



Member of the FM Global Group

Examination Standard for Ductile Iron Pipe and Fittings, Flexible Fittings and Couplings

Class Number 1610

October 2022

Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

Table of Contents

1. INTRODUCTION	1
1.1 Purpose.....	1
1.2 Scope.....	1
1.3 Basis for Requirements	2
1.4 Basis for Certification	2
1.5 Basis for Continued Certification	2
1.6 Effective Date.....	2
1.7 System of Units	2
1.8 Normative References	3
1.9 Terms and Definitions.....	3
2. GENERAL INFORMATION.....	6
2.1 Product Information	6
2.2 Certification Application Requirements	6
2.3 Requirements for Samples for Examination	6
3. GENERAL REQUIREMENTS.....	7
3.1 Review of Documentation	7
3.2 Physical or Structural Features	7
3.3 Materials	7
3.4 Markings	8
3.5 Manufacturer's Installation and Operation Instructions	8
3.6 Calibration	9
3.7 Tolerances	9
4. PERFORMANCE REQUIREMENTS	10
4.1 Examination.....	10
4.2 Joint Leakage.....	10
4.3 Hydrostatic Strength.....	10
4.4 Cycling Pressure Resistance (Flexible Fittings)	11
4.5 Gaskets (Underground Only)	11
4.6 Gaskets (Aboveground Only)	12
4.7 Positive Torque Indication Test	12
4.8 Mechanical Flexure	12
5. OPERATIONS REQUIREMENTS	14
5.1 Demonstrated Quality Control Program.....	14
5.2 Surveillance Audit Program.....	14
5.3 Installation Inspections	15
5.4 Manufacturer's Responsibilities	15
5.5 Manufacturing and Production Tests.....	15
5.5.1 Test Requirement No. 1 - <i>Material Composition</i>	15
5.5.2 Test Requirement No. 2 - <i>Dimensional Checks</i>	15
5.5.3 Test Requirement No. 3 - <i>Assembly Tests</i>	15
6. BIBLIOGRAPHY	15
APPENDIX A: Tolerances.....	16
APPENDIX B: Sample Listing	17

1. INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for ductile iron pipe for use in underground fire protection mains. This standard also addresses rigid (elbows, tees, etc.) and flexible (swivel, etc.) fittings and couplings for joining pipe and fittings. The fittings and couplings may be rated for use below and above ground.
- 1.1.2 Displacements due to seismic events (earthquake) are beyond the scope of this standard.
- 1.1.3 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for:
 - Ductile iron water pipe, from NPS (Nominal Pipe Size) 3 through 36 inch (80 to 915 mm) for underground use;
 - Rigid and flexible fittings or couplings, from NPS 3 through 12 inch (80 to 300 mm) for underground or aboveground use; and
 - Rigid and flexible fittings or couplings, from NPS 14 through 36 inch (350 to 900 mm) for underground use. Other sizes may be considered for certification on case by case basis.

Additional Notes:

- Ductile iron pipe is not permitted aboveground in fire protection systems;
 - Aboveground use is limited to fitting and coupling products up to NPS 12 in. maximum. It may be acceptable to use ductile iron fittings or couplings larger than NPS 12 inch in limited aboveground applications when transitioning from the underground to the aboveground fire protection system. Examples of such use include bridge and river crossings and tunnel applications. In these situations, special consideration must be given to the support system, accommodation for thermal expansion, and anchorage of components subject to hydraulic thrust. This will be reviewed on a case by case basis.
- 1.2.2 In cases where metric sized ductile iron pipe and fittings are to be examined for certification, test criteria comparable to the United States equivalent size shall be used.
- 1.2.3 Recognized pipe wall thickness classes or pressure classes are as defined in ANSI/AWWA C150/A21.50, *Thickness Design of Ductile-Iron Pipe*, or ANSI/AWWA C151/A21.51, *Ductile-Iron Pipe, Centrifugally Cast*. Other international standards will be considered on a case by case basis.
- 1.2.4 The certification agency will consider ductile iron pipe and fittings which are designed in accordance to national or international standards. Only after verification is made that the products to be reviewed are in conformance to ANSI/AWWA C150/A21.50, or Standard ANSI/AWWA C151/A21.51, or other nationally or internationally recognized standards will certification testing commence. All certification testing is to be conducted on production samples.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of ductile iron pipe, fittings and couplings for the purpose of obtaining certification. Ductile iron pipe, fittings and couplings having characteristics not anticipated by this standard may be certified if performance is equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate:
- the suitability of the product;
 - the performance of the product as specified by the manufacturer and required for certification;
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be conducted to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agencies product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 System of Units

Units of measurement used in this standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this standard.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies:

ANSI/AWWA C110/A21.10, *Ductile-Iron and Gray-Iron Fittings*
ANSI/AWWA C111/A21.11, *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*
ANSI/AWWA C150/A21.50, *Thickness Design of Ductile-Iron Pipe*
ANSI/AWWA C151/A21.51, *Ductile-Iron Pipe, Centrifugally Cast*
ANSI/AWWA C153/A21.53, *Ductile-Iron Compact Fittings*
ANSI/AWWA C606, *Grooved and Shouldered Joints*
ANSI/IEEE/ASTM SI 10, *American National Standard for Metric Practice*
ASTM A126, *Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings*
ASTM A536, *Standard Specification for Ductile Iron Castings*

1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

Accepted

This term refers to installations acceptable to the authority enforcing the applicable installation rules (Authority Having Jurisdiction). Acceptance is based upon an overall evaluation of the installation. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere.

Bell and Spigot Pipe

A general pipe design where one end of a length of pipe is straight (spigot) and the other larger end is bell shaped and contains a gasket seal. The spigot end of one pipe is designed to fit into the bell end of another pipe and to fit under the gasket seal. Generally, this joint uses an elastomeric gasket to obtain a seal. Older version of bell and spigot pipe used a poured seal made up of jute and lead. These joints are no longer permitted by most regulatory and public authorities as of this writing.

Coupling

A coupling is a fitting that is used to join two or more components together.

Ductile Iron Fittings

A device, such as a tee or elbow, which is cast from ductile iron, in accordance with the material requirements of ASTM A536, *Standard Specification for Ductile Iron Castings*, Grade 65-45-12 or equivalent.

Ductile Iron Pipe

Ductile iron pipe is a pipe made of ductile cast iron commonly used for potable water transmission and distribution. The pipe may be lined with cement and be provided with push on type unrestrained joints or joints that provide restraint through a number of techniques.

Flanged End Fitting

A device, such as a tee or elbow, which has an integral rim on each end that is drilled in a symmetric hole pattern and which is connected to a mating device by means of a gasket, bolts and hex nuts. Critical flange dimensions are as tabulated in AWWA C110, *Ductile-Iron and Gray-Iron Fittings*, or other nationally or internationally recognized standard.