FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/FDIS
10802**

ISO/TC **5**/SC **2**

Secretariat: AFNOR

Voting begins on:
2020-06-09

Voting terminates on:
2020-08-04

Ductile iron pipelines — Hydrostatic testing after installation

Canalisations en fonte ductile — Essais hydrostatiques après pose

Reference number
ISO/FDIS 10802:2020(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and Definitions ... **1**
4 Safety ... **3**
5 Preparation of the test sections ... **4**
5.1 General conditions ... 4
5.2 Pressure pipelines ... 4
5.2.1 General ... 4
5.2.2 Anchoring and closures ... 4
5.2.3 Partial backfilling before testing ... 6
5.2.4 Filling with water and air venting ... 6
5.3 Non-pressure pipelines ... 8
6 Pressure testing procedure ... **9**
6.1 General ... 9
6.2 Preliminary operations for pressure pipelines ... 9
6.3 Preliminary test for pressure pipelines ... 10
6.4 Main pressure test ... 11
6.4.1 General ... 11
6.4.2 Water loss test ... 11
6.4.3 Pressure drop test — Direct reading (PDDR) ... 12
6.5 Determination of acceptance ... 12
6.6 Testing of the complete pipeline ... 12
6.7 Non-pressure pipelines ... 12
7 Acceptance criteria ... **13**
7.1 Pressure pipelines ... 13
7.1.1 Water loss test — Falling pressure and water loss test — Constant pressure ... 13
7.1.2 Pressure drop test — Direct reading ... 13
7.2 Non-pressure pipelines ... 13
Annex A (informative) **Test methods description and comparison** ... **14**
Annex B (informative) **Example of hydrostatic testing report** ... **16**
Annex C (informative) **Pressure pairing of component pressures and pipeline pressures** ... **18**
Bibiliography ... **19**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 2, *Cast iron pipes, fittings and their joints*.

This second edition cancels and replaces the first edition (ISO 10802:1992), which has been technically revised.

The main changes compared to the previous edition are as follows:

— add the safety instructions for hydrostatic testing operation;

— add hydrostatic test flow chart;

— add several diagrams for comprehensiveness;

— add pressure drop test method, as alternative of constant pressure test.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Ductile pipelines include many components and jointing solutions to offer a reliable service under the worst situations (high pressure variations, earthquakes, etc.) hence the need of a secure hydrostatic pressure test after having taken into account possible movements of the components.

Every pipeline which has been constructed undergo a water pressure test to ensure the integrity of pipes, joints, fittings and other components such as anchor blocks.

Normally it is made as the assembly of the pipeline progresses, according to the proposed methodology consisting of 3 phases:

— preliminary operations to prepare the test;

— preliminary test to stabilize the pipeline and to evacuate air in the pipeline;

— main pressure test to assess the water tightness of a pipeline at test pressure; it can be done either by a:

  — water loss test: Falling pressure - WLFP or constant pressure – WLCP methods, or

  — pressure drop test - Direct reading – PDDR method.

Figure 1 summarizes the sequence to follow during the test.

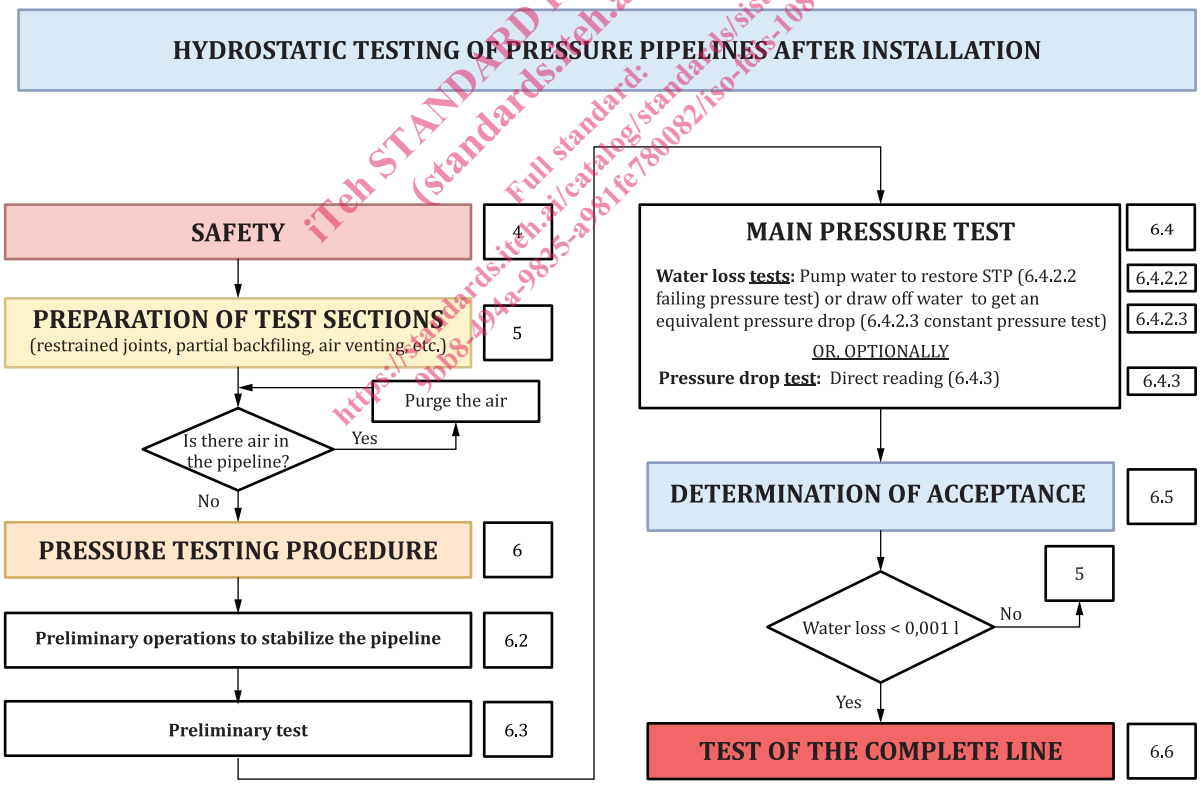

Figure 1 — Testing procedure flow chart

Ductile iron pipelines — Hydrostatic testing after installation

1 Scope

This document specifies site hydrostatic acceptance tests for installed pressure and non-pressure ductile iron pipelines used for conveying water and other liquids.

It does not cover testing of pipelines for gas.

NOTE In this document, all pressures are relative pressures expressed in bars, where 1 bar = 0,1 MPa.

2 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2531, *Ductile iron pipes, fittings, accessories and their joints for water applications*

ISO 6708, *Pipework components — Definition and selection of DN (nominal size)*

ISO 7186, *Ductile iron products for sewerage applications*

ISO 7268, *Pipe components — Definition of nominal pressure*

ISO 10804, *Restrained joint systems for ductile iron pipelines — Design rules and type testing*

ISO 16631, *Ductile iron pipes, fittings, accessories and their joints compatible with plastic (PVC or PE) piping systems, for water applications and for plastic pipeline connections, repair and replacement*

ISO 21051[1)], *Installation of Ductile iron pipes, fittings and accessories*

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in ISO 6708, ISO 7268 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
allowable operating pressure
PFA
P_{FA}
maximum internal pressure, excluding surge, that a component can safely withstand in permanent service

[SOURCE: ISO 2531:2009, 3.2, modified — The symbol has been added.]

1) Under preparation.

3.2
allowable maximum operating pressure
PMA
P_{MA}
maximum internal pressure, including surge, that a component can safely withstand in service

Note 1 to entry: $P_{MA} = 1,2 \times P_{FA}$

[SOURCE: ISO 2531:2009, 3.17, modified — The term has been changed from "maximum allowable operating pressure" to "allowable maximum operating pressure"; the symbol and note 1 to entry have been added.]

3.3
allowable site test pressure
PEA
P_{EA}
maximum hydrostatic pressure that a newly installed component can withstand for a relatively short duration, when either fixed above ground level or laid and backfilled underground, in order to measure the integrity and tightness of the pipeline

Note 1 to entry: This test pressure is different from the *system test pressure* (3.7) which is related to the design pressure of the pipeline.

Note 2 to entry: $P_{EA} = 1,2 \times P_{FA} + 5$.

[SOURCE: ISO 2531:2009, 3.3, modified — Note 2 to entry has been added.]

3.4
working pressure
WP
P_W
highest pressure that occurs at a time and a point in the pipeline when operating continuously under stable conditions, without surge

3.5
maximum working pressure
MWP
P_{MW}
maximum pressure to which a pipeline is subjected under surge conditions

3.6
maximum design pressure
MDP
P_{MD}
maximum operating pressure of the system or of the pressure zone fixed by the designer considering future developments and including surge

Note 1 to entry: It is the maximum pressure considering the design pressure and surge together, where:

— MDP is designated MDPa, P_{MDa}, fixed allowance for surge (secondary distribution networks);

— MDP is designated MDPc, P_{MDc}, surge is calculated (pumping & water mains).

3.7
system test pressure
STP
P_{ST}
pressure to which a pipeline or a pipeline section is subjected for testing purposes

Note 1 to entry: to entry:

— $P_{ST} = 1,5 \times P_D$ (when $P_{MD} < 10$ bar), or

— $P_{ST} = P_D + 5$ (when $P_{MD} \geq 10$ bar)

where P_D is the design pressure.

Note 2 to entry: Annex C provides information on pressure pairing of component pressures and pipeline pressures.

4 Safety

If not covered by a national regulation, the following specifications shall be implemented.

Related to personnel:

— At all stages of testing, the planned sequence and any variation of operations shall be controlled to avoid danger to personnel.

— All personnel shall be clearly informed of the intensity of the loading on temporary fittings and supports and the consequences if failure occurs.

— Prior to the commencement of operations, a check shall be made so that the appropriate safety equipment is available and that personnel have the correct protective clothing.

Related to works:

— Permanent abutments or anchorages shall be constructed to withstand thrust at the test pressure. Concrete anchor blocks shall be allowed to develop adequate strength before testing begins.

— Care shall be taken to ensure that caps or other temporary blanking fittings are adequately anchored, with the load distributed according to the strength of the supporting ground. Gate valves, fire hydrants, water hammer release equipment nor safety valves should / shall not be used as blanking fittings.

— Any temporary supports or anchorage at the ends of the test section shall not be removed until the pipeline is depressurized.

— After installation and until completion of reinstatement, all excavations shall remain adequately guarded. Work not related to pressure tests shall not be permitted in pipe trenches during pressure tests.

— When performing test, the pipe trench and its surrounding shall be guarded with safety distance. Only inspectors can enter the area to perform their work.

Related to equipment:

— Prior to carrying out a pressure test a check shall be made to ensure that the test equipment is calibrated, is in good working order and correctly fitted to the pipelines.

During the test:

— Air shall be exhausted from the pipeline as fully as reasonably possible. Filling shall take place slowly from, if possible, the lowest point in the pipeline and in such a way as to prevent back siphonage and so that air escapes at adequately sized facilities for venting.

— Care shall be taken to fill pipelines with water slowly whilst all facilities for venting are open and the pipelines adequately vented.

— Water used for test, shall be able to be drained without flooding or polluting of the work site.

WARNING — The test methods described in Clauses 5 and 6 are applicable only for water-pressure testing. They shall in no case be applied for air pressure testing because of the serious safety hazards involved in doing so.

5 Preparation of the test sections

5.1 General conditions

The ductile iron pipelines shall be made of ductile iron pipes, fittings and accessories in accordance with ISO 2531, ISO 7186 or ISO 16631, and installed in accordance with ISO 21051.

If other materials than ductile iron are included in the water network, they shall be tested separately. The ductile iron pipeline shall be tested as a whole or, when necessary, subdivided into several test sections selected so that:

— the test pressure can be achieved at the lowest point of each test section;

— a pressure of at least MDP can be achieved at the highest point of each lest section unless otherwise specified by the designer;

— the necessary water for testing can be provided and removed without difficulty.

The length of pipeline test sections should be determined on the basis of the following considerations:

— the local conditions;

— the availability of suitable water;

— the number of fittings and accessories (e.g. valves, hydrants, etc.) constituting the pipeline;

— the difference in elevation between different parts of the pipeline.

— the existence of locking joints:

In the event of partial locking of fittings with pipes to ensure self-anchoring, locked areas can be tested together with unlocked areas.

In case of a completely locked section, provision shall be made to allow the pipe to pull under pressure. The ends of these sections shall not be stopped.

5.2 Pressure pipelines

5.2.1 General

For pressure pipelines, the length of the test sections shall not exceed 1 500 m unless otherwise specified.

5.2.2 Anchoring and closures

It is required to evaluate the hydraulic loads exerted on the ends of the pipeline and set up a properly sized system of anchors, so as to absorb the loads in the timbers buried across the trench or in sheet piling.

Table 2 provides indicative values of a thrust force on a pipeline closure (such as, flanged blank) generated by hydraulic pressure of 1 bar, and a calculation example of the thrust exerted by pressure.