inches)</td>
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<td>3/4</td>
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<tr>
<td>1</td>
<td>10</td>
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<tr>
<td>1 1/4</td>
<td>15</td>
</tr>
<tr>
<td>1 1/2</td>
<td>22</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/min, 1 foot per second = 0.305 m/s.

604.10.2 Valves. Individual fixture shutoff valves installed at the manifold shall be identified as to the fixture being supplied.

604.10.3 Access. Access shall be provided to manifolds with integral factory- or field-installed valves.

604.11 Individual pressure balancing in-line valves for individual fixture fittings. Where individual pressure balancing in-line valves for individual fixture fittings are installed, such valves shall comply with ASSE 1066. Such valves shall be installed in an accessible location and shall not be utilized alone as a substitute for the balanced pressure, thermostatic, or combination shower valves required in Section 424.3.

SECTION 605
MATERIALS, JOINTS AND CONNECTIONS

605.1 Soil and ground water. The installation of a water service or water distribution pipe shall be prohibited in soil and ground water contaminated with solvents, fuels, organic compounds or other detrimental materials causing permeation, corrosion, degradation or structural failure of the piping material. Where detrimental conditions are suspected, a chemical analysis of the soil and ground water conditions shall be required to ascertain the acceptability of the water service or water distribution piping material for the specific installation. Where detrimental conditions exist, approved alternative materials or routing shall be required.

605.2 Lead content of water supply pipe and fittings. Pipe and pipe fittings, including valves and faucets, utilized in the water supply system shall have a maximum of 8-percent lead content.

605.2.1 Lead content of drinking water pipe and fittings. Pipe, pipe fittings, joints, valves, faucets, and fixture fittings utilized to supply water for drinking or cooking purposes shall comply with NSF 372 and shall have a weighted average lead content of 0.25-percent lead or less.

605.3 Water service pipe. Water service pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.3. Water service pipe or tubing, installed underground and outside of the structure, shall have a working pressure rating of not less than 160 psi (1100 kPa) at 73.4°F (23°C). Where the water pressure exceeds 160 psi (1100 kPa), piping material shall have a working pressure rating not less than the highest available pressure. Water service piping materials not third-party certified for water distribution shall terminate at or before the full open valve located at the entrance to the structure. All ductile iron water service piping shall be cement mortar lined in accordance with AWWA C104.

605.3.1 Dual check-valve-type backflow preventer. Dual check-valve backflow preventers installed on the water supply system shall comply with ASSE 1024 or CSA B64.6.

605.4 Water distribution pipe. Water distribution pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.4. Hot water distribution pipe and tubing shall have a pressure rating of not less than 100 psi (690 kPa) at 180°F (82°C).

605.5 Fittings. Pipe fittings shall be approved for installation with the piping material installed and shall comply with the applicable standards listed in Table 605.5. Pipe fittings utilized in water supply systems shall also comply with NSF 61. Ductile and gray iron pipe fittings shall be cement mortar lined in accordance with AWWA C104.

605.5.1 Mechanically formed tee fittings. Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.

605.5.1.1 Full flow assurance. Branch tubes shall not restrict the flow in the run tube. A dimple/de depth stop shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed 1/3 inch (6.4 mm) above the first dimple. Dimples shall be aligned with the tube run.

605.5.1.2 Brazed joints. Mechanically formed tee fittings shall be brazed in accordance with Section 605.14.1.

605.6 Flexible water connectors. Flexible water connectors exposed to continuous pressure shall conform to ASME A112.18.6/CSA B125.6. Access shall be provided to all flexible water connectors.

605.7 Valves. All valves shall be of an approved type and compatible with the type of piping material installed in the system. Ball valves, gate valves, globe valves and plug valves intended to supply drinking water shall meet the requirements of NSF 61.

605.8 Manufactured pipe nipples. Manufactured pipe nipples shall conform to one of the standards listed in Table 605.8.
APPENDIX F
PROPOSED CONSTRUCTION BUILDING CODES FOR TURF AND LANDSCAPE IRRIGATION SYSTEMS

PART I: GENERAL

A. Description.

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

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

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

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

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

B. Permits.

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

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

C. Preconstruction submittals.

1. Plans or drawings.

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

b. Commercial, industrial, municipal and multiple-family. Provide professionally designed drawings prior to start of construction. Design drawings shall be clearly readable, to reasonable scale, show the entire site to be irrigated, including all improvements, and shall include but not be limited to: date, scale, revisions, legend, specifications which list all aspects of equipment and assembly thereof, water source, water meter and/or point of connection, backflow prevention devices, pump station size, pump station location, design operating pressure and flow rate per zone, locations of pipe, controllers, valves, sprinklers, sleeves, gate valves, etc. The plans and specifications shall be prepared in accordance with Section 107 of the Florida Building Code, Building.

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

D. Definitions.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Effluent Water.** Also referred to as reclaimed or gray water, wastewater which has been treated per Section 403.086, Florida Statutes 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
mental Protection Agency (EPA); Pesticide Regulation Notice 87-1; or other applicable codes.

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

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

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

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

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

PART III — STANDARDS

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

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

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

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

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

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

   ASAE S339: Uniform classification for water hardness.

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

   ASAE EP400.1: Designing and constructing irrigation wells.


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

2. ASTM International Standards:


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

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

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

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

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

3. American Water Works Association (AWWA) standards:

   AWWA C-900: PVC pipe standards and specifications

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

   ASSE 1001: Pipe applied atmospheric type vacuum breakers.

   ASSE 1013: Reduced pressure principle backflow preventers.

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

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

   ASSE 1024: Dual check valve type backflow preventers.

5. Hydraulic Institute Standards, 14th Edition

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

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

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

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

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

   SCS Code 441-1: Irrigation system, trickle.

   SCS Code 442: Irrigation system sprinkler.

   SCS Code 449: Irrigation water management.
APPENDIX F

SCS Code 533: Pumping plant for water control.
SCS Code 642: Well.

PART IV: MATERIALS

A. PVC pipe and fittings.
   1. PVC pipe should comply with one of the following standards ASTM D 1785, ASTM D 2241, AWWA C-900, or AWWA C-905. SDR-PR pipe shall have a minimum wall thickness as required by SDR-26. All pipe used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.
   2. All solvent-weld PVC fittings shall, at a minimum, meet the requirements of Schedule 40 as set forth in ASTM D 2466.
   3. Threaded PVC pipe fittings shall meet the requirements of Schedule 40 as set forth in ASTM D 2464.
   4. PVC gasketed fittings shall conform to ASTM D 3139. Gaskets shall conform to ASTM F 477.
   5. PVC flexible pipe should be pressure rated as described in ASTM D 2740 with standard outside diameters compatible with PVC IPS solvent-weld fittings.
   6. PVC cement should meet ASTM D 2564. PVC cleaner-type should meet ASTM F 656.

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

C. Steel pipe and fittings.
   1. All steel pipe shall be rated Schedule 40 or greater and be hot-dipped galvanized or black in accordance with ASTM 53.
   2. Threaded fittings for steel pipe should be Schedule 40 malleable iron.

D. Polyethylene pipe.
   1. Flexible swing joints shall be thick-walled with a minimum pressure rating of 75 psi (517 kPa) in accordance with ASTM D 2239.
   2. Low pressure polyethylene pipe for microirrigation systems shall conform with ASAE S-435.
   3. Use fittings manufactured specifically for the type and dimensions of polyethylene pipe used.

E. Sprinklers, spray heads, and emitters.
   1. Select units and nozzles in accordance with the size of the area and the type of plant material being irrigated. Sprinklers must fit the area they are intended to water without excessive overspray onto anything but the lot individual landscaped surface. Intentional direct spray onto walkways, buildings, roadways, and drives is prohibited. All sprinklers used with effluent water systems shall be designated for non-potable use by either label or by the industry standard color purple.
   2. Use equipment that is protected from contamination and damage by use of seals, screens, and springs where site conditions present a potential for damage.
   3. Support riser-mounted sprinklers to minimize movement of the riser resulting from the action of the sprinkler.
   4. Swing joints, either flexible or rigid, shall be constructed to provide a leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

F. Valves.
   1. Valves must have a maximum working pressure rating equal to or greater than the maximum pressure of the system, but not less than 125 psi (861 kPa). This requirement may be waived for low mainline pressure systems [30 psi (207 kPa) or less]. All valves used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.
   2. Only valves that are constructed of materials designed for use with the water and soil conditions of the installation shall be used. Valves that are constructed from materials that will not be deteriorated by chemicals injected into the system shall be used on all chemical injection systems.

G. Valve boxes.
   1. Valve boxes are to be constructed to withstand traffic loads common to the area in which they are installed. They should be sized to allow manual operation of the enclosed valves without excavation.
   2. Each valve box should be permanently labeled to identify its contents. All valve boxes used with effluent water systems shall be designated for nonpotable use by either label or by the industry standard color purple.

H. Low voltage wiring.
   1. All low voltage wire which is directly buried must be labeled for direct burial wire. Wire not labeled for direct burial must be installed in watertight conduits, and be UL listed TWW or THW type wire as described in the NEC. All wire traveling under any hardcape or roadway must be installed within a pipe and sleeve.
   2. The size of the electrical control wire shall be in accordance with the valve manufacturer’s specifications, based on the solenoid in-rush amperage and the circuit length, considering the number of solenoids operating, on the circuit. Minimum of #14 AWG single strand control wire shall be used on all systems, except single lot individual residential systems.
3. Connections are to be made using UL approved devices specifically designed for direct burial. All splices shall be enclosed within a valve box.

I. Irrigation controllers.

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

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

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

J. Pumps and wells.

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

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

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

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

K. Chemical injection equipment.

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

L. Filters and strainers.

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

PART V: INSTALLATION

A. Pipe installation.

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

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<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Depth of Cover (inches)</th>
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<tbody>
<tr>
<td>1/2 - 2 1/2</td>
<td>18</td>
</tr>
<tr>
<td>3 - 5</td>
<td>24</td>
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<tr>
<td>6 and larger</td>
<td>30</td>
</tr>
</tbody>
</table>

b. All areas except vehicle traffic:

<table>
<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Depth of Cover (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 - 1 1/2</td>
<td>6</td>
</tr>
<tr>
<td>2 - 3</td>
<td>12</td>
</tr>
<tr>
<td>4 - 6</td>
<td>18</td>
</tr>
<tr>
<td>More than 6</td>
<td>24</td>
</tr>
</tbody>
</table>

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

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

4. Thrust blocks, or other approved method, must be used on all gasketed PVC systems. They must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outside diameter of the pipe. Size thrustblocks in accordance with ASA 589.

5. The trench bottom must be uniform, free of debris, and of sufficient width to properly place pipe and support it over its entire length. Native excavated material may be used to backfill the pipe trench. However, the initial backfill material to 6” above the top of the pipe shall be free from rocks or stones larger than 1-inch in diameter. The final backfill material shall be free of rock or debris that is greater than 3” in diameter. At the time of placement, the moisture content of the material shall be such that the required degree of compaction can be obtained with the backfill method to be used. Blocking or mounding shall not be used to bring the pipe to final grade.

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

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

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

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

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

C. Sprinkler installation.

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

2. Provide a minimum separation of 4 inches (102 mm) between sprinklers and pavement. Provide a minimum separation of 12 inches (305 mm) between sprinklers and buildings and other vertical structures. Piping must be thoroughly flushed before installation of sprinkler nozzles. Surface mounted and pop-up heads shall be installed on swing joints, flexible pipe, or polyethylene (PE) nipples. Above-ground (riser mounted) sprinklers shall be mounted on Schedule 40 PVC or steel pipe and be effectively stabilized.

D. Pump installation.

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

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

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

E. Low voltage wire installation.

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

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

F. Hydraulic control tubing.

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

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

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

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

PART VI: TESTING & INSPECTIONS

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

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

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

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

Test all mainlines upstream of the zone valves as follows:

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

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

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

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

**DUCTILE IRON:**

\[
L = \frac{SDP}{133,200}
\]

**PVC, GASKETED JOINT:**

\[
L = \frac{NDP}{7,400}
\]

Where:

- \(L\) = allowable leakage (gph)
- \(N\) = number of joints,
- \(D\) = nominal diameter of pipe (inches),
- \(P\) = average test pressure (psi), and
- \(S\) = length of pipe (ft).

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

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

1. Cross connection control and backflow prevention.
   
   a. Public or domestic water systems: Check that an approved backflow prevention assembly is properly installed and functioning correctly. Review the location of the assembly to check that it is not creating a hazard to pedestrians or vehicular traffic.
   
   b. Water systems other than public or domestic water systems: Check that the proper backflow prevention assemblies are provided.
   
   c. All assemblies that can be, will be tested by a certified technician prior to being placed into service.

2. Sprinkler coverage testing.
   
   a. All sprinklers must be adjusted to minimize overspray onto buildings and paved areas.
   
   b. All sprinkler controls must be adjusted to minimize runoff of irrigated water.
   
   c. All sprinklers must operate at their design radius of throw. Nozzle sizes and types called for in the system design must have been used.
   
   d. Spray patterns must overlap as designed.
   
   e. Sprinklers must be connected, as designed, to the appropriate zone.

**D. Site restoration.**

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

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