INTERNATIONAL STANDARD

ISO 6594

Second edition
2006-03-15

Cast iron drainage pipes and fittings — Spigot series

Tuyaux et raccords salubres en fonte — Série à bouts unis

Reference number
ISO 6594:2006(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 6594 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 6594:1983), which has been technically revised.

Introduction

The distinctive character of discharge pipelines is that products flow though them in a single direction under the force of gravity; they are thus laid on a slight slope in the direction of flow. As a result, they include descending, vertical, oblique or slightly sipping components, but exclude any horizontal or ascending components.

This International Standard consists of sections covering technical specifications, dimensions, and control and compliance testing.

The technical specification applies to cast iron drainage pipes and fittings used for the discharge of waste water, sewage, rainwater and for ventilation. Thirteen of the nominal sizes used in various countries have been selected.

NOTE The nominal size, DN, is a number which permits classification of the pipes and fittings; it is only loosely related to the inside diameter.

For the dimensions and masses, only the most commonly used sizes of the various pipes and fittings were selected. This International Standard does not exclude the use of sizes which may be specified in national standards.

If the nominal masses of finished products (pipes, fittings and accessories) are given in manufacturer's catalogues, the lower deviation is not permitted to exceed the value specified in 3.10.

The tests and controls provided in the final section are intended to be carried out to check compliance with the requirements given in the other two sections.

Cast iron drainage pipes and fittings — Spigot series

1 Scope

This International Standard specifies the characteristics of cast iron drainage pipes and fittings used for the installation of:

— discharge pipes for waste and sewage,

— rain water pipe systems, and

— ventilation pipe systems.

The technical specification is applicable to the range of nominal sizes, DN: 40 – 50 – 70 – 75 – 100 – 125 – 150 – 200 – 250 – 300 – 400 – 500 – 600. Where applicable, national standards and/or regulations could clarify, and possibly restrict, the field of application of the pipes and fittings covered.

In addition, this International Standard gives the dimensions for the most commonly used pipe and fitting sizes.

It also provides control testing and test methods for checking compliance with the technical specification and the dimensional and other requirements.

2 Normative references

The following referenced documents are indispensable for the application 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 185, *Grey cast irons — Classification*

3 Technical specification

3.1 Type of ends and their jointing

Cast iron drainage pipes and fittings are of the spigot type without sockets.

The pipes and fittings may be assembled using various types of joints whose characteristics and tolerances shall be specified in the national standards or, failing these, in manufacturer's catalogues.

In order to achieve satisfactory assembly, each end shall present a free length corresponding at least to the values of Table 1. See Figure 1.

Table 1 — Minimum free lengths

Nominal size DN	Minimum free length l mm
40	25
50	25
70[a]	30
75[a]	30
100	35
125	40
150	45
200	56
250	66
300	76
400	76
500	76
600	76

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

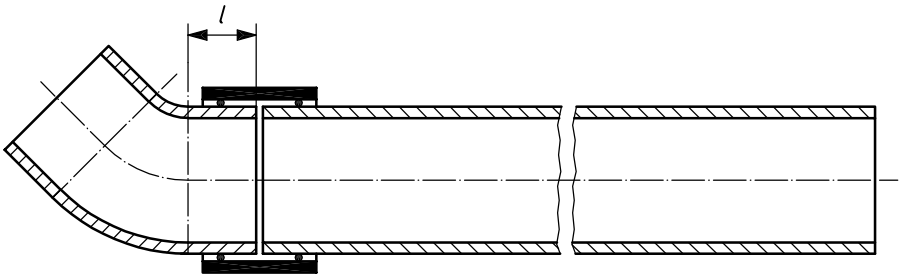

Figure 1

3.2 Quality of cast iron

The quality of the type of cast iron used for drainage pipes and fittings shall be at least 150, in accordance with ISO 185, and have a phosphorous content of less than 0,9 %.

3.3 Quality of pipe and fittings

Drainage pipes and fittings shall be sound and free from surface and other defects which would impair performance or service life.

When fractured, the castings shall show a fine, grey, close and regular grain. Pipes and fittings with small imperfections that are unavoidable due to the manufacturing processes and which are not harmful in any way to their usage shall not be rejected.

Drainage pipes and fittings shall be capable of being cut with the tools normally used for installation.

3.4 Marking

Drainage pipes and fittings shall carry a durable manufacture's mark.

The pipes shall carry this manufacturer's mark and the indication of the nominal diameter at least once per metre of length.

Where possible, the fittings shall have their nominal diameter and, if necessary, the angle of deviation, cast on.

The marking shall be effected outside the region of the joint of the spigot (see 3.1).

3.5 Range of nominal sizes

The range of nominal sizes is [1]:

40 – 50 – 70 –75 – 100 – 125 – 150 – 200 – 250 – 300 – 400 – 500 – 600

3.6 External diameters and tolerances

The external diameters of drainage pipes and fittings and the tolerances applicable are given in Table 2.

Table 2 — External diameters and tolerances

Nominal size DN	External diameter, DE, of pipe body mm	Tolerance on external diameter, DE mm
40	48	$^{+2}_{-1}$
50	58	$^{+2}_{-1}$
70[a]	78	$^{+2}_{-1}$
75[a]	83	$^{+2}_{-1}$
100	110	± 2
125	135	± 2
150	160	± 2
200	210	± 2,5
250	274	± 2,5
300	326	± 2,5
400	429	$^{+2}_{-3}$
500	532	$^{+2}_{-3,5}$
600	635	$^{+2}_{-4}$

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

1) The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

3.7 Thicknesses and tolerances

Table 3 gives the minimum and nominal thicknesses of drainage pipes and fittings, spigot series. See Figure 2. Maximum thicknesses are not specified.

Table 3 — Nominal and minimum thicknesses of pipes and fittings

DN	Thickness *e* mm			
	Pipe		Fitting	
	nom.	min.	nom.	min
40	3,0	2,5	3,7	2,5
50	3,5	3,0	4,2	3,0
70[a]	3,5	3,0	4,2	3,0
75[a]	3,5	3,0	4,2	3,0
100	3,5	3,0	4,2	3,0
125	4,0	3,5	4,7	3,5
150	4,0	3,5	5,3	3,5
200	5,0	4,0	6,0	4,0
250	5,5	4,5	7,0	4,5
300	6,0	5,0	8,0	5,0
400	6,3	5,0	8,3	5,0
500	7,0	5,2	9,0	5,2
600	7,7	5,8	9,7	5,8

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

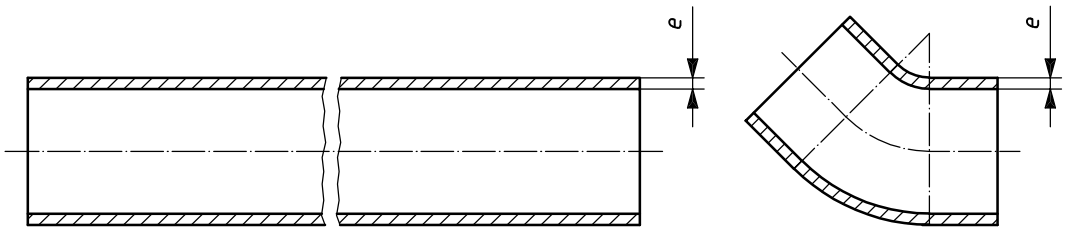

Figure 2

3.8 Lengths and tolerances

The normal manufacturing lengths of the pipes and fittings, and their tolerances, are given in Clause 4.

3.9 Tolerances on angles

The tolerances on the angles of the bends and branches are fixed at ± 2° throughout.

3.10 Masses and tolerances

The negative tolerance with respect to the mass, if indicated in the manufacturer's catalogue, shall be:

— 15 % for pipes;

— 15 % for fittings.

Positive tolerances are not specified, but components whose mass is greater than indicated shall be accepted, provided they satisfy all other requirements of this International Standard.

3.11 Protection

Unless otherwise specified, drainage pipes and fittings shall be supplied coated internally and externally.

The coatings shall dry rapidly, shall not be sticky, shall adhere well, shall not chip and shall be sufficiently resistant to temperature under normal conditions of use, transportation and storage of the products.

The external coatings shall, in addition, be suitable for the application of finish coatings.

4 Dimensions

4.1 Pipe

Symbol:

Tolerance on L of 3 m: $\pm$ 20 mm, for all diameters. See Figure 3.

Dimensions in metres

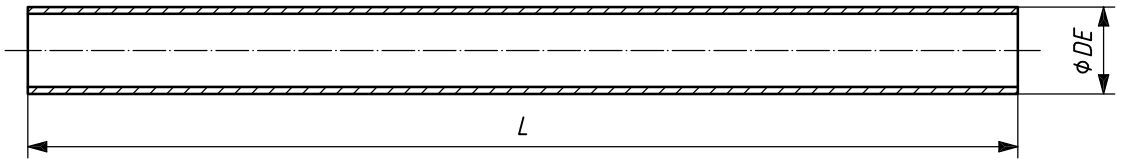

Figure 3

4.2 Fittings

4.2.1 45° bend

Symbol:

Tolerance on a: ± 5 mm. See Table 4 and Figure 4.

Table 4 — 45° bend

Nominal size DN	a mm
40	45
50	50
70[a]	60
75[a]	60
100	70
125	80
150	90
200	110
250	130
300	155
400	247
500	318
600	350

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

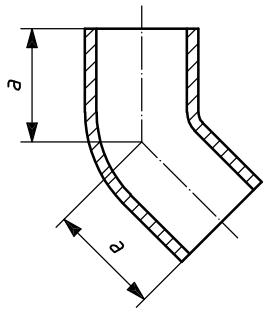

Figure 4

4.2.2 68° bend

Symbol:

Tolerance on a: ± 5 mm. See Table 5 and Figure 5.

Table 5 — 68° bend

Nominal size DN	a mm
40	65
50	70
70[a]	75
75[a]	80
100	90
125	105
150	120
200	145
250	170
300	200

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

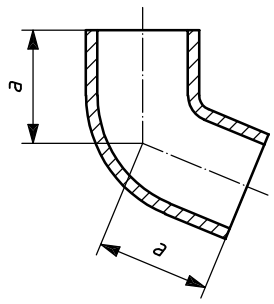

Figure 5

4.2.3 88° bend

Symbol:

Tolerance on a: ± 5 mm. See Table 6 and Figure 6.

Table 6 — 88° bend

Nominal size DN	a mm
40	65
50	75
70[a]	90
75[a]	95
100	110
125	125
150	145
200	180
250	220
300	260

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

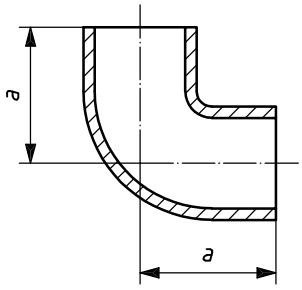

Figure 6

4.2.4 45° single branch

Symbol:

Tolerance on L, a, b: ± 5 mm, for single branch and single branch extended pattern. See Tables 7 and 8 and Figure 7.

Table 7 — 45° single branch

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
40	40	160	115	115
50	50	160	115	115
70[a]	50	170	130	130
70[a]	70[a]	200	145	145
75[a]	50	180	135	135
75[a]	75[a]	215	155	155
100	50	185	150	150
100	70[a]	220	170	170
100	75[a]	220	170	170
100	100	260	190	190
125	100	270	210	210
125	125	305	230	230
150	100	280	225	225
150	125	315	245	245
150	150	355	265	265
200	150	375	300	300
200	200	455	340	340
250	200	470	380	380
250	250	560	430	430
300	250	580	465	465
300	300	660	505	505
400	300	660	555	565
500	300	720	635	680
500	400	875	720	720
600	300	725	690	755
600	400	880	780	800
600	500	1 030	850	870

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

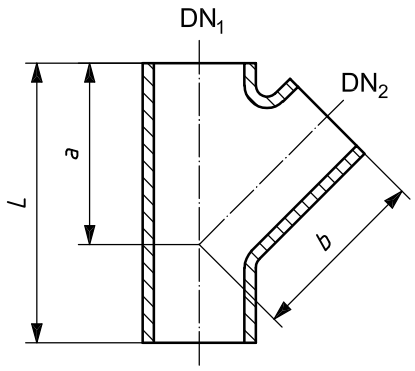

Figure 7

Table 8 — 45° single branch — Extended pattern

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
50	50	185	135	135
70[a]	50	190	150	150
70[a]	70[a]	215	160	160
100	50	200	165	165
100	70[a]	235	185	185
100	100	275	205	205
125	100	280	220	220
125	125	320	240	240
150	100	295	240	240
150	125	325	255	255
250	200	480	390	390

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

4.2.5 68° single branch

Symbol:

Tolerance on L, a, b: $\pm$ 5 mm, for single branch and single branch extended pattern. See Tables 9 and 10 and Figure 8.

Table 9 — 68° single branch

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
50	50	145	85	85
70[a]	50	145	90	90
70[a]	70[a]	170	100	100
75[a]	50	155	95	95
75[a]	75[a]	180	110	110
100	50	155	100	100
100	70[a]	180	110	110
100	75[a]	185	115	115
100	100	220	130	130
125	100	225	140	140
125	125	255	155	155
150	100	235	150	155
150	125	265	165	170
150	150	295	180	180
200	150	310	200	210
200	200	365	225	225
250	200	390	255	265
250	250	460	285	285
300	250	485	315	320
300	300	545	345	345

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

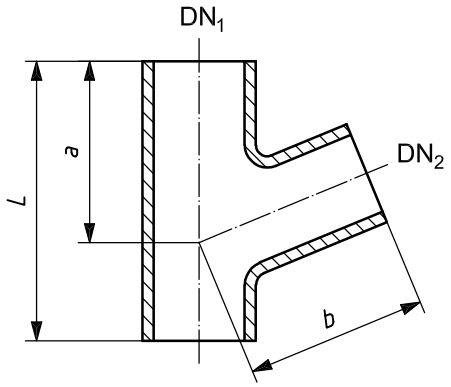

Figure 8

Table 10 — 68° single branch — Extended pattern

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
100	50	155	100	110
100	70[a]	180	110	120
100	75[a]	185	115	125

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

4.2.6 68° double branch

Symbol:

Tolerances on L, a, b: ± 5 mm. See Table 11 and Figure 9.

Table 11 — 68° double branch

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
70[a]	50	145	90	90
75[a]	50	155	95	95
70[a]	70[a]	170	100	100
75[a]	75[a]	180	110	110
100	70[a]	180	110	120
100	75[a]	185	115	125
100	100	220	130	130
125	100	225	140	140
125	125	255	155	155
150	125	265	165	170
150	150	295	180	180
200	150	310	200	210
200	200	365	225	225

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

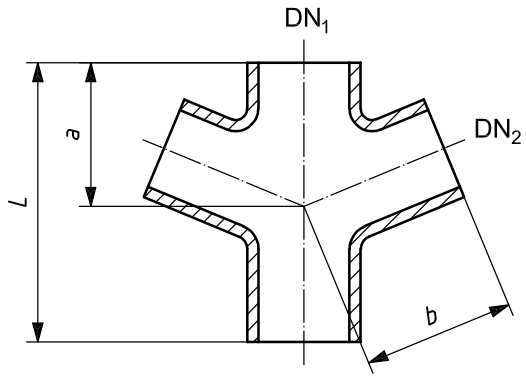

Figure 9

4.2.7 88° single branch

Symbol:

Tolerances on L, a, b: $\pm$ 5 mm for single branch and single branch extended pattern. See Tables 12 and 13 and Figure 10.

Table 12 — 88° single branch

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
50	50	145	65	75
70[a]	70[a]	170	85	95
75[a]	75[a]	180	85	95
100	100	220	105	115
125	125	255	125	135
150	150	295	145	155
200	70a	240	115	170
200	75a	250	120	170
200	100	270	125	175
200	200	365	180	180
250	250	455	225	225
300	300	530	265	265

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

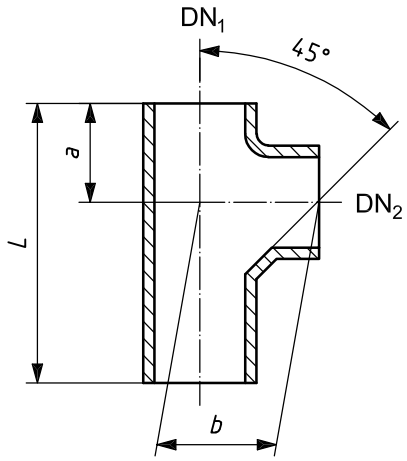

Figure 10

Table 13 — 88° single branch — Extended pattern

Nominal size		L	a	b
DN_1	DN_2	mm	mm	mm
50	50	145	65	85
70[a]	70[a]	180	85	95
200	200	380	180	200
250	250	470	225	240

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

4.2.8 Diminishing pieces

Symbol:

Tolerances on L: ± 5 mm. See Table 14 and Figure 11.

Table 14 — Diminishing pieces

Nominal sizes		L
DN_1	DN_2	mm
50	40	75
70[a]	50	75
75[a]	50	80
100	50	80
100	70[a]	85

Table 14 (*continued*)

Nominal sizes		L
DN_1	DN_2	mm
100	75[a]	90
125	70[a]	90
125	75[a]	95
125	100	95
150	70[a]	100
150	75[a]	100
150	100	105
150	125	110
200	100	115
200	125	120
200	150	125
250	150	135
250	200	145
300	200	160
300	250	170
400	300	200
500	300	200
500	400	200
600	400	200
600	500	200

[a] The range of nominal sizes and their classification differ slightly from one country to another. The use of DN 70 or DN 75 is subject to national standards or regulations.

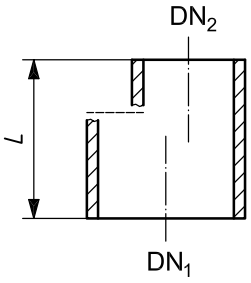

Figure 11

4.2.9 Tees with an access door

Symbol:

To allow cleaning of the pipelines, manufacturing ranges of fittings shall include tees with a leak-tight plate.

The minimum dimension, *l*, of the opening of tees with an access door up to and including DN 100 shall be at least equal to the number of the nominal size in millimetres. For tees over DN 100, the minimum opening dimension, *l*, shall be at least 100 mm.

See Figure 12.

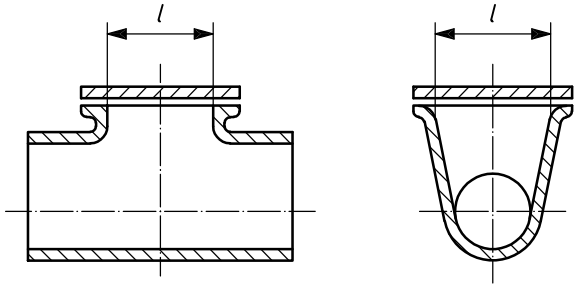

Figure 12

5 Control testing and test methods

5.1 Testing of castings

5.1.1 Dimensions

5.1.1.1 Measure all lengths indicated in the tables of this International Standard to an accuracy of 1 mm.

5.1.1.2 Ascertain the external diameter at a distance of 20 mm to 30 mm from the pipe end, to an accuracy of 0,2 mm. Make two measurements on two axes 90° apart. Each reading shall be within the specified tolerances.

5.1.1.3 Measure all thicknesses to an accuracy of 0,1 mm in at least two diametrically opposed positions. Each reading shall be within the specified tolerances. Spherical end callipers (ball gauges) are recommended to be used for this measurement.

5.1.1.4 Fittings angles shall be determined to an accuracy of 30′.

5.1.2 Quality of cast iron

Testing shall be carried out according ISO 185.

Check the minimum tensile strength on separately cast test bars. The phosphorous content shall be determined by chemical analysis or any other appropriate procedure, for example, spectrometry.

5.1.3 Quality of pipes and fittings

Carry out the following controls and tests on the raw castings.

a) Visual inspection and ringing test

Visually inspect the inside and outside walls using an appropriate light source (e.g. against the light) and carry out a ringing test by lightly tapping with a hammer.

b) Cutting test

Carry out this test using a cutting tool saw in order to check that pipes are capable of being cut.

c) Crush tests on pipe rings

Perform crush tests on three rings at least 60 mm long, with parallel ends, and cut square to the axis from uncoated pipes.

1) Crush the rings between parallel platens (without V-support) of a length greater than that of the ring.

2) Calculate the strength, σ, using the following equation:

$$\sigma = \frac{3F\left(d - e\right)}{\pi b e^2}$$

where

F is the load applied, in newtons (N);

d is the mean outside diameter of ring before testing, in millimetres (mm);

e is the mean thickness measured at the rupture level, in millimetres (mm);

b is the mean length, in millimetres (mm).

The measured strength shall be at least 300 N/mm^2 for an average of three tests.

5.2 Testing coated products

5.2.1 Marking

Carry out a visual inspection to determine compliance according to 3.4.

5.2.2 Masses

If specified by manufacturer, carry out a control by weighing to an accuracy of 100 g.

5.2.3 Coating

Carry out a visual inspection to determine compliance according to 3.11.

5.3 Quality control

5.3.1 General

In order to ensure constant pipe and fitting quality, the manufacturer shall perform the quality control operations according to 5.3.2 and 5.3.3.

5.3.2 Inspection by the manufacturer

5.3.2.1 The manufacturer shall check the quality of the pipes and fittings of his own production at each plant. For each new or repaired model and for each new or repaired metal mould, it is required that, before starting mass production, a sufficient number of samples of prototypes (at least five) are checked, in order to meet the requirements of this International Standard.

5.3.2.2 During mass production the following shall be checked.

a) On each casting:

- pipe and fitting quality, checked by visual inspection and ringing test [see 5.1.3 a)];
- marking (see 5.2.1);
- coating (see 5.2.3).

b) On randomly taken castings:

- external diameter (see 5.1.1.2);
- wall thickness (see 5.1.1.3);
- cast iron quality (see 5.1.2);
- masses (see 5.2.2);
- results of cutting and ring crush tests [see 5.1.3 b) and c)].

The testing frequency and number of samples tested shall be determined according to the volume, schedule and method of production of each plant in order that compliance with the requirements of Clauses 3 and 4 of this International Standard be ensured from start to finish of the manufacturing process.

5.3.2.3 If the test results are not satisfactory, the manufacturer shall immediately take adequate measures to remedy the defects discovered. If necessary, customers shall be informed to preclude the possibility of damage resulting from those defects.

Once the defects have been corrected, the appropriate tests shall be repeated, if necessary.

Those products which do not meet the requirements of this International Standard shall be rejected.

5.3.2.4 The test results shall be recorded and, as far as possible, statistically assessed. Test records shall be kept for five years.

5.3.3 Quality control — Inspection

Conformity of the pipes and fittings to the requirements of this International Standard shall be guaranteed by quality control.

Such quality control is to be carried out at the customer's request according to the national standards and regulations in force in the countries of use.

5.4 Certificate

If so requested by the purchaser with his order, the manufacturer shall supply a certificate stating that the items conform to this International Standard.

ICS 77.140.75; 91.140.80

Price based on 18 pages