

AS/NZS 2544:1995

Australian/New Zealand Standard

Grey iron pressure fittings

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Grey iron pressure fittings

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS/16 on Cast Iron Pressure Pipes and Fittings to supersede AS 2544—1982, *Grey iron pressure pipes and fittings*, because of a revision of AS 2280, *Ductile iron pressure pipes and fittings*, and the publication of AS 4087, *Metallic flanges for waterworks purposes*. It is issued as a Joint Standard.

The objective of this document is to provide a standard manufacturing specification to be used by manufacturers and purchasers of grey iron pressure fittings.

Requirements for pipes have been removed from this Standard as grey iron pipes are no longer manufactured for pressure applications.

Fittings dealt with by this Standard are intended primarily for use with water supply pressure pipes having compatible outside diameters, but can be used with other pressure pipes by means of suitable adaptors. Tables in this Standard relate only to the dimensions of the bodies and spigot ends of fittings.

Flanged joints shall be in accordance with AS 4087.

This Standard sets out manufacturing requirements and dimensions for fittings. The works hydrostatic test pressures specified in Clause 3.3 are intended primarily to detect casting flaws and bear no relation to safe working pressures for the fittings. As stated in the Foreword, no attempt has been made to relate wall thicknesses of fittings to any particular working pressure.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

The wall thickness for cast grey iron fittings depends on several factors, including the following:

- (a) The internal pressure to which the fittings are likely to be subjected, including pressure due to water hammer.
- (b) The external loads expected to be applied to the fittings when laid which depend on the depth of the pipeline in the ground and other pipe laying conditions.
- (c) Stresses due to expansion and contraction.
- (d) Stresses incurred during handling.
- (e) Allowances for corrosion.

Because the effect of many of these factors cannot be precisely anticipated, this Standard does not attempt to relate the specified thickness of the fitting to particular internal working pressures.

It is the responsibility of the designer of the pipeline to evaluate the effect of the prevailing factors and to ensure that fittings manufactured to this Standard are suitable for the proposed application. Fittings of higher strength may be achieved by the use of a higher grade of cast iron or greater wall thickness.

Where pipeline designers are combining uPVC pipes with fittings manufactured to this Standard, the following should be considered when assessing safe depth of pipe entry into fitting sockets:

- (a) Thermal expansion and contraction.
- (b) Joint deflection.
- (c) Viscoelasticity of pipeline material.
- (d) Off square pipe cuts and chamfer lengths.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Grey iron pressure fittings**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies requirements for grey iron fittings of nominal sizes up to and including DN 600.

The fittings are intended primarily for the conveyance of water under pressure, but they may be used for the conveyance of sewage or other fluids.

This Standard specifies one class of fitting. It does not imply any correlation between the wall thicknesses specified and working pressure.

NOTES:

- 1 Guidelines to purchasers on requirements that should be agreed upon at the time of the enquiry or order are detailed in Appendix A.
- 2 Cast grey iron fittings complying with this Standard are compatible with pipes and fittings of other materials.

1.2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1199	Sampling procedures and tables for inspection by attributes
1391	Methods for tensile testing of metals
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
1646	Elastomeric seals for waterworks purposes
1816	Metallic materials—Brinell hardness test
1830	Iron castings—Grey cast iron
1984	Vernier callipers (metric series)
2101	Internal micrometers (including stick micrometers) (metric series)
2102	Micrometer callipers for external measurement
2758	Aggregates and rock for engineering purposes
2758.1	Part 1: Concrete aggregates
3500	National Plumbing and Drainage Code
3500.0	Part 0: Glossary of terms
3855	Suitability of plumbing and water distribution systems products for contact with potable water
3972	Portland and blended cements
4087	Metallic flanges for waterworks purposes

AS/NZS	
3750	Paints for steel structures
3750.4	Part 4: Bitumen paint
4158	Polymeric coatings on valves and fittings for water industry purposes
4158.1	Part 1: Thermal-bonded coatings
ISO 9000	Quality management and quality assurance standards
ISO 9000.1	Part 1: Guidelines for selection and use
ISO 9004	Quality management and quality system elements
ISO 9004.1	Part 1: Guidelines
SAA/SANZ	
HB18	Guidelines for third-party certification and accreditation
HB18.44	Guide 44—General rules for ISO or IEC international third party certification schemes for products
BS	
3148	Methods of test for water for making concrete (including notes on the suitability of the water)

1.3 DEFINITIONS For the purpose of this Standard, the definitions given in AS 3500.0 and those below apply.

1.3.1 Bulkhead testing condition—a condition of testing for a fitting whereby a test machine is used to anchor and seal the joints on the fitting being tested.

1.3.2 Coating—a corrosion-inhibiting medium applied to the external surface of a fitting.

1.3.3 Effective length—the overall length of a fitting measured along its centreline, but excluding the depth of any socket(s).

1.3.4 Fettling—the cleaning of castings, removal of fins, gates and the like, by chipping, grinding or other mechanical means.

1.3.5 Free-end testing condition—a condition of testing for a flanged fitting whereby the flanged end or ends under test are fitted with a blanking piece without external restraint.

1.3.6 Lining—a medium applied to the internal surface of a fitting.

1.3.7 Mortar—cement mortar consisting of portland cement, inert aggregates and water.

1.3.8 Test piece—a prepared piece for testing, made from a test specimen by some mechanical operation.

1.3.9 Test sample—a portion of material or a group of items selected from a batch or consignment by a sampling procedure.

1.3.10 Test specimen—a portion of material or a single item taken from the test sample for the purpose of applying a particular test.

1.4 MARKING Fittings shall be clearly and indelibly marked with the following information:

- (a) Manufacturer's name or trademark.
- (b) Nominal size.
- (c) Where applicable, the angle of the fitting.
- (d) Grey or 'GI'.
- (e) Number of this Standard, i.e. AS/NZS 2544.

Any mark required by the purchaser, after inspection and passing of the fitting, shall be indented on the ground surface of a 25 mm diameter boss which is cast onto the fitting.

NOTE: Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, or on packaging or promotional material related to that product, are advised to ensure that such compliance is capable of being verified. Information on alternative means for demonstrating compliance with this Standard is given in Appendix B.

1.5 AUSTRALIAN WATER AUTHORITY REQUIREMENTS For Australian Water Authority contracts, the informative requirements of Appendix B shall be taken as normative requirements.

SECTION 2 MANUFACTURE AND FINISH

2.1 QUALITY OF METAL The processed metal from which the fittings are manufactured shall be grey iron complying with the tensile and hardness requirements of Clauses 3.1 and 3.2, respectively.

2.2 MODE OF CASTING Fittings shall be cast in moulds and shall not be removed from the moulds until cooling has progressed far enough to avoid all risks of distortion, cracking or other defects arising from the removal of the fitting from the mould.

NOTE: After withdrawal from the moulds, fittings may require heat treatment to achieve compliance with Clauses 3.1 and 3.2.

2.3 FINISH

2.3.1 General Fittings shall be manufactured to comply with the specified dimensions and performance requirements.

2.3.2 Defects Minor surface defects may be rectified by fettling, provided that the specified dimensions and performance requirements are attained. Small surface imperfections, inseparable from the method of manufacture and which are not detrimental to the functional quality of the casting, shall be accepted, provided that they do not prevent compliance with any other requirement of this Standard. Cracks and tears in the metal shall not be repaired.

SECTION 3 TESTING

3.1 TENSILE STRENGTH TEST When tested in accordance with Appendix C and AS 1391, the minimum tensile strength of any fitting shall be as specified for T-series grey iron castings designated AS 1830/T-220.

3.2 HARDNESS TEST When tested in accordance with Appendix C and AS 1816, the Brinell hardness (HB) at the outside surface of any fitting shall be as specified for H-series grey iron castings designated AS 1830/H-229.

3.3 WORKS HYDROSTATIC PRESSURE TESTS

3.3.1 General The works hydrostatic test procedures, as specified in Appendix D, are intended primarily to detect casting flaws and bear no relation to safe working pressures for the fittings.

3.3.2 Flexible joints test When fittings are tested in accordance with Appendix D, they shall not leak or sweat.

3.4 EFFECT ON WATER Materials in contact with potable water shall comply with AS 3855.

3.5 CEMENT MORTAR LINING Cement mortar lining shall be tested in accordance with Appendix E.

S E C T I O N 4 J O I N T S

4.1 GENERAL Fittings specified in this Standard may be used with a variety of jointing systems and pipe materials.

All joint ring gaskets shall be manufactured from elastomeric materials complying with AS 1646.

Spigot ends of fittings shall be suitable for use with push-in type elastomeric ring or mechanical joints and shall comply with dimensions given in Figure 5.1.

Socket profiles and dimensions are not an integral part of this Standard, the design of socket joints being the responsibility of the individual manufacturers. The minimum depth of entry past the seal, for fittings intended for use with UPVC pipe, shall be in accordance with Table 4.1.

A joint shall provide a positive seal within the manufacturer's range of maximum allowable joint deflection and withdrawal allowance under all combinations of joint and gasket dimensional tolerances, including ovality.

The elastomeric ring joint shall be type-tested for a range of pressures from -80 to +4500 KPa for DN 100 to DN 300, and from -80 to +3600 kPa for DN 375 to DN 600 for a minimum of 2 h at $20 \pm 5^\circ\text{C}$ without leakage at the maximum allowable joint deflection.

4.2 FLANGED JOINTS Integral flanges for flanged joints on fittings shall comply with the requirements of AS 4087.

4.3 SOCKETED JOINTS Socketed joints shall maintain a seal under test conditions in accordance with Table 4.2.

NOTE: The manufacturer's guidance should be obtained with regard to interchangeability where pipes and fittings of differing designs or materials are to be jointed.

TABLE 4.1
DEPTH OF ENTRY (FOR uPVC PIPES)

Nominal Size DN	Minimum depth of entry beyond elastomeric seal, mm
100	43
150	48
200	56
225	61
250	69
300	67
375	73
450	80
500	84
525	84
600	91

NOTES:

- 1 The socket depths given take into account the higher coefficient of thermal expansion applicable to uPVC pipe material.
- 2 The depths given are based on a temperature differential of 30°C. Temperature differentials in excess of 30°C may require a greater depth of entry.
- 3 Information on effective depth of seal for particular joint designs should be sourced from the manufacturer.

TABLE 4.2
JOINT DEFLECTIONS

Nominal size DN	Minimum deflection nominal dimensions	
	Radians	Degrees
100 to 250	0.06	3° 26'
300 to 600	0.04	2° 18'

SECTION 5 DIMENSIONS AND TOLERANCES OF FITTINGS

5.1 DIMENSIONS The dimensions of the fittings shall be in accordance with Figures 5.2 to 5.20 as appropriate to the type and size of fitting. The external diameters of spigots and barrels of fittings shall be in accordance with Figure 5.1.

NOTE: Symbols for fittings should be in accordance with Appendix F.

Dimensions shall be determined in accordance with Appendix G.

5.2 TOLERANCE ON DIMENSIONS AND MASS

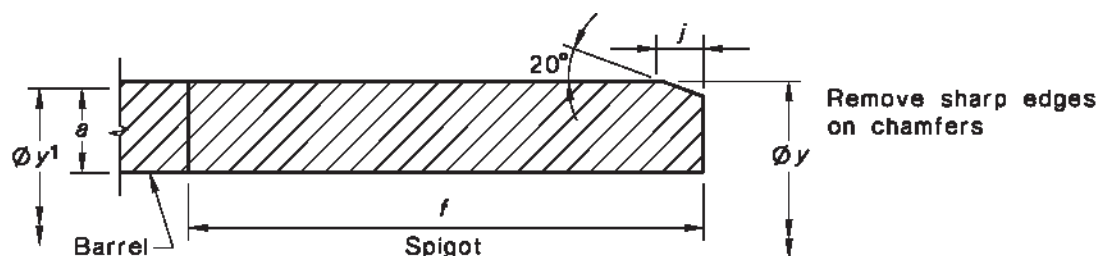
5.2.1 Tolerance on dimensions The following tolerances on the dimensions of fittings shall be permitted:

- (a) *Outside diameter of spigots and barrels* See Figure 5.1.
- (b) *Thickness* Values given in Figures 5.1 and 5.23 are minimum values.
- (c) *Length* Tolerances include—
 - (i) ± 6 mm for fittings with any combination of ends; and
 - (ii) ± 1.5 mm for fittings with double flanged ends.

5.2.2 Tolerance on mass The tolerance on the mass of a fitting shall be $\pm 10\%$ of the mass nominated by the manufacturer.

5.2.3 Ovality of fittings Ovality of barrels and spigots of fittings shall be accepted, within the tolerances specified in Figure 5.1.

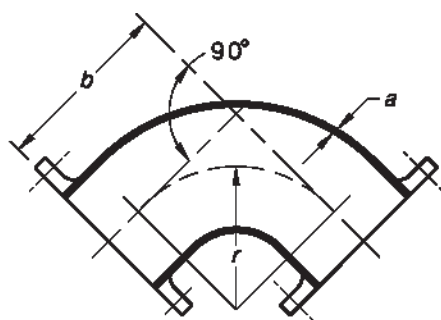
NOTE: The purchaser may specify other ovality tolerances.



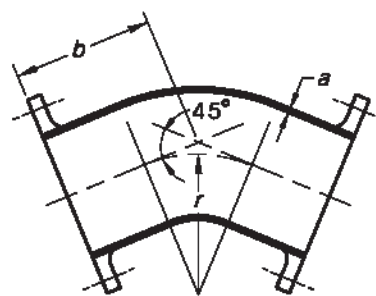
millimetres

Dimension	Nominal size, DN										
	100	150	200	225	250	300	375	450	500	525	600
<i>a</i>	For wall thickness see Table relevant to fitting										
<i>f</i>	102	102	115	115	115	115	140	140	140	140	140
<i>j</i>	10	10	10	10	10	10	16	16	16	16	16
Ø <i>y</i> and Ø <i>y</i> ¹	122	177	232	259	286	345	426	507	560	587	667
Tolerance on spigot Ø <i>y</i>	+1, -2										
Tolerance on barrel Ø <i>y</i> ¹	± 4.0							+5.0 -4.0			
Allowable ovality	4	5	7	8	9	10	12	15	15	15	15

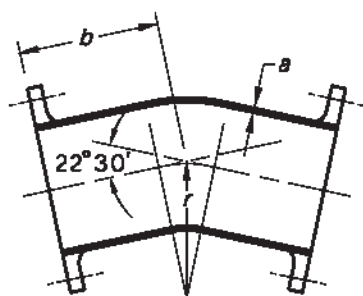
FIGURE 5.1 BARREL AND SPIGOT FOR FITTINGS



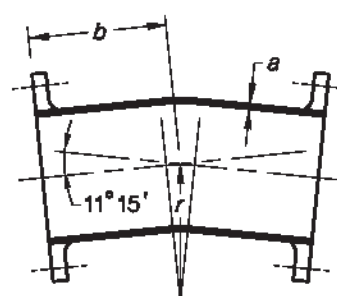
(a) 90° bends



(b) 45° bends



(c) 22 1/2° bends



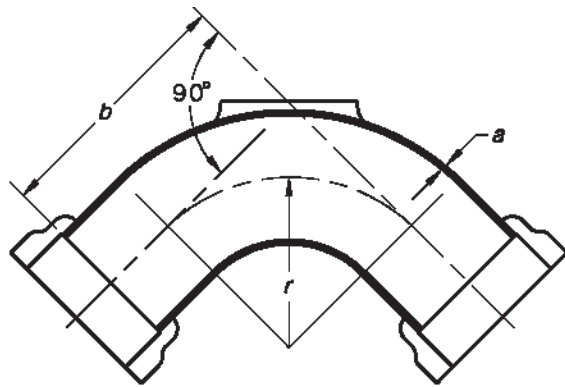
(d) 11 1/4° bends

SYMBOL

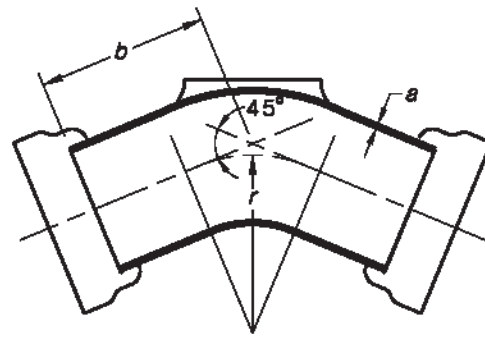
millimetres

Nom. size	Dimension				
	a	90° Bends		45°, 22 1/2°, 11 1/4° Bends	
		b	r	b	r
DN					
100	10	241	152	152	152
150	12	279	190	190	190
200	15	305	203	203	203
225	15	330	229	229	229
250	16	356	254	254	254
300	18	406	305	305	305
375	20	495	381	381	381
450	22	572	457	457	457
500	23	622	508	508	508
525	23	648	533	533	533
600	25	737	610	610	610

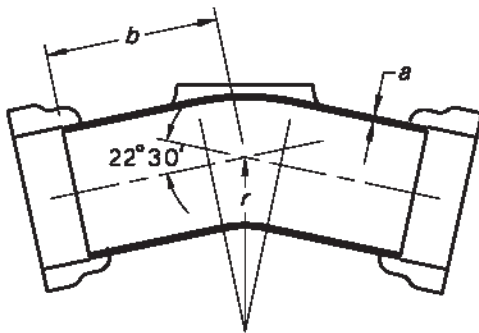
FIGURE 5.2 BENDS, FLANGE—SIZES 100 TO 600



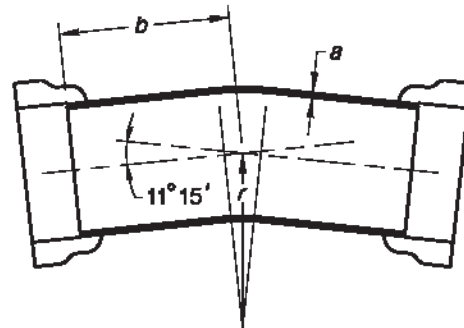
(a) 90° bends



(b) 45° bends



(c) 22½° bends



(d) 11¼° bends

SYMBOL 

millimetres					
Nominal size DN	Dimension				
	<i>a</i>	90° Bends		45°, 22½°, 11¼° Bends	
		<i>b</i>	<i>r</i>	<i>b</i>	<i>r</i>
100	10	241	152	152	152
150	12	279	190	190	190

NOTE: For details of thrust pads, see Figure 5.21. No thrust pad required on 11¼° bends.

FIGURE 5.3 BENDS, SOCKET—SIZES 100 AND 150