

Threaded pipe fittings in malleable cast iron and cast copper alloy

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- British Malleable Tube Fittings Association
- British Plumbing Fittings Manufacturers' Association
- Co-opted Members

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Foreword

This British Standard has been prepared by panel ISE/19/-/3. It supersedes BS 143 & 1256:1986, which is withdrawn.

In 1968, BS 143, the standard for malleable cast iron fittings, and BS 1256, which covered fittings with parallel internal threads and taper external threads, were revised and incorporated into one standard, BS 143 & 1256. The 1986 revision of BS 143 & 1256 was related to and followed the general format of ISO 49:1983, *Malleable cast iron fittings threaded to ISO 7-1*. ISO 49 was revised in 1994 and this second edition was used as the basis for preparation of the new European Standard EN 10242, which was subsequently adopted as BS EN 10242.

The range of fitting sizes and types specified in BS EN 10242 did not fully align with BS 143 & 1256:1986, so this revision details the fittings not covered by BS EN 10242 that are in regular production by UK manufacturers. For malleable iron fittings, the technical requirements have been aligned, where appropriate, with BS EN 10242 to obviate dual production requirements, and the style of BS EN 10242 has been generally adopted.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 24, an inside back cover and a back cover.

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1 Scope

This British Standard specifies requirements for design and performance of threaded pipe fittings in malleable cast iron and cast copper alloy for two basic designs:

- a) BS 143, with taper external and taper internal threads;
- b) BS 1256, with taper external and parallel internal threads.

This British Standard applies to fittings in the following categories:

- 1) category 1: BS 143 design and BS 1256 design, in a limited range of malleable cast iron fitting sizes and types with threads conforming to BS 21 (ISO 7-1), and that are not included in BS EN 10242;
- 2) category 2: BS 143 design only, in a full range of malleable cast iron fitting sizes and types with threads conforming to ANSI/ASME B1.20.1 (NPT);
- 3) category 3: BS 143 design only, in a limited range of cast copper alloy fitting sizes and types, with threads conforming to BS 21 (ISO 7-1) or ANSI/ASME B1.20.1 (NPT).

These fittings are for general purposes for transmission of fluids and gases up to the limits of pressure and temperature specified in this British Standard. They are intended for connection of elements with threads conforming to BS 21 (ISO 7-1) or ANSI/ASME B1.20.1 (NPT), in sizes 1/8 to 6 for malleable cast iron fittings and sizes 1/8 to 2 for cast copper alloy fittings.

NOTE For use in conditions outside the pressure and temperature limits specified in this British Standard, reference should be made to the manufacturer.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 21:1985, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)*.

BS 2779:1986, *Specification for pipe threads for tubes and fittings where pressure-tight joints are not made on the threads (metric dimensions)*.

BS EN 1562:1997, *Founding — Malleable cast irons*.

BS EN 1982:1999, *Copper and copper alloys — Ingots and castings*.

BS EN 10204:1991, *Metallic products — Types of inspection documents*.

BS EN ISO 6708:1996, *Pipework components — Definition and selection of DN (nominal size)*.

ANSI/ASME B1.20.1:1983, *Pipe threads, general purpose (inch)*.

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in BS EN ISO 6708 and the following apply.

3.1

fitting

connecting piece of one or more parts

3.2

jointing thread

thread conforming to BS 21

3.3

fastening thread

thread conforming to BS 2779

3.4

fitting size

designation of thread size of threaded outlet

NOTE See 13.2 for fittings with more than one thread size.

3.5

nominal size

see BS EN ISO 6708

NOTE 1 Nominal size is designated by the letters DN followed by a number.

NOTE 2 Guidance on the relationship between fitting size and nominal size is given in annex A.

NOTE 3 Nominal size should not be used for designation of fitting size.

3.6

reinforcement

additional material on the outside diameter of an internally threaded fitting in the form of a band or bead

3.7

rib

local and axially aligned additional material on the outside or inside of a fitting used to assist in manufacturing or assembly

3.8

outlet

internally or externally threaded end of a fitting that can connect to a tube, fitting or other component

3.9

run

two principal axially aligned outlets of fittings with more than two outlets

3.10

branch

side outlet(s) of a tee, pitcher tee or cross

3.11**chamfer**

machined or cast surface in the form of a cone at the entrance of a thread used to assist assembly and to prevent damage to the start of the thread

3.12**face-to-face dimension**

distance between the two parallel faces of axially aligned outlets of a fitting

3.13**face-to-centre dimension**

distance between the face of an outlet and the central axis of an angularly disposed outlet

3.14**centre-to-centre dimension**

distance between the axes of the two outlets of a return bend

4 Types of fitting

Table 1 gives the fitting types and corresponding symbols used in this British Standard, together with a reference to the table in which their sizes and dimensions are specified.

NOTE The symbols relate to identification of fittings and may be used for designation (see 13.1).

5 Materials**5.1 Fittings****5.1.1 Malleable cast iron**

Malleable cast iron for fittings shall conform to BS EN 1562. The grade of material shall be selected from the following:

- grades EN-GJMW-400-5 or EN-GJMW-350-4 for fittings in whiteheart malleable cast iron;
- grades EN-GJMB-350-10 or EN-GJMB-300-6 for fittings in blackheart malleable cast iron.

5.1.2 Other ferrous materials

Other ferrous materials with mechanical properties at least equivalent to the malleable cast irons specified in 5.1.1 may be used for straight fittings up to and including 3/8, but shall not be used for unions or for larger fittings.

5.1.3 Cast copper alloy

Cast copper alloy for fittings shall conform to BS EN 1982. The grade of material shall be selected from the following:

- symbol CuSn3Zn8Pb5-C, alloy no. CC 490K;
- symbol CuSn5Zn5Pb5-C, alloy no. CC 491K;
- symbol CuSn7Zn2Pb3-C, alloy no. CC 492K.

5.2 Gasket material

If the purchaser states that the gasket could come into contact with potable water (see annex B) the material shall either:

- conform to annex C; or
- conform to the purchaser's own specification.

NOTE If the purchaser does not indicate a gasket material, the gasket material is not covered by this British Standard.

5.3 Hot dip zinc coating**5.3.1 General**

If zinc coating protection is required on malleable cast iron fittings, it shall be applied by the hot dip process and shall conform to 5.2.2 to 5.2.4.

NOTE For fittings of other ferrous materials (see 5.1.2) alternative zinc coating may be provided by agreement with the purchaser.

5.3.2 Chemical composition

The content by mass of the accompanying elements in the finish zinc coating shall not exceed the following:

- aluminium (Al): 0.1 %;
- antimony (Sb): 0.01 %;
- arsenic (As): 0.02 %;
- bismuth (Bi): 0.01 %;
- cadmium (Cd): 0.01 %;
- copper (Cu): 0.1 %;
- lead (Pb): 1.6 % (or by agreement, 1.8 %);
- tin (Sn): 0.1 %.

5.3.3 Coating mass per surface unit

The surface related mass of the zinc coating shall be not less than 500 g/m², as a mean of five fittings. (This corresponds to a medium layer thickness of 70 µm.) The surface related mass of the zinc coating shall not be less than 450 g/m² (63 µm) measured on any individual sample.

NOTE The medium layer thickness $\bar{s}$ of the zinc coating, in micrometres, can be calculated by using the approximation formula:

$$\bar{s} = \frac{m_A}{7.2}$$

where

m_A is the surface related mass of the zinc coating in g/m².

5.3.4 Surface condition

Zinc coating on the internal surface of the fitting shall be continuous, except for with machined black surfaces. The internal zinc coating shall be free from zinc blisters, zinc burrs and non-metallic remainders.

NOTE In the special case of larger material cross-sections, it is permissible for the iron-zinc alloy phases to grow through.

5.4 Despatch conditions of finished fittings

The surfaces of fittings shall be free of polycyclic aromatic hydrocarbons.

Table 1 — Index of fitting types, symbols and specifying tables of this British Standard

Fitting type	Description	Symbol	Outlets type/pattern no.	Table no.
A	Elbows	A1	Female-equal outlets	3
			Female-reducing outlets	4
		A4	Male/female-equal outlets	3
			Male/female-reducing outlets	4
	45° elbows	A1/45°	Female-equal outlets	5
		A4/45°	Male/female-equal outlets	
B	Tees	B1	Female-equal outlets	3
			Female-reducing outlets	6, 7
			Female-increasing outlets	6
		B4	Male/female-equal outlets	3
C	Crosses	C1	Female-equal outlets	3
D	Bends	D1	Female-equal outlets	8
		D4	Male/female-equal outlets	8
		D8	Male-equal outlets	8
	45° bends	D4/45°	Male/female-equal outlets	9
E	Pitcher tees	E1	Female-equal outlets	10
			Female-reducing outlets	10
	Twin elbows	E2	Female-equal outlets	8
Kb	Return bends	Kb1	Female-equal outlets	11
M	Sockets	M2	Female-equal outlets	12
			Female-reducing outlets	
		M3	Female-reducing outlets	
		M4	Male/female-reducing outlets	
N	Bushes	N4	Pattern I	13
			Pattern II	
	Hexagon nipples	N8	Male-equal	14
			Male-reducing	
P	Backnuts	P4	—	15
T	Caps	T1	—	16
	Plugs	T8	Plain pattern	16
		T9	Beaded pattern	
		T11	Countersunk pattern	
U	Unions	U1	Female-flat seat pattern	17
		U11	Female-taper seat pattern	
		U12	Male/female-taper seat pattern	
UA	Elbow unions	UA11	Female-taper seat pattern	18
		UA12	Male/female-taper seat pattern	

6 Design

6.1 Design options are based on the basic design, thread type and material grade. Fittings shall conform to one of the design options given in Table 2.

6.2 The face-to-face, face-to-centre and centre-to-centre dimensions of fittings shall conform to Tables 3 to 18.

NOTE The drawings in Tables 3 to 18 are diagrammatic and should not limit the manufactured form of the fittings.

6.3 Bushes, nipples, backnuts, plugs, and unions shall be provided with flats for assembly purposes. Flats on plugs shall be square except that for sizes 5 and 6 a slotted head may be provided as shown in Table 16. Flats on other fittings (except unions) shall be hexagonal on sizes ¾ and below, and hexagonal or octagonal on sizes above ¾. Flats on unions may be hexagonal, octagonal or decagonal.

All other fittings shall be reinforced at the internally threaded end with a band or bead (see Figure 1) except that caps and sockets may alternatively have a polygonal shaped reinforcement.

6.4 Manufacturers may incorporate ribs at their discretion. Ribs shall not project higher than the band or bead.

6.5 Backnuts shall be plain or recessed.
NOTE One face of each backnut may be machined.

- 6.6 Plugs shall be:
- a) solid type for sizes ¼ and ½;
 - b) solid or hollow type for sizes ¾ to 4;
 - c) hollow type for sizes 5 and 6.

6.7 Two typical types of seat for unions and their designations are given in Tables 17 and 18. Unions with other types of seat design and unions with seats of materials other than specified in 5.1 may be considered to conform to this standard if they conform to Tables 17 and 18 and the other requirements of this standard. (These unions do not have a formal designation.) Gaskets for type U1 unions shall conform to Table 19. If the gasket could come into contact with potable water, the gasket material shall conform to annex C.

Table 2 — Design options

Design option	Basic design	Thread type		Material grade	
		External	Internal	Malleable cast iron	Copper alloy
1	BS 143	R	R _c	EN-GJMB-300-6	—
2	BS 1256	R	R _p	EN-GJMB-350-10	
3	BS 143	NPT	NPT	EN-GJMW-350-4 EN-GJMW-400-5	
4	BS 143	R	R _c	—	CC 490K
5	BS 143	NPT	NPT		CC 491K CC 492K

NOTE 1 The design option is for manufacturers only. It does not indicate design options available for the purchaser.
NOTE 2 BS 143 and BS 1256 design fittings in malleable iron are also identified in BS EN 10242 and ISO 149 by design symbols A, B, C, or D depending on the material grade and thread type.

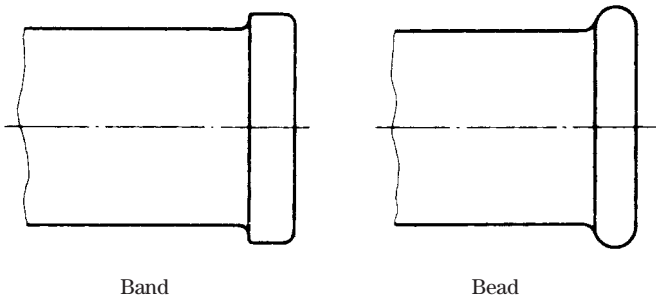
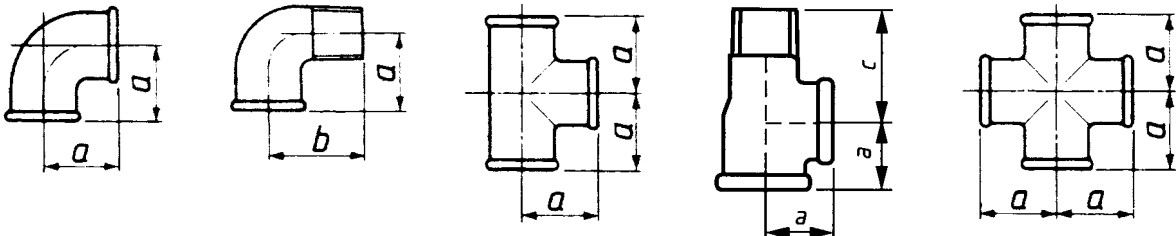


Figure 1 — Forms of reinforcement

Table 3 — Elbows A1; male and female elbows A4; tees B1; male and female tees B4; crosses C1

												
Elbows A1		Male/female elbows A4		Tees B1		Male/female tees B4		Crosses C1				
Fitting size										Dimensions		
A1		A4		B1		B4		C1		a mm	b mm	c mm
Cat. 2	Cat. 3	Cat. 2	Cat. 3	Cat. 2	Cat. 3	Cat. 1	Cat. 2	Cat. 2	Cat. 3			
1/8	—	1/8	—	1/8	1/8	—	—	—	—	19	25	—
1/4	1/4	1/4	1/4	1/4	1/4	—	—	1/4	—	21	28	—
3/8	3/8	3/8	3/8	3/8	3/8	—	—	3/8	—	25	32	—
1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	28	37	41
3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	—	33	43	48
1	1	1	1	1	1	1	1	1	—	38	52	54
1 1/4	1 1/4	1 1/4	—	1 1/4	1 1/4	—	—	1 1/4	—	45	60	—
1 1/2	1 1/2	1 1/2	—	1 1/2	1 1/2	—	—	1 1/2	—	50	65	—
2	2	2	—	2	2	—	—	2	—	58	74	—
2 1/2	—	2 1/2	—	2 1/2	—	—	—	2 1/2	—	69	88	—
3	—	3	—	3	—	—	—	3	—	78	98	—
4	—	4	—	4	—	—	—	4	—	96	118	—
5	—	—	—	5	—	—	—	—	—	115	—	—
6	—	—	—	6	—	—	—	—	—	131	—	—

NOTE For an explanation of the categories see clause 1.

NOTE For an explanation of the categories see clause 1.