INTERNATIONAL STANDARD

# ISO 10802

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# Ductile iron pipelines — Hydrostatic testing after installation

*Canalisations en fonte ductile — Essais hydrostatiques après pose*



Reference number
ISO 10802:1992(E)

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.



International Standard ISO 10802 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Sub-Committee SC 2, *Cast iron pipes, fittings and their joints*.



Annex A of this International Standard is for information only.



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# Ductile iron pipelines — Hydrostatic testing after installation

## 1 Scope

This International Standard 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.



## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.



ISO 6708:1980, *Pipe components — Definition of nominal size.*

ISO 7268:1983, *Pipe components — Definition of nominal pressure.*

## 3 Definitions

For the purposes of this International Standard, the definition of nominal size (DN) given in ISO 6708, the definition of nominal pressure given in ISO 7268 and the following definitions apply.

**3.1 rated pressure of a component:** Maximum pressure, under steady-state conditions, for which a component is designed.

**3.2 working [operating] pressure:** Maximum pressure, under steady-state conditions, for which a pipeline is designed.

**3.3 maximum working [operating] pressure:** Maximum pressure to which a pipeline is subjected under surge conditions.

**3.4 test pressure:** Pressure to which a pipeline is subjected for testing purposes.

## 4 Selection and preparation of test sections

### 4.1 Recommended length of test sections

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

a) the local conditions;

b) the availability of suitable water;

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

d) the difference in elevation between different parts of the pipeline.

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

**4.1.3** For non-pressure pipelines, the test section is usually the total length between consecutive manholes or inspection points.

If special arrangements are made to enable testing over only part of the length between manholes and inspection points, then the length of the test section shall not exceed 1 000 m unless otherwise specified.

## 4.2 Anchoring and closures

### 4.2.1 Pressure pipelines

All changes in direction and/or cross-section of the pipeline, such as bends, tees, tapers (reducers) and blank flanges, shall be adequately restrained (or anchored) before testing by means of thrust blocks or restraining (self-anchoring) joints.

The design of the restraining (anchoring) devices shall take due consideration of the test pressure to be applied.

Isolation of the test sections shall be achieved by using blank flanges or other types of closures. If, for practical reasons, valves are used as closure pieces, the test pressure shall not exceed the rated pressure of the valves. When evaluating the overall leakage allowance for a test section, due consideration shall be taken of the allowable leakage rate(s) of the valve(s).

### 4.2.2 Non-pressure pipelines

Anchoring of non-pressure pipelines is not usually necessary owing to the low test pressure applied.

## 4.3 Partial backfilling before testing

Pipelines are normally tested after backfilling. However, when particular conditions necessitate that pressure testing be carried out before completion of backfilling or with the pipe joints accessible for examination, sufficient backfill material shall be placed over the pipe barrel between the joints to prevent movement, and due consideration shall be given to restraining thrust forces during the test. In particular, restrained-joint systems which derive their stability from the interaction of the pipe and soil should be backfilled prior to testing.



## 4.4 Filling with water

Filling should normally be carried out at the lowest point of the section to be tested and at a rate slow enough to ensure that all air is evacuated.

The pipeline shall have air-venting facilities at all high points. As a guide, the flow-rate during filling should not exceed 10 % of the design working flow-rate.

Cement mortar lined pipelines require a period of time after filling (depending on site hygrometric conditions) for absorption by the lining to take place.

# 5 Test procedure

**WARNING — The test methods described in this clause 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.**

## 5.1 Pressure pipelines

### 5.1.1 Preliminary operations

**5.1.1.1** After filling and before application of the test pressure, maintain the test section at the working pressure for a sufficient period of time for it to stabilize with respect to line movement under pressure, water absorption by the lining, etc.

Inspect visually all exposed joints, fittings, anchorages and closures and repair all defects, after draining the test section if necessary.

**5.1.1.2** When the visual inspection is satisfactory, raise the pressure steadily until the test pressures specified in 5.1.1.3 and 5.1.1.4 are attained.

**5.1.1.3** The test pressure at the lowest point of the test section shall be not less than the limit specified in a) or b), whichever is greater.

a) for working pressures less than or equal to 10 bar: 1,5 times the working pressure;

   for working pressures greater than 10 bar: the working pressure plus 5 bar;

b) the maximum working pressure.

The test pressure shall not exceed

— the maximum test pressure specified in the standards applicable to the pipes, fittings, flanges and accessories, or

— the design pressure of the restraining or anchoring devices.

**5.1.1.4** The test pressure at the highest point of the test section shall not be less than the working pressure at this point.

### 5.1.2 Pressure test

#### 5.1.2.1 Falling pressure test

Maintain the test pressure constant to $\pm$ 0,1 bar, by pumping if necessary, for a period of at least 1 h. Then disconnect the pump and allow no further water to enter the test section for a period of at least

1 h for DN $\leqslant$ 600

3 h for 600 < DN $\leqslant$ 1 400

6 h for DN > 1 400

At the end of this period, measure the pressure in the test section.

Determine the water loss either by measuring (to an accuracy of ± 5 %) the amount of water it is necessary to pump into the test section to restore the test pressure to within ± 0,1 bar, or by restoring the test pressure and measuring the amount of water it is necessary to draw off the test section to produce an equivalent pressure drop.

#### 5.1.2.2 Constant pressure test

Maintain the test pressure constant to ± 0,1 bar, by pumping if necessary, for a period of at least 1 h.

Then maintain the test pressure constant (to ± 0,1 bar) in the test section by pumping for at least

1 h for DN ⩽ 600

3 h for 600 < DN ⩽ 1 400

6 h for DN > 1 400

and measure (to an accuracy of ± 5 %) the amount of water used to do so.

### 5.1.3 Determination of acceptance

If the water loss determined in 5.1.2.1 or 5.1.2.2 is greater than the acceptable limit specified in 6.1, the test procedure shall be repeated if necessary until full stabilization of the test section has been achieved. If the test is not successful, locate and repair the defects, and repeat the test procedure until the loss is below the limit specified in 6.1, unless otherwise agreed.



### 5.1.4 Testing of the complete pipeline

After all test sections have been found to be acceptable and have been jointed together, it is recommended that a test be carried out on the complete pipeline in accordance with 5.1.1 to 5.1.3, and that all work which has not been subjected to sectional testing be inspected.

## 5.2 Non-pressure pipelines

**5.2.1** After filling and before application of the test pressure, leave the test section for a sufficient period of time to allow water absorption by the lining. During this period, inspect visually all exposed joints, fittings and closures and all defects, after draining the test section if necessary.

**5.2.2** Apply the test pressure by filling the upstream manhole.

Unless maximum water tightness is essential (see 5.2.3), the test pressure shall not exceed

0,4 bar at the crown of the pipe adjoining the upstream manhole;

1 bar at the crown of the pipe adjoining the downstream manhole, unless otherwise specified.

**5.2.3** When maximum water tightness is essential, for instance owing to the presence of a high water table, springs or wells, a test pressure of up to 5 bar may be specified.

**5.2.4** After a test period of 2 h, determine the water loss by measuring the quantity of water it is necessary to add to restore the initial level in the upstream manhole.

**5.2.5** If the water loss determined is greater than the acceptable limit specified in 6.2, the test procedure shall be repeated if necessary until full stabilization of the test section has been achieved. If the test is not successful, locate and repair the defects, and repeat the test procedure until the loss is below the limit specified in 6.2, unless otherwise agreed.

# 6 Acceptance criteria

## 6.1 Pressure pipelines

The water loss shall not exceed 0,001 litre/hour/kilometre of pipeline/millimetre of nominal size/bar of static pressure (average head applied to the test section).

This corresponds to an acceptable loss of 1 l/h per kilometre of DN 100 pipeline tested at 10 bar.

In cases where the elevation of the pipeline varies considerably throughout its length, the acceptable loss shall be determined from a weighted average pressure.

## 6.2 Non-pressure pipelines

The water loss shall not exceed 0,1 litre/kilometre of pipeline/millimetre of nominal size.

However, when a test pressure in excess of 1 bar is specified (see 5.2.3), the acceptance criterion is that of pressure pipelines.

# Annex A
(informative)

## Bibliography

[1] ISO 2531:1991, *Ductile iron pipes, fittings and accessories for pressure pipelines.*

[2] ISO 7186:1983, *Ductile iron pipes and accessories for non-pressure pipe-lines.*

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**Descriptors:** pipelines, pipes (tubes), cast iron products, spheroidal-graphite cast-iron, metal tubes, tests, hydrostatic tests, acceptance testing.

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