



Standard Specification for Cast Iron Soil Pipe and Fittings¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers cast iron soil pipe and fittings for use in gravity flow plumbing, drain, waste and vent sanitary, and storm water applications. It establishes standards covering material, manufacture, mechanical and chemical properties, coating, test methods, inspection, certification, product markings, dimensions, and dimensional tolerances for extra-heavy and service cast iron soil pipe and fittings. These pipe and fittings are not intended for pressure applications as the selection of the proper size for sanitary drain, waste, vent, and storm drain systems allows free air space for gravity drainage.

1.2 This specification covers pipe and fittings of the following patterns and, when so designated, shall apply to any other patterns that conform with the dimensions found in Tables 1 and 2 and all other applicable requirements given in this specification.

1.2.1 Pipe:

Extra heavy, 2½ ft (0.75 m), 3½ ft (1.0 m), 5 ft (1.5 m), 10 ft (3.0 m) lengths	Tables 1, 2
Service, 2½ ft (0.75 m), 3½ ft (1.0 m), 5 ft (1.5 m), 10 ft (3.0 m)	1, 2
Outside dimensions (for detailing)	X1.1

1.2.2 Fittings:

¼ bends; long ¼ bends	Tables 3, 4
¼ bends, long low-hub	5
¼ bends, low heel; high heel	6, 7

¼ bends, short sweep; long sweep	Tables 8
¼ bends, reducing long sweep	9
½ bends	10
⅓ bends	10
⅓ bends; long ⅓ bends	11
⅙ bends	11
Y branches	12, 13
Y branches, combination ⅓ bends, single	14
Y branches, combination ⅓ bends, double	14
Sanitary T branches, single	15
Sanitary T branches, double	15
Sanitary T branches, cleanout	16
Tapped sanitary T branches, single	17
Tapped sanitary T branches, double	17
T branches, single and double	18
Tapped T branches, single	19
Tapped T branches, double	19
T branches, cleanout	20
-45° offset fitting	21
Double hubs	22
Long double hubs	22
Reducers	23
Increases	24, 25
P traps	26, 27
Deep seal P traps	28
Running traps	29
Screw plugs (brass)	30
Blind plugs	31
Iron-body ferrules	32
Side inlets	Fig. 3
Closet bends	33
Tapping bosses	34
Reducing ¼ bend SV	35
Combination Y and ⅓ bend	36
'H' branch fitting	37

¹ This specification is under the jurisdiction of ASTM Committee A04 on Iron Castings and is the direct responsibility of Subcommittee A04.12 on Pipes and Tubes.

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1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

- A48/A48M Specification for Gray Iron Castings
- A644 Terminology Relating to Iron Castings
- D1248 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- D3960 Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- E8/E8M Test Methods for Tension Testing of Metallic Materials
- E1645 Practice for Preparation of Dried Paint Samples by Hotplate or Microwave Digestion for Subsequent Lead Analysis
- E2349 Practice for Safety Requirements in Metal Casting Operations: Sand Preparation, Molding, and Core Making; Melting and Pouring; and Cleaning and Finishing

2.2 Federal Standard:³

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.3 Military Standard:³

MIL-STD-129 Marking for Shipment and Storage

2.4 ANSI/ASME Standard:⁴

B1.20 Pipe Threads

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *manufacturer, n*—the entity that casts the pipe and fittings covered by this standard.

4. Materials and Manufacture

4.1 The pipe and fittings shall be iron castings suitable for installation and service for sanitary, storm drain, waste, and vent piping applications. The pipe and fittings shall meet all applicable requirements and tests given in this specification.

4.2 The castings shall be made of cast iron, produced by an established commercial method that provides control over chemical and physical properties. Cast iron is a generic term for a series of alloys as defined in Terminology A644 and includes gray iron as well as ductile iron. The castings shall be sound, true to pattern, and of compact close grain that permits drilling and cutting by ordinary methods. The interior surface shall be reasonably smooth and free from defects that would make the castings unfit for the use for which they are intended.

4.3 To minimize the possibility of introducing radioactive material to a melting operation, ferrous scrap, pig iron, and any recycled ferrous material shall be screened by the manufacturer

for radioactivity with detection devices operated in accordance with the detection manufacturer's instructions. Written operating, calibration, and maintenance procedures for the detection equipment shall be provided to the purchaser for review when requested. Records shall be maintained by load of these tests for a period of seven years.

4.3.1 Only radiation devices designed specifically for the purpose of screening ferrous material shipments shall be used for the purpose of conforming to this requirement. Handheld radiation detectors (Geiger counters) are not appropriate and shall not be used for the purpose of conforming to this requirement.

4.3.2 Material that is found contaminated with radioactivity shall not be used to produce products covered by this specification.

4.3.3 Analysis of castings after the time of production shall not be used to determine compliance to this specification.

4.4 Foundries manufacturing products to this specification shall comply to all local, provincial, state, and national safety laws and regulations and to the requirements of Practice E2349.

4.5 Pipe and fittings shall not be patched, filled, or welded to correct cosmetic or material defects that occur during the course of manufacturing.

5. Mechanical Properties

5.1 *Mechanical Tests for Gray Iron*—The manufacturer shall perform tests to determine mechanical properties of the gray iron used in the manufacture of gray iron soil pipe and fittings. Tension test specimens shall be employed. The manufacturer shall maintain a record of mechanical tests for a minimum of seven years.

5.1.1 *Tensile Strength Test*—The tensile strength shall be not less than 21 000 psi (145 MPa).

5.1.2 Tension test reports shall include breaking load of test bars, machined diameter of test bar, and calculated tensile strength.

5.1.3 Analysis of castings or test bars after the time of production shall not be used as evidence of compliance to this specification.

6. Chemical Test for Gray Iron

6.1 The manufacturer shall perform tests to determine the significant chemical constituents of the gray iron used in the manufacture of gray iron soil pipe and fittings. Analysis shall be performed at the minimum of once per lot as defined in this specification. The manufacturer shall maintain a record of chemical tests performed for a minimum of seven years. The test results shall conform to the following requirements as to chemical composition:

Phosphorous (P)	0.38 % Maximum
Sulfur (S)	0.15 % Maximum
Chromium (Cr)	0.50 % Maximum
Titanium (Ti)	0.10 % Maximum
Aluminum (Al)	0.50 % Maximum
Lead (Pb)	0.015 % Maximum
Carbon Equivalent	4.10 % Minimum by mass

Note: Carbon equivalent for gray iron = %C+%Si/3+%P/3.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

6.1.1 Chemical tests shall be performed at the time of production of the castings covered by this specification.

6.1.2 Analysis of castings after the time of production shall not be used as evidence of compliance to this specification.

7. Dimensions and Permissible Variations

7.1 Pipe:

7.1.1 Single-hub pipe shall have a hub at one end and a spigot at the other. Double-hub pipe shall have a hub at each end. Hubs shall have lead grooves. The inner end of hub shall be either with or without a centering recess, all combinations of which shall make a satisfactory leakproof joint. Hub and barrel shall be cast in one piece (see Fig. 1).

7.1.2 Single-hub pipe shall be of 2½-ft (0.75-m), 3½-ft (1.00-m), 5-ft (1.5-m), and 10-ft (3.0-m) nominal laying lengths. The laying length shall be as shown in Table 1 and shall be within the tolerances on laying length specified in Table 2. Double-hub pipe shall be of the same overall length as single-hub pipe of the same size. Its laying length shall be 5 ft minus the two telescoping lengths (dimension Y), or 10 ft minus the telescoping length (dimension Y). Other dimensions shall be as specified in Table 1 as applicable, and be within the tolerances specified in Table 2. The dimensions shall apply to pipe before any coating is applied.

7.1.3 Pipe shall be straight to the extent that any deflections in the barrel of a 2½-ft (0.75-m), 3½-ft (1.00-m), and 5-ft (1.5-m) length of pipe shall not exceed ¼ in. (6.4 mm) for sizes 4 in. (102 mm) and larger, and shall not exceed ⅓ in. (7.9 mm) for smaller sizes; for 10-ft lengths, deflections in the barrel shall not exceed ½ in. (12.7 mm) for sizes 4 in. and larger, nor exceed ⅝ in. (15.9 mm) for smaller sizes.

7.2 Fittings:

7.2.1 *Dimensions of Fittings*—All fittings shall conform to the dimensions specified for hub and spigot ends in Table 1 and Table 2, as applicable. Fittings of the patterns specified in this specification shall conform to the applicable dimensions in Tables 3-37 inclusive, and to the tolerances in Table 2. Other patterns (Note 1) shall conform to Table 1, as applicable, for hub and spigot dimensions, and for wall thickness throughout, and to dimension R', Tables 15-17, for the minimum radius of any drainage inlets that such fittings shall be permitted to provide. All fittings shall have spigot ends of sufficient length to provide adequate room for making joints. All dimensions given in this specification shall apply to fittings before any coating is applied.

NOTE 1—Such as, for example, fittings known in the trade as “specials,” when designated as being in conformity with this specification.

7.2.2 *Water Seal and Traps*—Traps shall have water seals as follows:

Trap Size, in. (mm)	Minimum Water seal, in. (mm)
2 (50)	2 (50)
3 to 6 (75 to 150), incl	2½ (64)
8 to 12 (200 to 300), incl	3 (75)

7.2.3 *Ends of Fittings*—Hubs shall have lead grooves. The inner end of hub shall be permitted to be either with or without a centering recess, all combinations of which shall enable the installer to make a satisfactory joint. Tapped openings shall conform to 7.2.4. It is permissible to increase the wall thickness on the inside surface of fittings having one or more plain ends. The increased thickness shall not reduce the minimum B dimension in Table 1 in excess of 0.10 in. for sizes 8 in. and smaller, and 0.15 in. for 10 in. and larger, and shall not extend more than 4¼ in. from the plain end. The increased thickness shall be tapered and offer no obstruction to flow. Inside diameters complying with service or extra-heavy inside diameters shall be permitted on 12- and 15-in. sizes only.

7.2.4 *Pipe Threads*—Screw plugs and tapped openings in fittings shall have American Standard taper pipe threads. The threads shall be in accordance with ANSI/ASME B1.20 of the current issue.

7.2.5 Internal threads shall be chamfered on the entering end approximately to the major diameter of the thread, at an angle of approximately 45° with the axis of the thread, and the entering end of external threads shall be similarly chamfered approximately to be minor diameter of the thread, for easy entrance in making a joint and for protection of the thread. The chamfer shall be concentric with the thread and shall be included in measurements of thread length.

8. Methods of Specifying Fittings

8.1 *Method of Specifying Sizes of Fittings of More Than One Size*—The sizes are designated by the order of listing, as follows:

- 8.1.1 Branch and tapped fittings:
 - 8.1.1.1 Size of run (Note 2), and
 - 8.1.1.2 Size of branch.
- 8.1.2 Reducers, increasers, and offset fittings:
 - 8.1.2.1 Size of inlet or run (Note 2),
 - 8.1.2.2 Size of outlet or offset distance, and
 - 8.1.2.3 Length, if supplied in more than one length.

NOTE 2—The run is that portion of the fitting that forms part of the main drain, waste, or vent line. The spigot end is ordinarily the outlet.

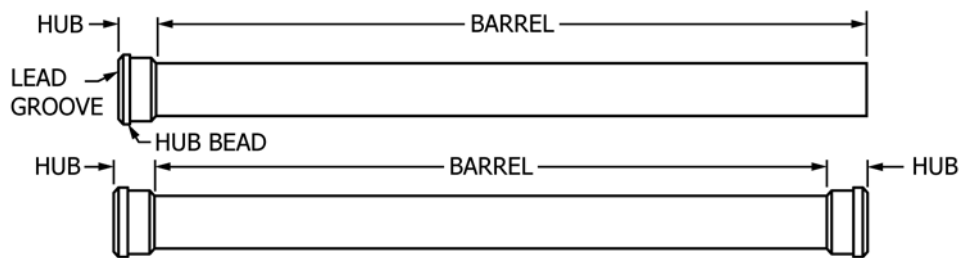


FIG. 1 Single-Hub and Double-Hub Cast Iron Soil Pipe Laying Lengths