

AS 1074—1989

Reconfirmed 2018

Australian Standard[®]

**Steel tubes and tubulars for
ordinary service**

This Australian Standard was prepared by Committee WS/4, Steel Pipes and Fittings—Water and Gas. It was approved on behalf of the Council of Standards Australia on 8 February 1989 and published on 10 April 1989.

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Confederation of Australian Industry
Metal Trades Industry Association of Australia
Public Works Department, New South Wales
The Australian Gas Association
Water Resources Commission, Queensland

Additional interests participating in preparation of Standard:

Water Authority of Western Australia

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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1074–1989

Steel tubes and tubulars for ordinary service

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NOTES

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ordinary service**

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PREFACE

This Standard was prepared by the Standards Australia's Committee on Steel Pipes and Fittings—Water and Gas to supersede AS 1074—1980, *Steel tubes and tubulars threaded or suitable for threading with pipe threads of Whitworth form*.

This edition adopts the descriptions, dimensions and masses as specified in BS 138:1985, *Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads*.

This Standard does not indicate the services for which the tubes are appropriate. Where the use of tubes is not controlled by by-laws or regulations, reference should be made to the appropriate Code of Practice or application Standard. Some Codes of Practice for building relating to town gas and water, and also the relevant by-laws, preclude the use of light tubes for these services. If the application is for pressure purposes, reference should be made to AS CB18, *SAA Pressure Piping Code—Part 1: Ferrous piping*.

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STANDARDS AUSTRALIA

Australian Standard

Steel tubes and tubulars for ordinary service

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This Standard specifies requirements for threaded steel tubes and tubulars, and plain-end steel tubes suitable for screwing as specified in AS 1722.1, and of DN 8 to DN 150 inclusive (nominal size). Three wall thicknesses of tube, designated Light, Medium, and Heavy, are specified in Section 2.

NOTE: Guidelines on information that should be specified by the purchaser or agreed upon at the time of enquiry or order are given in Appendix A.

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

AS

1355 Glossary of terms used in connection with water and sanitary plumbing and drainage installations

1391 Methods for tensile testing of metals

1650 Galvanized coatings

1722 Pipe threads of Whitworth form

1722.1 Part 1: Sealing pipe threads

1835 Tubes for pressure purposes — Seamless steel

1836 Tubes for pressure purposes — Welded steel

2084 Non-destructive testing — Eddy current testing of metal tubes

BS

3894 Method for converting elongation values for steel

Part 1: Carbon and low alloy steels

ISO

65 Carbon steel tubes suitable for screwing in accordance with ISO 7/1

1.3 DEFINITIONS. For the purpose of this Standard, the definitions given in AS 1355 and those below apply.

1.3.1 Tube—length of uniform circular hollow section.

1.3.2 Socket—internally threaded coupling used in joining tubes.

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

1.3.4 Length of screwed-and-socketed tube.

1.3.4.1 Random length—length of tube with one socket screwed on.

1.3.4.2 Exact length—length of tube excluding socket.

1.3.5 Nominal size (DN)—a numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

NOTE: It is designated by DN followed by a number, e.g. DN 32.

1.4 DESIGNATION. Tubes and tubulars shall be designated according to their nominal size.

Sockets and backnuts shall be designated according to the respective nominal sizes of the tubes for which they are intended.

SECTION 2. TUBES

2.1 PROCESS OF MANUFACTURE. Tubes may be either welded or seamless.

2.2 MATERIAL. Tubes shall be manufactured from steel which shows, not more than 0.045 percent of sulfur and not more than 0.045 percent of phosphorus. Carbon equivalent as calculated from the following equation shall not exceed 0.4:

$$\text{Carbon equivalent} = C + \frac{Mn}{6}$$

Lengths or strips cut from selected tubes and tested in accordance with AS 1391 shall show —

- minimum yield strength of 195 MPa;
- a tensile strength of between 320 MPa and 460 MPa; and
- an elongation of not less than 20 percent on a gauge length of $5.65\sqrt{S_0}$ where S_0 is the original cross-sectional area of the test piece.

NOTE: Where other gauge lengths are used, the corresponding elongation on $5.65\sqrt{S_0}$ can be obtained from BS 3894: Part 1.

2.3 DIMENSIONS OF TUBES. The dimensions of the tubes shall be as given in Tables 2.1, 2.2, and 2.3,

as applicable, subject to the tolerances as specified in Clause 2.4.

2.4 PERMISSIBLE VARIATION IN THICKNESS, DIAMETER, AND MASS. The following manufacturing tolerances shall be permitted on the tubes:

- Thickness:*

Light welded tubes + unlimited, – 8 percent.

Medium and heavy tubes —

Welded + unlimited, – 10 percent.

Seamless + unlimited, – 12.5 percent.

- Outside diameter:*

Light tubes as given in Table 2.1.

Medium tubes as given in Table 2.2.

Heavy tubes as given in Table 2.3.

- Mass.* The mean consignment mass for quantities of 150 m and over of one size shall not deviate from the standard mass by more than ± 4 percent. No single tube shall deviate from the standard mass by more than + 10, – 8 percent.

TABLE 2.1
DIMENSIONS OF STEEL TUBES — LIGHT

Nominal size	Outside diameter mm		Thickness mm	Mass of black tube kg/m	
	Min.	Max.		Plain or screwed ends	Screwed and socketed
DN 8	13.2	13.6	1.8	0.515	0.519
DN 10	16.7	17.1	1.8	0.670	0.676
DN 15	21.0	21.4	2.0	0.947	0.956
DN 20	26.4	26.9	2.3	1.38	1.39
DN 25	33.2	33.8	2.6	1.98	2.00
DN 32	41.9	42.5	2.6	2.54	2.57
DN 40	47.8	48.4	2.9	3.23	3.27
DN 50	59.6	60.2	2.9	4.08	4.15
DN 65	75.2	76.0	3.2	5.71	5.83
DN 80	87.9	88.7	3.2	6.72	6.89
DN 100	113.0	113.9	3.6	9.75	10.0

NOTE: Dimensions and masses are in accordance with ISO 65 (light series 2).

TABLE 2.2
DIMENSIONS OF STEEL TUBES — MEDIUM

Nominal size	Outside diameter mm		Thickness mm	Mass of black tube kg/m	
	Min.	Max.		Plain or screwed ends	Screwed and socketed
DN 8	13.3	13.9	2.3	0.641	0.645
DN 10	16.8	17.4	2.3	0.839	0.845
DN 15	21.1	21.7	2.6	1.21	1.22
DN 20	26.6	27.2	2.6	1.56	1.57
DN 25	33.4	34.2	3.2	2.41	2.43
DN 32	42.1	42.9	3.2	3.10	3.13
DN 40	48.0	48.8	3.2	3.57	3.61
DN 50	59.8	60.8	3.6	5.03	5.10
DN 65	75.4	76.6	3.6	6.43	6.55
DN 80	88.1	89.5	4.0	8.37	8.54
DN 100	113.3	114.9	4.5	12.2	12.5
DN 125	138.7	140.6	5.0	16.6	17.1
DN 150	164.1	166.1	5.0	19.7	20.3

NOTE: Dimensions and masses are in accordance with ISO 65.

2.5 SCREW THREADS. The screw threads of all threaded tubes shall comply with AS 1722.1, except as provided below and except that on Light tubes the basic length of useful thread shall be reduced to 80 percent of the sum of the fitting allowance plus gauge length for pipe threads of series R and RC (see AS 1722.1) for the particular nominal size.

Where Light tubes approach the low limits of outside diameter, some 'black' threads (perfect at the root and imperfect at the crest) are to be expected beyond the gauge plane, but such 'black' threads shall not be regarded as justification for the rejection of the tubes.

NOTE: Care is necessary when hand screwing Light tubes.

Tubes shall be supplied threaded with taper pipe threads.

2.6 LENGTHS.

2.6.1 Standard lengths. When so ordered, tubes shall be supplied in standard lengths of 6.50 ± 0.08 m.

2.6.2 Exact lengths. Where exact lengths are specified, either for threaded tubes or for plain end tubes, each tube shall be within +8, -0 mm of the specified length.

2.7 GALVANIZING. Tubes ordered galvanized shall comply with AS 1650.

Tubes which are to be threaded shall be galvanized before threading.

2.8 LEAK TIGHTNESS TEST. Every tube shall be tested at the manufacturer's works by one of the following methods:

- A hydrostatic test at a pressure of 5 MPa maintained sufficiently long for proof and inspection. The tube shall not leak during the test.
- An eddy current test in accordance with Appendix B. The test shall not result in a signal greater than the signal from the reference standard.
- An ultrasonic test in accordance with Appendix C. The test shall not result in a signal greater than the signal from the reference standard.

2.9 DUCTILITY OF FINISHED TUBES.

2.9.1 Tubes of DN 50 and smaller. Finished tubes of DN 50 and smaller shall be capable of withstanding

the following bending test without showing any signs of fracture or failure:

- The test shall be carried out by means of a tube bending machine round a grooved former of the radius specified in (b) or (c) below, as appropriate. Welded tubes shall be bent with the weld at 90 degrees to the plane of bending. The tubes shall not be filled for this test.
- Ungalvanized tubes shall be capable of being bent cold without cracking through 180 degrees round a former having a radius at the bottom of the groove equal to 6 times the outside diameter of the tube as given in Tables 2.1, 2.2 and 2.3, as appropriate.
- Galvanized tubes shall be capable of being bent cold without cracking of the steel through 90 degrees round a former having a radius at the bottom of the groove equal to 8 times the outside diameter of the tube as given in Tables 2.1, 2.2 and 2.3 as appropriate.

2.9.2 Tubes larger than DN 50. For finished tubes larger than DN 50, rings not less than 40 mm in length, cut from ends of selected tubes, shall be capable of being flattened between parallel plates with the weld, if any, at 90 degrees (point of maximum bending). No opening shall occur by fracture in a weld until the distance between the plates is less than 75 percent of the original outside diameter of the tube, and no cracks or breaks in the metal elsewhere than in a weld shall occur until the distance between the plates is less than 60 percent of the original outside diameter of the tube as given in Tables 2.1, 2.2, and 2.3 as appropriate.

The test rings may have their inner and outer edges rounded.

2.10 WORKMANSHIP. The tubes shall be cleanly finished and free from defects which would affect the performance or function of the tubes in service. They shall be within the tolerances as specified in Clause 2.4. The threads shall be clean, well cut, and within

TABLE 2.3
DIMENSIONS OF STEEL TUBES—HEAVY

Nominal size	Outside diameter mm		Thickness mm	Mass of black tube kg/m	
	Min.	Max.		Plain or screwed ends	Screwed and socketed
DN 8	13.3	13.9	2.9	0.765	0.769
DN 10	16.8	17.4	2.9	1.02	1.03
DN 15	21.1	21.7	3.2	1.44	1.45
DN 20	26.6	27.2	3.2	1.87	1.88
DN 25	33.4	34.2	4.0	2.94	2.96
DN 32	42.1	42.9	4.0	3.80	3.83
DN 40	48.0	48.8	4.0	4.38	4.42
DN 50	59.8	60.8	4.5	6.19	6.26
DN 65	75.4	76.6	4.5	7.93	8.05
DN 80	88.1	89.5	5.0	10.3	10.5
DN 100	113.3	114.9	5.4	14.5	14.8
DN 125	138.7	140.6	5.4	17.9	18.4
DN 150	164.1	166.1	5.4	21.3	21.9

NOTE: Dimensions and masses are in accordance with ISO 65.

the tolerances specified in AS 1722.1, except as provided for in Clause 2.5. The ends shall be cut cleanly and square with the axis of the tube. Tubes shall be straight within 1:500 measured at the centre of the length.

Galvanized tubes shall have surfaces on which the coating is continuous, as smooth and evenly distributed as possible and free from defects which would affect the performance or function of the tubes in service. Tubes of DN 8 to DN 25 inclusive shall, after galvanizing, be capable of having a rod 230 mm long, of the appropriate diameter as given in Table 2.4, passed through them to ensure a free internal diameter.

TABLE 2.4
ROD DIAMETERS

Nominal size	Diameter of rod mm
DN 8	4.4
DN 10	7.1
DN 15	9.5
DN 20	14.3
DN 25	20.6

2.11 MARKING. Tubes shall be distinguished by colour at one end as follows:

- (a) Light tube Brown.
- (b) Medium tube Blue.
- (c) Heavy tube Red.

Markings shall be applied before the tubes leave the manufacturer's works.

NOTE: Manufacturers making a statement of compliance with this Australian 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.

Independent certification is available from Standards Australia under the Standards Mark Product Certification Scheme. The Standards Mark, shown below, is a (registered) certification trade mark owned by Standards Australia and granted under licence to manufacturers whose products comply with the requirements of suitable Australian Standards and who operate sound quality assurance programs to ensure consistent product quality.

Further information on product certification and the suitability of this Standard for certification is available from Standards Australia's Quality Assurance Services, 1 The Crescent, Homebush NSW 2140.



2.12 PROTECTION. The threads of all tubes shall be effectively protected against corrosion. Each tube larger than DN 80 shall have a protecting ring affixed to the screwed end.

SECTION 3. SOCKETS

3.1 PROCESS OF MANUFACTURE. Sockets may be either welded or seamless.

3.2 MATERIAL. Sockets shall be manufactured from steel as specified for tubes except that the tensile strength shall not be less than 300 MPa.

3.3 DIMENSIONS. Dimensions of sockets shall be as shown in Figure 3.1.

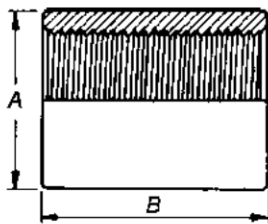
3.4 SCREW THREADS. The screw threads of sockets shall comply with AS 1722.1. Sockets shall

have parallel pipe threads unless otherwise specified.

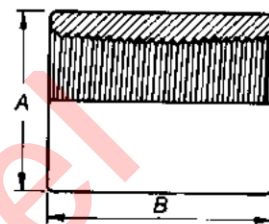
In order to prevent damage to the leading thread, the ends of the sockets shall be chamfered internally.

NOTE: For DN 65 and larger, taper threaded sockets provide a screwed joint which is less sensitive to jointing techniques and external forces.

3.5 GALVANIZING. Sockets ordered galvanized shall comply with AS 1650. Sockets which are to be threaded shall be galvanized before threading.



(a) Series RP internal parallel pipe thread to AS 1722.1 supplied as standard



(b) Series RC internal taper pipe thread to AS 1722.1 available when specified (see Clause 3.4)

millimetres		
Nominal size	Minimum outside diameter (A)	Minimum length (B)
DN 8	18.5	27
DN 10	22	28
DN 15	27	37
DN 20	32.5	39
DN 25	39.5	46
DN 32	48	51
DN 40	56	51
DN 50	68	60
DN 65	84	69
DN 80	98	75
DN 100	124	87
DN 125	151	96
DN 150	178	96

NOTES:

1. The minimum length (B) has been increased to allow for the chamfer at the ends of the socket according to the following equation:

$$B = 2L + 3.5P$$

where

L = length of useful thread on tube end, being sum of basic gauge length and fitting allowance (see AS 1722.1).

P = pitch of thread.

2. For minimum length of faced sockets, see Figure 4.3.

FIGURE 3.1 SOCKETS

SECTION 4. TUBULARS

4.1 GENERAL. Tubulars shall be made from Medium or Heavy tubes which comply with the appropriate requirements of Section 2. For return bends, and for tubulars threaded with parallel pipe threads, only Heavy tubes shall be used.

4.2 THREADS. Tubulars shall be threaded with taper or parallel pipe threads as shown in Figures 4.1 to 4.5 inclusive. Sockets for tubulars shall, unless otherwise specified, have parallel pipe threads. All threads shall comply with AS 1722.1.

4.3 GALVANIZING. Tubulars ordered galvanized, shall comply with AS 1650. Tubulars which are to be threaded shall be galvanized before threading.

4.4 PIECES. Pieces shall conform to the dimensions as shown in Figure 4.1.

4.5 NIPPLES. Nipples shall conform to the dimensions as shown in Figure 4.2.

4.6 LONGSCREWS. Longscrews shall be supplied single or double, as may be ordered, and shall conform to the appropriate dimensions as shown in Figure 4.3.

The parallel pipe thread on the longscrews and on the sockets shall comply with the appropriate requirements of AS 1722.1 for Series RL and Series RP.

NOTES:

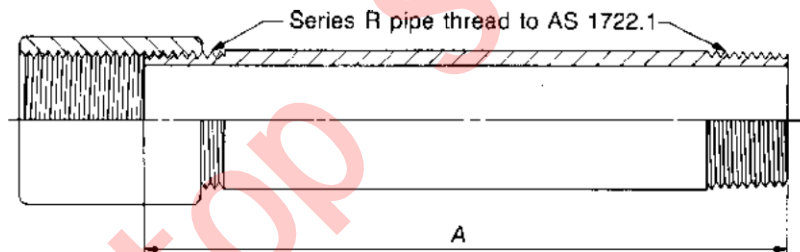
1. The thread should be of such a size that the socket will run on the longscrew handtight without perceptible shake.
2. The use of longscrews for running joints is permissible for low pressures, but it is not recommended for the higher pressures or for work in which there are wide variations of temperature.

4.7 SOCKETS AND BACKNUTS. Sockets shall be faced square to the longitudinal axis on the end against which the backnut abuts. The face of the backnut which abuts against the socket shall be concave at an angle of approximately 5 degrees.

4.8 BENDS AND SPRINGS. Bends and springs shall conform to the appropriate dimensions as shown in Figure 4.4. A tolerance on the specified angle of ± 1.5 degrees shall be permitted.

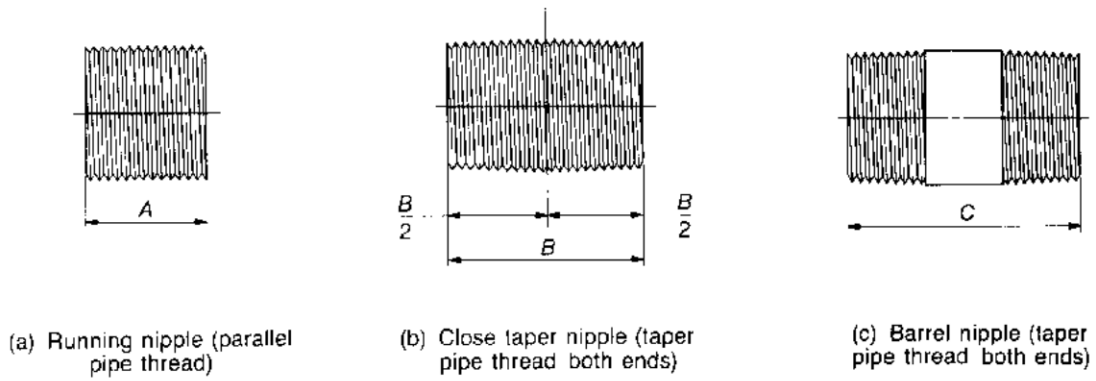
Type 1A bends, as shown in Figure 4.4, in addition to conforming to the appropriate dimensions shall be fitted with sockets and backnuts complying with the requirements of Clause 4.7.

4.9 RETURN BENDS. Return bends shall conform to the dimensions as shown in Figure 4.5. The ends of the bend shall be parallel within ± 1.5 degrees.



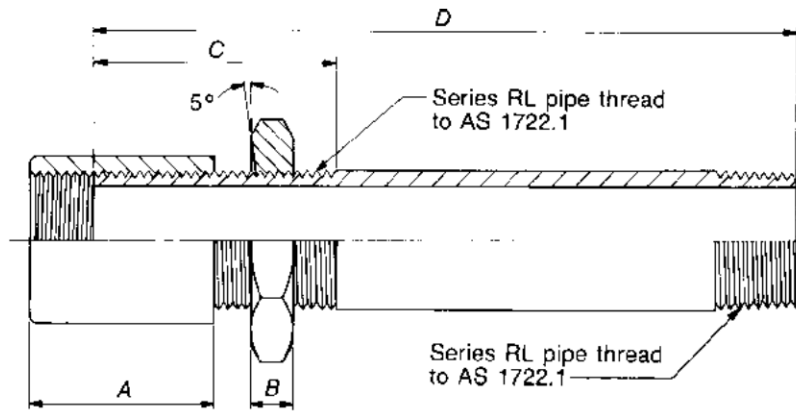
millimetres	
Nominal size	Approximate standard lengths (A)
DN 8	100, 150, 200, 250
DN 10	100, 150, 200, 250
DN 15	100, 150, 200, 250
DN 20	100, 150, 200, 250
DN 25	100, 150, 200, 250
DN 32	150, 200, 250, 300
DN 40	150, 200, 250, 300
DN 50	150, 200, 250, 300
DN 65	150, 200, 250, 300
DN 80	200, 250, 300, 400
DN 100	200, 250, 300, 400
DN 125	250, 300, 400, 500
DN 150	250, 300, 400, 500

FIGURE 4.1 PIECES

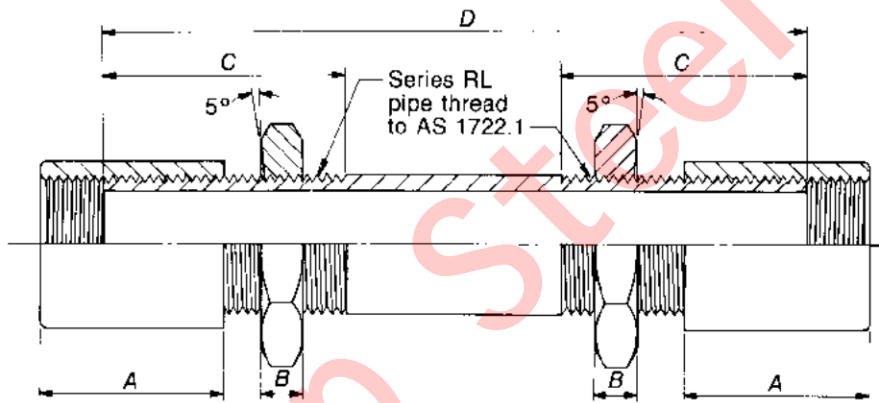


Nominal size	Standard lengths			millimetres
	Running nipple (A)	Close taper nipple (B)	Barrel nipple (C)	
DN 8	19	27	38	+ 3, - 0
DN 10	21	28	38	
DN 15	27	37	51	+ 4.5, - 0
DN 20	30	39	54	
DN 25	33	46	60	
DN 32	38	51	70	+ 6, - 0
DN 40	38	51	70	
DN 50	48	60	79	+ 8, - 0
DN 65	51	69	89	
DN 80	57	75	102	
DN 100	70	87	114	
DN 125	78	96	124	
DN 150	78	96	127	

FIGURE 4.2 RUNNING NIPPLES, CLOSE TAPER NIPPLES, AND BARREL NIPPLES



(a) Single long screw

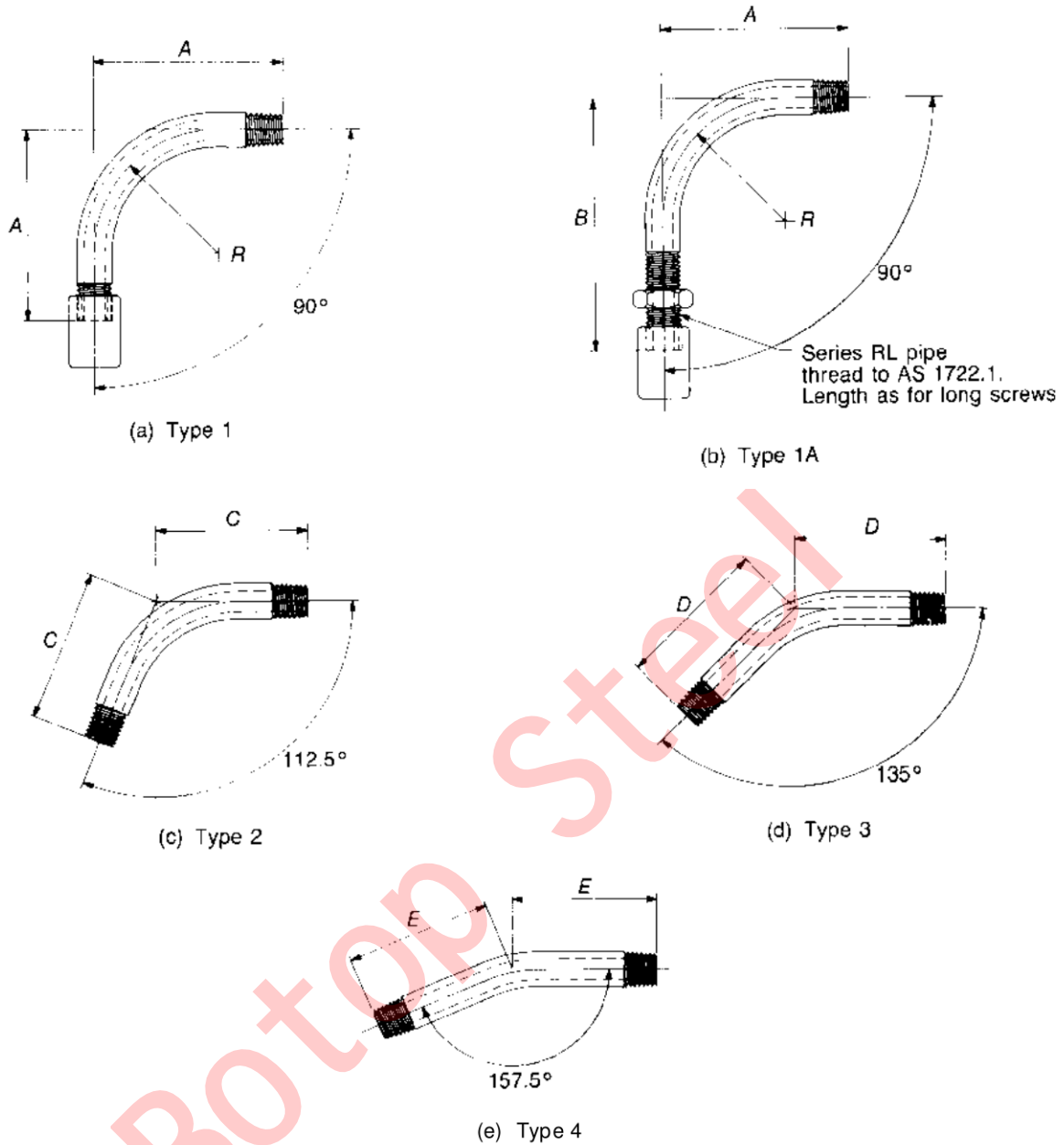


(b) Double long screw

Nominal size	Faced socket length		Hexagon backnut		Minimum effective length of long thread (C)	Approximate standard lengths (D)
			Width across flats	Thickness (B)		
DN 8	25	+ 1.5, - 0	19	6.5	37	100, 150, 200, 250
DN 10	25	+ 3, - 0	24	7	40	100*, 150, 200, 250
DN 15	35		30	8	52	100*, 150, 200, 250
DN 20	37		36	9	54	100*, 150, 200, 250
DN 25	43		41	9.5	62	100*, 150, 200, 250
DN 32	48	+ 4, 5, - 0	50	11	70	150*, 200, 250, 300
DN 40	48		60	12	71	150*, 200, 250, 300
DN 50	57		70	13	82	150*, 200*, 250, 300
DN 65	65	+ 6, - 0	90	17	97	150*, 200*, 250, 300
DN 80	71		100	21	106	200*, 250*, 300, 400
DN 100	84		130	22	121	200*, 250*, 300, 400
DN 125	92		160	24	130	250*, 300*, 400, 500
DN 150	92	190	25	132	250*, 300*, 400, 500	

* Double long screws cannot be supplied in these lengths.

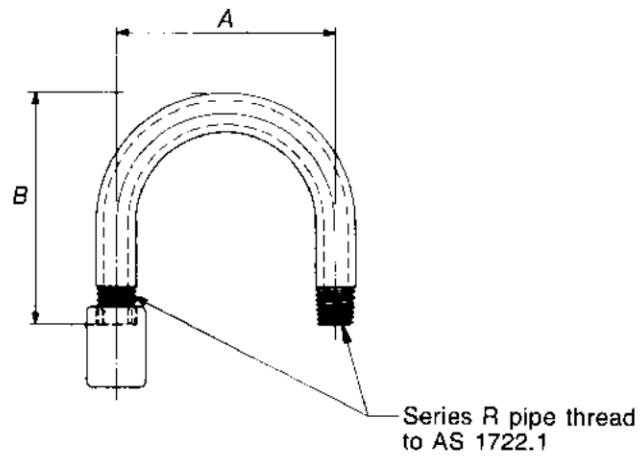
FIGURE 4.3 LONG SCREWS



Nominal size	Bends 90°		Approximate radius (R)	Springs		
	Approximate centre to face			112.5°	135°	157.5°
	(A)	(B)	(C)	(D)	(E)	
DN 8	64	92	41	60	57	54
DN 10	73	105	48	67	64	60
DN 15	86	127	57	79	76	73
DN 20	102	143	73	92	89	86
DN 25	121	168	89	108	105	102
DN 32	146	197	108	133	127	124
DN 40	165	219	127	149	143	140
DN 50	203	264	159	181	175	168
DN 65	248	321	197	222	213	206
DN 80	292	371	232	260	248	241
DN 100	381	467	308	340	324	318
DN 125	540	632	—	476	457	444
DN 150	622	718	—	572	540	527

FIGURE 4.4 BENDS AND SPRINGS

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Nominal size	millimetres	
	Approximate centre (A)	Approximate back to face (B)
DN 8	51	64
DN 10	64	70
DN 15	89	102
DN 20	102	121
DN 25	114	140
DN 32	127	152
DN 40	165	178
DN 50	190	210
DN 65	305	292
DN 80	356	330
DN 100	457	400
DN 125	762	578
DN 150	914	962

FIGURE 4.5 RETURN BENDS

APPENDIX A
INFORMATION TO BE SUPPLIED WITH ORDER

(This Appendix does not form an integral part of this Standard.)

The following information should be supplied by the purchaser with each order:

- (a) The number of this Australian Standard.
- (b) The nominal size, thickness, length and end finish.
- (c) Whether tubes screwed and fitted with sockets are required.
- (d) Whether taper threaded sockets to Series RC pipe threads are required (see Clause 3.4).
- (e) Whether galvanizing, with or without test, is required (see Clauses 2.7, 3.5 and 4.3).
- (f) The required method for the leak tightness test (see Clause 2.8).
- (g) Whether test certificates for the steel are required (see Clause 2.2).
- (h) Whether nominated tests are to be specifically related to the order.
- (i) Additional requirements (if any) regarding the size of batches represented by test samples.
- (j) Whether nominated tests should be witnessed by the purchaser or purchaser's representative.
- (k) Name of Inspecting Authority (if any).
- (l) Details of any additional markings required (see Clause 2.11).
- (m) Whether a manufacturer's certificate stating that the tubes, sockets and tubulars have been manufactured to comply with this Standard is required.

If an order omits any of the required information, the manufacturer/supplier may assume that the omitted option is not required.

APPENDIX B
EDDY CURRENT TESTING

(This Appendix forms an integral part of this Standard.)

B1 SCOPE. This Appendix sets out a method for eddy current testing by making reference to AS 2084 in which the principles and operation of equipment used is detailed.

NOTE: In the manufacture of pipe to this Standard (AS 1074), in which batch identification is impracticable owing to large quantities and continuous operation, the record of results, test report and information to be recorded (see AS 2084) are also impracticable to implement.

B2 APPARATUS. The test equipment shall comply with AS 2084.

The equipment shall be checked with an applicable reference standard in the manner specified in AS 2084 to demonstrate the effectiveness of the equipment and the inspection procedure.

B3 REFERENCE STANDARDS. Reference standards shall have the same diameter and thickness as the product being tested and may be of any length convenient to the manufacturer.

A reference standard shall be either of the following:

- (a) A tube containing a hole drilled radially through the wall, for example, a 1.6 mm hole in DN 50 and smaller and 3.2 mm hole in DN 65 and larger.

NOTE: The hole should not be construed as the minimum size imperfection detectable by eddy current equipment.

- (b) A tube identified by the manufacturer as containing an imperfection which will withstand the hydrostatic test pressure specified in Clause 2.8(a), i.e. 5 MPa.

B4 PROCEDURE. The procedure for testing shall be as detailed in AS 2084.

APPENDIX C
ULTRASONIC EXAMINATION OF LONGITUDINAL WELD
OF ELECTRIC RESISTANCE WELDED PIPE

(This Appendix forms an integral part of this Standard.)

C1 SCOPE. This Appendix sets out a method for the ultrasonic examination of longitudinal weld of electric resistance or induction welded (ERW) pipe.

NOTE: Adoption by the pipe manufacturer of ultrasonic methods of testing tubular products to this Standard is not to be regarded as intentionally introducing a different quality product to that tested only by hydrostatic pressure. Exact equivalence cannot be demonstrated, since the alternative test methods search on different principles. Steel tubes for pressure purposes are covered by AS 1835 and AS 1836, in which a wider range of test categories is applicable, leading to enhanced quality assurance where pertinent to the intended use.

C2 APPARATUS. Any equipment utilizing ultrasonic principles and capable of continuous and uninterrupted inspection of the weld seam shall be used.

The equipment shall be checked with an applicable reference standard as described in Paragraph C3 at least once every 8 h to demonstrate the effectiveness of the equipment and the inspection procedure.

C3 REFERENCE STANDARDS. Reference standards shall have the same specified diameter and thickness as the product being inspected and may be of any length convenient to the manufacturer. Reference standards shall contain either of the following:

- (a) Machined notches, one on the inside and one on the outside surface, as shown in Figure C1, parallel to the weld seam and separated by a distance sufficient to produce two separate and distinguishable signals. Care shall be taken in the preparation of the reference standard to ensure freedom from fins or other edge roughness, or distortion of the pipe.
- (b) A tube containing a 3.2 mm hole drilled radially through the wall.

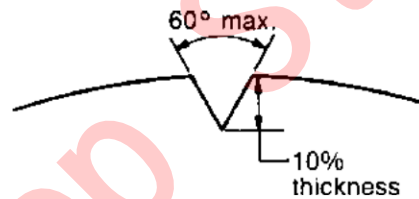


FIGURE C1 N10 NOTCH

NOTE: (a) and (b) above should not be construed as the minimum size imperfection detectable by the ultrasonic equipment.

- (c) A weld zone condition assessable by hand probing as containing an imperfection which the manufacturer can demonstrate would be able to withstand the hydrostatic test pressure specified in Clause 2.8(a), i.e. 5 MPa.

C4 PROCEDURE. The equipment shall be adjusted to produce well-defined indications when the reference standard is scanned by the inspection unit in a manner simulating the inspection of the product. Reflection or transmission techniques may be used at the discretion of the manufacturer.

NOTES

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