

TABLE 84.30-7
SUBSOIL DRAIN PIPE AND TUBING

Material	Standard
Cast iron	ASTM A74; CISPI 301
Clay drain tile	ASTM C4
Polyethylene (PE)	ASTM F405
Polyvinyl chloride (PVC)	ASTM D2729 (Perforated only)
Styrene rubber (SR)	ASTM D3298
Vitrified clay	ASTM C700

(4) **WATER SUPPLY SYSTEMS.** Water supply systems shall be of such material and workmanship as set forth in this subsection. All materials in contact with water, in a water supply system, shall be suitable for use with potable water.

(a) *Water quality.* A water supply system shall be resistive to corrosive action and degrading action from the water being conveyed.

(b) *Soil and groundwater.* The installation of water supply systems shall be prohibited in soil and groundwater that is contaminated with solvents, fuels, organic compounds or other detrimental materials which will cause permeation, corrosion, degradation, or structural failure of the piping material.

1. Where detrimental conditions are suspected, a chemical analysis of the soil and groundwater conditions shall be required to ascertain the acceptability of the proposed water supply system materials for the specific installation.

2. Where a detrimental condition exists, no underground water supply system may be installed until the detrimental condition can be:

a. Eliminated and the source of the condition can be eliminated;

b. Identified and the pipe and joining method can be proven resistant to the detrimental condition; or

c. Avoided by choosing an alternate route that will not be affected by the detrimental condition.

(c) *Certification of plastic pipe.* Plastic pipe for a water supply system shall conform to NSF 14 and shall be certified by a nationally recognized testing agency as to conforming to NSF 14. Plastic pipe for water supply systems shall bear the certification mark of the testing agency.

(d) *Water services and private water mains.* 1. Water service pipe and private water mains shall conform to one of the standards listed in Table 84.30-8. Pipe and tubing for water services and private water mains shall have a minimum working pressure of 150 psig at 73.4°F.

2. A local governmental unit may by ordinance restrict the types of materials for water services and private water mains which are to be located within or beneath an area subject to an easement for a highway, street or public service right-of-way. Before adopting an ordinance restricting the types of materials for water services the local governmental unit shall submit a copy of the proposed ordinance to the department for review and approval.

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

(e) *Water distribution pipe.* 1. Except as provided in subd. 2., water distribution pipe shall have a minimum working pressure of 100 psig at 180°F and shall conform to one of the standards listed in Table 84.30-9.

2. Water distribution pipe installed underground for an exterior turf sprinkler system shall conform to one of the standards listed in Table 84.30-10. Water distribution pipe and fittings for exterior turf sprinkler systems shall have a minimum working pressure of 100 psig at 73.4°F. Water distribution pipe installed above ground for an exterior turf sprinkler system shall conform to subd. 1.

Note: Portions of a water supply system that supply water to a fire sprinkler system are to also conform to the requirements specified in s. ILHR 51.23.

(f) *Bending limitations.* 1. The bending of polybutylene water service pipe or tubing shall be in accordance with the manufacturer's instructions.

2. a. The bending radius of polybutylene water distribution pipe or tubing shall meet or exceed the bending radius specified in Table 84.30-9m and shall meet or exceed the bending radius specified by the manufacturer of the pipe or tubing.

b. Polybutylene water distribution pipe or tubing shall be supported or anchored at the beginning and end of long bends in accordance with the manufacturer's instructions.

Table 84.30-8
PIPE AND TUBING FOR
WATER SERVICES AND PRIVATE WATER MAINS

Material	Standard
Acrylonitrile butadiene styrene (ABS) ^a	ASTM D1527; ASTM D2282
Brass	ASTM B43
Cast iron	ASTM A377; AWWA C115/A21.15
Chlorinated polyvinyl chloride (CPVC) ^a	ASTM D2846; ASTM F441; ASTM F442; ASTM F443
Copper ^b	ASTM B42; ASTM B88
Ductile iron	ASTM A377; AWWA C115/A21.15; AWWA C151/A21.51
Galvanized steel	ASTM A53; ASTM A120
Polybutylene (PB) ^a	ASTM D2662; ASTM D2666; ASTM D3000; ASTM D3309
Polyethylene (PE) ^a	ASTM D2239; ASTM D2737; ASTM D2104; ASTM D2447; ASTM D3035
Polyvinyl chloride (PVC) ^a	ASTM D1785; ASTM D2241; ASTM D2740; ASTM D2672; AWWA C900
Stainless steel	ANSI B36.19

Note a: Plastic water service systems shall be installed in accordance with ASTM D2774. See Appendix for further explanatory material.

Note b: Copper tubing, type M, may not be installed underground.

Table 84.30-9
WATER DISTRIBUTION PIPE AND TUBING

Material	Standard
Brass	ASTM B43
Cast iron	ASTM A377; AWWA C115/A21.15
Chlorinated polyvinyl chloride (CPVC) ^a	ASTM D2846
Copper ^b	ASTM B42; ASTM B88
Ductile iron	ASTM A377; AWWA C115/A21.15; AWWA C151/A21.51
Galvanized steel	ASTM A53; ASTM A120
Polybutylene (PB) ^a for agricultural use and pure-water use	ASTM D3309
Stainless steel	ANSI B36.19M; ASTM A270; ASTM A450

Note a: Plastic pipe and tubing installed underground shall be in accordance with ASTM D2774. See Appendix for further explanatory material.

Note b: Copper tubing, type M, may not be installed underground.

Table 84.30-9m
MINIMUM BENDING RADIUS OF POLYBUTYLENE
WATER DISTRIBUTION PIPE AND TUBING

Pipe Size (inches)	Bending Radius (inches)	Tubing Size (inches)	Bending Radius (inches)
¾	12¾	¼	4½
1	15¾	⅝	6
1¼	20	¾	7½
1½	23	¾	10½
2	28¾	1	13½
		1¼	16½
		1½	19½
		2	25½

Note: See Appendix for further explanatory material.

Table 84.30-10
EXTERIOR TURF
SPRINKLER SYSTEM PIPE AND TUBING

Material	Standard
Acrylonitrile butadiene styrene (ABS) ^a	ASTM D1527; ASTM D2282
Brass	ASTM B43
Cast iron	ASTM A377; AWWA C115/A21.15
Chlorinated polyvinyl chloride (CPVC) ^a	ASTM F441; ASTM F442; ASTM F443; ASTM D2846
Copper ^b	ASTM B88
Ductile iron	ASTM A377; AWWA C115/A21.15; AWWA C151/A21.51
Galvanized steel	ASTM A53; ASTM A120
Polybutylene (PB) ^a	ASTM D2666; ASTM D3000; ASTM D2662; ASTM D3309
Polyethylene (PE) ^a	ASTM D2104; ASTM D2239; ASTM D2447; ASTM D3035; ASTM D2737
Polyvinyl chloride (PVC) ^a	ASTM D1785; ASTM D2241; ASTM D2672; AWWA C900; ASTM D2740

Note a: Plastic pipe and tubing installed underground shall be in accordance with ASTM D2774. See Appendix for further explanatory material.

Note b: Copper tubing, type M, may not be installed underground.

(5) **PIPE FITTINGS AND VALVES.** (a) *Fittings.* Pipe fittings shall conform to the pipe material standards listed in this chapter or one of the standards listed in Table 84.30-11. Threaded drain pipe fittings shall be of the recessed drainage type.

(b) *Water supply valves.* 1. Control valves for water services and private water mains shall be designed and constructed to withstand a minimum pressure of 125 psig at 73.4°F.

2. Control valves for water distribution systems shall be designed and constructed to withstand a minimum pressure of 100 psig at 180°F.

3. A control valve for water supply piping 3/4 inches through 4 inches in diameter which serves 2 or more plumbing fixtures shall have a nominal diameter at least equal to the piping and shall have a minimum Cv factor as specified in Table 84.30-10a.

84.30-10a
MINIMUM Cv FACTORS

Nominal Valve Diameters	Cv Factors
3/4	18
1	35.5
1 1/4	61
1 1/2	107
2	175
3	255
4	340

Note: The Cv factor is defined as the flow coefficient for valves, expressing the flow rate in gallons per minute of 60° with a one psi pressure drop across the valve.

(c) *Special fittings and valves.* 1. Water hammer arrestors shall conform to ANSI A112.26.1 or ASSE 1010.

2. Relief valves and automatic gas shutoff devices for hot water supply systems shall conform to ANSI Z21.22.

3. Water pressure reducing valves and strainers for water pressure reducing valves for domestic supply systems shall conform to ASSE 1003.

4. Hose connection vacuum breakers shall conform to ASSE 1011 or ASSE 1019.

5. Backflow preventers with intermediate atmospheric vents shall conform to ASSE 1012.

6. Reduced pressure principle backflow preventers shall conform to ASSE 1013.

7. Backwater valves shall conform to ANSI A112.14.1.

8. Pipe applied atmospheric type vacuum breakers shall conform to ASSE 1001.

9. Laboratory faucet vacuum breakers shall conform to ASSE 1035.

10. Trap seal primer valves shall conform to ASSE 1018.

(d) *Pipe saddles.* Pipe saddles shall be installed in accordance with the instructions of the saddle manufacturer and the following limitations:

1. Pipe saddles may be installed on private interceptor main sewers, building sewers, underground drain and vent pipe and tubing, and where otherwise approved by the department;
2. A saddle for drain piping shall have a radius in accordance with s. ILHR 82.30 (8) (a);
3. The material of the saddle shall be compatible with the materials of the pipes which are to be connected to the saddle;
4. The hole in the pipe which is to receive the saddle shall be drilled or cored to match the saddle outlet;
5. Straps or clamps which wrap around the pipe and saddle shall be provided by the manufacturer of the saddle;
6. Saddles shall be installed with straps or clamps which wrap around the pipe and saddle; and
7. Proper hangers or bedding shall be provided to maintain alignment between the opening in the pipe and the saddle.

Table 84.30-11
PIPE FITTINGS

Material	Standard
Acrylonitrile butadiene styrene (ABS)	ASTM D2465; ASTM D2468; ASTM D2469; ASTM D3311; ASTM F409
Cast bronze	ANSI B16.15; ANSI B16.24
Cast copper alloy	ANSI B16.18; ANSI B16.23; ANSI B16.26; ANSI B16.32
Cast iron	ANSI B16.4; ANSI B16.12; ANSI B16.1
Chlorinated polyvinyl chloride (CPVC)	ASTM F437; ASTM F438; ASTM F439
Copper	ANSI B16.22; ANSI B16.29; ANSI B16.43
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; ANSI/AWWA C153/A21.53; ANSI B16.42
Malleable iron	ANSI B16.3
Polybutylene (PB)	ASTM D3309; ASTM F845
Polyethylene (PE)	ASTM D2609; ASTM D2683; ASTM D3197; ASTM D3261
Polyvinyl chloride (PVC)	ASTM D2464; ASTM D2466; ASTM D2467; ASTM D3036; ASTM D3311; ASTM F409
Stainless steel	ASTM A403
Steel ^a	ANSI B16.5; ANSI B16.9; ANSI B16.11; ANSI B16.28
Styrene-rubber (SR)	ASTM D2852

Note a: Steel fittings and malleable iron fittings to be used in a water supply system shall be galvanized-coated in accordance with ASTM A123.

(6) SPECIAL MATERIALS. (a) *Sheet lead*. Sheet lead for the following uses may not weigh less than indicated in subs. 1. to 3.

1. Safe pans, 4 pounds per square foot;
2. Site-fabricated flashings for vent pipes, 3 pounds per square foot; and
3. Prefabricated flashings for vent pipes, 2½ pounds per square foot.

(b) *Traps and fixture drain connection fittings.* Copper or tubular brass traps and fixture drain connections fittings shall be at least of 20 gage material.

(c) *Sheet copper.* Sheet copper for the following uses may not weigh less than indicated in subs. 1. and 2. and shall conform to ASTM B152.

1. Safe pans, 12 ounces per square foot;
2. Flashing for vent pipes, 8 ounces per square foot; and
3. Flush tank linings, 10 ounces per square foot.

(d) *Cleanout plugs.* Cleanout plugs shall be of brass or plastic. Brass cleanout plugs shall be used with metallic piping only and shall conform to ASTM A74. Plastic cleanout plugs shall conform to the requirements of sub. (5) (a).

(e) *Flush pipes and fittings.* Flush pipes and fittings shall be of nonferrous material and shall conform to ANSI A112.19.5.

(f) *Safing materials.* Safing materials made from chlorinated polyethylene shall conform to ASTM D4068.

History: Cr. Register, May, 1988, No. 389, eff. 6-1-88

ILHR 84.40 Joints and connections. (1) **GENERAL.** (a) *Tightness.* Joints and connections in the plumbing system shall be watertight and gastight for the pressure required by test or the system design, whichever is greater, with the exception of perforated or open joint piping.

Note: The testing requirements for tightness are in s. ILHR 82.21.

(b) *Preparation of pipe ends.* Pipe ends shall be prepared in accordance with the applicable pipe standard or the pipe or fitting manufacturer's instructions.

(c) *Prohibited joints and connections.* Unless otherwise permitted in this chapter or ch. ILHR 82 or 83, the following types of joints and connections shall be prohibited:

1. Cement or concrete joints;
2. Mastic or hot poured bituminous joints;
3. Elastomeric rolling o-rings between different diameter pipes;
4. Solvent cement joints between different types of plastic pipe; and
5. Roll grooving of galvanized steel pipe.

(2) **ABS PLASTIC PIPE.** Joints between acrylonitrile butadiene styrene plastic pipe or fittings shall be installed in accordance with pars. (a) to (c).

(a) *Mechanical joints.* Mechanical joints shall be installed in accordance with the manufacturer's instructions.

1. Drain and vent systems. Mechanical push-on joints for drain and vent systems shall conform to ASTM D3212.

an assumption of any responsibility for defects in design, construction, or performance of any plumbing material or product nor for any damages that may result.

(7) **FEES.** Fees for the review of a plumbing material or product under this section and any required on-site inspections shall be submitted in accordance with s. Ind 69.23 (5) (c) or (d), and (e).

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ILHR 84.60 Incorporation of standards by reference. (1) **CONSENT.** Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the standards listed in sub. (4).

(2) **COPIES.** Copies of the adopted standards are on file in the offices of the department, the secretary of state and the revisor of statutes. Copies may be purchased through the respective organizations listed in Tables 84.60-1 to 84.60-10.

(3) **INTERIM AMENDMENTS.** Interim amendments of the adopted standards shall have no effect in the state until such time as this section is correspondingly revised to reflect the changes.

(4) **ADOPTION OF STANDARDS.** The standards referenced in Tables 84.60-1 to 84.60-10 are hereby incorporated by reference into this chapter.

Table 84.60-1

Standard Reference Number	Title
AHAM	Association of Home Appliance Manufacturers 20 North Wacker Drive Chicago, Illinois 60606
DW-1-82	Household Dishwashers

Table 84.60-2

Standard Reference Number	Title
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, New York 10018
1. A112.6.1M-79	Supports for Off-the-Floor Plumbing Fixtures for Public Use
2. A112.14.1-75	Backwater Valves
3. A112.18.1M-79	Finished and Rough Brass Plumbing Fixture Fittings
4. A112.19.1M-79	Enameled Cast Iron Plumbing Fixtures
5. A112.19.2M-82	Vitreous China Plumbing Fixtures

Standard Reference Number	Title
6. A112.19.3-76	Stainless Steel Plumbing Fixtures (Designed for Residential Use)
7. A112.19.4-77	Porcelain Enameled Formed Steel Plumbing Fixtures
8. A112.19.5-79	Trim for Water Closet Bowls, Tanks and Urinals (Dimensional Standards)
9. A112.21.1M-80	Floor Drains
10. A112.21.2-71	Roof Drains
11. A112.26.1-84	Water Hammer Arrestors
12. B1.20.1-83	Pipe Threads, General Purpose (Inch)
13. B16.1-75	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
14. B16.3-77	Malleable Iron Threaded Fittings, Class 150 and 300
15. B16.4-77	Cast Iron Threaded Fittings, Class 125 and 250
16. B16.5-81	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
17. B16.9-78	Factory-Made Wrought Steel Butt welding Fittings
18. B16.11-80	Forged Steel Fittings, Socket-Welded and Threaded
19. B16.12-83	Cast Iron Threaded Drainage Fittings
20. B16.15-78	Cast Bronze Threaded Fittings, Class 125 and 250
21. B16.18-78	Cast Copper Alloy Solder-Joint Pressure Fittings
22. B16.22-80	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
23. B16.23-76	Cast Copper Alloy Solder Joint Drainage Fittings (DWV)
24. B16.24-79	Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300
25. B16.26-83	Cast Copper Alloy Fittings for Flared Copper Tubes
26. B16.28-78	Wrought Steel Butt welding Short Radius Elbows and Returns
27. B16.29-80	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings (DWV)
28. B16.32-79	Cast Copper Alloy Solder Joint Fittings for Solvent Drainage Systems
29. B16.42-79	Fittings, Class 150 and 300, Ductile Iron Pipe Flanges and Flanged
30. B16.43-82	Wrought Copper and Copper Alloy Solder Joint Fittings for Solvent Drainage Systems
31. B36.19M-85	Stainless Steel Pipe
32. Z21.22-79	Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems
33. Z124.1-80	Plastic Bathtub Units
34. Z124.2-80	Plastic Shower Receptors and Shower Stalls