



Polybutylene (PB) plumbing pipe systems—Metric series

Part 2: Mechanical and fusion jointing systems



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 - Master Plumbers, Gasfitters and Drainlayers New Zealand
 - New Zealand Water & Waste Association
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-

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Australian Standard®

**Polybutylene (PB) plumbing pipe
systems—Metric series**

**Part 2: Mechanical and fusion jointing
systems**

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PREFACE

This Standard was prepared by the Joint Australia/New Zealand Standards Committee PL-006 Polyolefin Pipe Systems at the request of pipe and fittings importers. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this series of Standards as Australian Standards rather than Australian/New Zealand Standards.

This Standard incorporates Amendment No. 1 (November 2018). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The AS 5082 series consists of the following:

AS

5082 Polybutylene (PB) plumbing pipe systems—Metric series

5082.1 Part 1: Metric polybutylene (PB) pipes for hot and cold water applications

5082.1 Part 2: Mechanical and fusion jointing systems

NOTE: For polybutylene extrusion compounds refer to Australian/New Zealand Standard AS/NZS 2642.1, *Polybutylene (PB) plumbing pipe systems—Polybutylene (PB) extrusion compounds*.

This series of Standards differs from the relevant parts of the AS/NZS 2642 series for PB pipe systems as follows:

- (a) The outside diameters of the pipes follow the metric dimensions, in accordance with ISO 161-1, *Thermoplastics pipes for the conveyance of fluids—Nominal outside diameters and nominal pressures*, Part 1: *Metric series*, as distinct from the diameters in the AS/NZS 2642 series which follow copper pipe compatible diameters.
- (b) The size range of pipes within the AS 5082 series is greater, and a number of test requirements have been based on the ISO 15876 series, *Plastics piping systems for hot and cold water installation—Polybutylene (PB)*.
- (c) The jointing system allows for fusion jointing.

It is not intended that this series of Standards will replace the AS/NZS 2642 series, which will be limited to plumbing sizes and pressure classes. To differentiate between both metric and imperial based systems, in particular given the closeness of the outside diameter tolerances for the 18 mm (nominal diameter) AS/NZS 2642 pipe and the 16 mm metric outside diameter pipe, both Standards will run concurrently to allow both systems to be marked or labelled differently.

Care should be taken to avoid mismatching of AS/NZS 2642 pipes or fittings with products complying with this series of Standards.

Statements expressed in normative terms in notes to tables are deemed to be requirements of this Standard.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

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STANDARDS AUSTRALIA

Australian Standard

Polybutylene (PB) plumbing pipe systems—Metric series

Part 2: Mechanical and fusion jointing systems

1 SCOPE

This Standard specifies requirements for mechanical and fusion jointing fittings suitable for use as fixed joints with polybutylene pipes manufactured in accordance with AS 5082.1 .

This standard is applicable to fittings of the following types:

- (a) Socket weld fittings.
- (b) Electrofusion fittings.
- (c) Mechanical fittings.
- (d) Fittings with incorporated inserts.

2 APPLICATION

Means for demonstrating compliance with this Standard shall be in accordance with Appendix A.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---|
| 1199 | Sampling procedures for inspection attributes |
| 1199.1 | Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection |
| 1349 | Bourdon tube pressure and vacuum gauges |
| 1722 | Pipe threads of Whitworth form |
| 1722.1 | Part 1: Sealing pipe threads |
| 1722.2 | Part 2: Fastening pipe threads |
| 2345 | Dezincification resistance of copper alloys |
| 3688 | Water supply—Copper and copper alloy compression and capillary fittings and threaded end connectors |
| 5082 | Polybutylene (PB) plumbing pipe systems—Metric series |
| 5082.1 | Part 1: Metric polybutylene (PB) pipes for hot and cold water applications |

A1

AS ISO/IEC

- | | |
|-------|---|
| 17025 | General requirements for the competence of testing and calibration laboratories |
|-------|---|

AS/NZS

- | | |
|---------|---|
| 1462 | Methods of test for plastics pipes and fittings |
| 1462.1 | Method 1: Method for determining the dimensions of pipes and fittings |
| 1462.14 | Method 14: Method for determination of the light transmission of pipe |

AS/NZS

2642 Polybutylene pipe systems

2642.1 Part 1: Polybutylene (PB) pipe extrusion compounds

3500 Plumbing and drainage

3500.0 Part 0: Glossary of terms

3707 Method for testing pressure cycling resistance of pipes and fittings

4020 Testing for products in contact with drinking water

4131 Polyethylene (PE) compounds for pressure pipes and fittings

4331 Metallic flanges

ISO

228 Pipe threads where pressure-tight joints are not made on threads

228-1 Part 1: Dimensions, tolerances and designation

1043 Plastics—Symbols and abbreviated terms

1043-1 Part 1: Basic polymers and their special characteristics

9080 Plastics piping and ducting systems—Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation

15876 Plastics piping systems for hot and cold water installations—Polybutylene (PB)

15876-3 Part 3: Fittings

ASTM

D1600 Standard terminology for abbreviated terms relating to plastics

4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 2642.1 and AS/NZS 3500.0, and the ones below apply.

4.1 Mechanical and fusion fittings**4.1.1** *Compression fitting*

A fitting in which the joint is made by the compression of a ring or sleeve on the outside of the pipe with or without additional sealing elements and with or without internal support.

4.1.2 *Flanged fitting*

A fitting in which the pipe connection consists of two mating flanges that are mechanically pressed together and sealed by the compression of an elastomeric sealing element between them.

4.1.3 *Flat seal union fitting*

A fitting in which the pipe connection consists primarily of two components (at least one of which normally incorporates a flat sealing surface) that are mechanically pressed together by means of screwed nut or similar and sealed by the compression of an elastomeric sealing element between them.

4.1.4 *Socket weld fitting*

A fitting in which the joint with the pipe is made by melting together the other part of the pipe with the inner part of the fitting by means of heat induced by a heated tool.

4.1.5 *Electrofusion fitting*

A fitting in which the joint with the pipe is made by melting together the other part of the pipe with the inner part of the fitting by means of heat induced by current flowing in an appropriate resistor inserted in the fitting body.

4.1.6 *Fitting with incorporated inserts*

A fitting in which the joint is made by means of connecting threads or other outlets, inserted in the plastics body combined with weld ends for socket welding or electrofusion.

5 CLASSIFICATION

Insert-type fittings shall be classified according to their nominal working pressure (PN) at 20°C; namely, PN 10, 16, 20 and 25 for use with pipe complying with AS 5082.1. Other fittings shall be classified by the maximum pressure class for which they are suitable.

6 PRESSURE RATING ACCORDING TO PIPE MATERIAL TEMPERATURE

The working pressure of polybutylene pipe, according to pipe material temperature, is shown in Table 1.

NOTE: This Table is included so that the appropriate pressure for a particular class of pipe can be used in the testing of fittings for compliance with this Standard, see Appendix D, Paragraph D4.2.

7 SIZE AND TYPE

Where fittings are required to connect PB pipes with pipes of other materials, the method of specifying the size and type of fittings shall be in accordance with Appendix B.

TABLE 1
PRESSURE RATING OF PIPES ACCORDING TO PIPE MATERIAL TEMPERATURE

PN	Maximum allowable operating pressure (MAOP), MPa					
	20°C	40°C	60°C	70°C	80°C (25 yrs)	95°C (10 yrs)
10	1.00	0.98	0.76	0.65	0.54	0.36
16	1.60	1.53	1.20	1.01	0.84	0.56
20	2.00	1.92	1.50	1.27	1.05	0.70
25	2.50	2.40	1.88	1.58	1.31	0.88

NOTES:

- 1 The manufacturer's recommendations should be sought for applications involving continuous use at temperatures above 70°C.
- 2 PN10 = 10 Bar

8 MATERIAL CHARACTERISTICS

8.1 PB Fitting material

The PB material from which fittings are made shall comply with AS/NZS 2642.1.

When tested in-accordance with Appendix C, injection-moulded tubular pieces shall withstand the hydrostatic hoop stress without bursting or leakage.

8.2 Plastic fitting material not identical to the PB pipe compound

The fitting material in the form of injection-moulded tubular test pieces shall be evaluated by using the method given in ISO 9080. The σ_{LCL} -values at temperatures 20°C and 95°C shall be established. The injection-moulded tubular test piece shall conform to the times for failure at the hydrostatic levels for the material corresponding to the test temperature and the control points given in Table 2.

If evaluation using ISO 9080 is available from long-term internal pressure tests relative to extruded pipe of the same compound as used for the fitting, hydrostatic test data may be used when testing to the control points given in Table 2.

TABLE 2
CONTROL POINTS FOR TESTING FITTING MATERIALS
WITH TUBULAR TEST PIECES

	Test conditions	
	—	80
Maximum design temperature, $TP_{D\ max}$ (°C)	—	80
Test temperature, TP_{Test} (°C)	20	95
Test duration (h)	1	1000

NOTE: The nominal diameter of the injection-moulded tubular test piece should be equal to the nominal fitting diameter.

8.3 Dezincification resistance

Copper alloy parts in contact with water shall comply with AS 2345.

9 TOXICITY AND EFFECT ON WATER

Components of fittings in contact with potable water shall comply with the requirements of AS/NZS 4020 when tested using a scaling factor of 0.1.

10 FREEDOM FROM DEFECTS

10.1 General

The defects described in this Clause cannot be completely quantified. Where the presence, size or frequency of any defects are considered to be of concern, arrangements should be made between the purchaser/water authority/certifying body (as appropriate), and the manufacturer. This may be achieved by the provision of acceptable type samples or methods of test.

Where the presence, size or frequency of any imperfection is considered to be of concern, the manufacturer should be able to demonstrate fitness for purpose of the products.

10.2 Requirements

10.2.1 General requirements

The fitting shall be clean, smooth and free from burrs, fins, irregularities and sharp edges that could affect the performance or function of the fitting in service and the safe handling of the fitting during installation and use. There shall be no imperfections that will score the pipe or cause damage to other fittings.

The bore of fittings shall be free from irregularities that may restrict the free flow of fluids.

10.2.2 Requirements specific to plastics materials

The surfaces of plastics components shall be free from grooves, pinholes, blisters, heat marks or other imperfections that could affect the performance or function of the fitting in service.

NOTE: For the purposes of this Standard, the term ‘plastics’ includes elastomers.

10.2.3 Requirements specific to metallic materials

Fittings made from metallic materials shall be sound and free from folds, laps, blisters, laminations, blow holes and other imperfections that could affect the performance or function of the fittings in service. Copper and copper alloy fittings shall comply with the workmanship and finish requirements of AS 3688.

Pitting shall not be present on sealing faces or thread faces. Pitting shall be permissible in other locations, provided the minimum wall thicknesses given in the manufacturer's specification are maintained, and the pits will not affect the performance and function of the fitting in service.

No components shall be burned, plugged, stopped or patched.

11 FASTENING

11.1 Threads on end connections

Threads on fitting ends shall be right-hand Whitworth form and shall comply with AS 1722.1 or AS 1722.2, as appropriate. Refer to the manufacturer for torque requirements of fittings.

11.2 Fittings intended for connection to other pipe systems

Fittings, such as end connectors, intended to join polyethylene pipe systems to pipe systems made from other materials (e.g. copper) shall comply with the relevant dimensional and performance requirements of the appropriate Australian, or Australian/New Zealand Standard for the other pipe system. Where there is a variation in criteria between that Standard and this Standard, the minimum criteria shall apply. Where there are no criteria given for a particular requirement in either Standard, then that requirement shall be deemed not to apply for the purposes of this Standard.

11.3 Flanged ends on fittings

Flanges that are required to connect to existing systems or for specific applications shall be constructed such that they may be attached to flanges complying with the relevant part of AS/NZS 4331 and conform to the relevant performance requirements.

Flanges shall be at right angles to and concentric with the axis of the internal diameter.

12 PERFORMANCE REQUIREMENTS

12.1 Selection of class of pipe

All polybutylene pipe used in testing shall be appropriate to the nominal working pressure rating of the fitting and to the diameter for which the fitting under test was manufactured, and shall comply with AS 5082.1.

All test joint assemblies shall be made in accordance with the fitting manufacturer's instructions. The geometry of fittings under test shall be selected at the maximum and minimum extremes of dimensional tolerance. Selection of fittings to be type-tested shall be performed to test 'worst case' joint assemblies.

12.2 Test requirements

12.2.1 Overview

An overview of test and performance requirements of jointing systems is given in Table 3.

NOTE: Refer to Appendix A for means of demonstrating compliance with this Standard.

TABLE 3
JOINT AND FITTINGS TESTS

Test	Joining system			Test parameters	Test method
	SW	EF	M		
Compatibility of fittings with pipe	N	N	Y	Clause 12.2.2	Appendix C
Bending test	N	N	Y	Clause 12.2.3	Appendix D
Pull-out test	N	N	Y	Clause 12.2.4	Appendix E
Thermal cycling test	Y	Y	Y	Clause 12.2.5	Appendix F
Liquid infiltration	N	N	Y	Clause 12.2.6	Appendix G
Pressure cycling test	N	N	Y	Clause 12.2.7	AS 3707
Porosity test	See Note 1			Clause 12.2.8	Clause 11.2.8
Short-term pressure test	Y	Y	Y	Clause 12.2.9	Appendix H

LEGEND:

SW—Socket welded joint
 EF—Electrofusion joint
 M—Mechanical joint
 Y—Denotes test applicable
 N—Denotes test not applicable

NOTES:

- 1 Porosity test is applicable to metallic-bodied fittings (see Clause 12.2.8).
- 2 Where fittings with unequal ends are to be tested the internal hydrostatic pressure should be calculated using the larger end pipe dimensions.

12.2.2 Compatibility of fittings with pipe

When tested in accordance with Appendix C, fittings shall withstand internal pressures equivalent to both a nominal hoop stress in the pipe of 6.0 MPa at a temperature of $95 \pm 1^\circ\text{C}$ for 1000 h, and a nominal hoop stress in the pipe of 15.5 MPa at a temperature of $20 \pm 5^\circ\text{C}$ for 165 +24, -0 h.

12.2.3 Resistance to leakage when subjected to bending

This requirement is applicable to fittings for use with pipes of nominal outside diameters of up to and including 63 mm. When determined in accordance with Appendix D, the resistance to leakage of an assembled joint when subjected to bending shall be such that there is no leakage in the joints.

12.2.4 Resistance to pull-out of assembled joints

When determined in accordance with Appendix E, the resistance to pull-out of an assembled joint shall be such that the pipe shall not separate from the fitting.

12.2.5 Thermal cycling test

When determined in accordance with Appendix F, the resistance to thermal cycling of an assembled joint or fitting shall be such that there is no leakage in the joint or fitting.

12.2.6 Liquid infiltration

When determined in accordance with Appendix G, the resistance to liquid infiltration of an assembled joint or fitting shall be such that there shall be no leakage in the joint or fitting.

12.2.7 Pressure cycling test

When determined in accordance with AS/NZS 3707 using the parameters given in Table 4, the resistance to pressure cycling of an assembled joint shall be such that there is no leakage in the joint or fitting.

TABLE 4
TEST PARAMETERS FOR PRESSURE CYCLING

Test parameters		
Test temperature	23°C	
Number of test pieces	3	
Frequency of test cycles/minute	30 ±5	
Number of cycles	10 000	
Test pressure limits for a design pressure of:	Upper limit	Lower limit
10 bar	15.0 bar	0.5 bar
16 bar	24.0 bar	0.5 bar
20 bar	30.0 bar	0.5 bar
25 bar	37.5 bar	0.5 bar

12.2.8 Porosity test

This requirement is applicable to metallic-bodied fittings only. The bodies of fittings shall be capable of withstanding a pressure test which shall consist of either—

- (a) the application of an internal hydrostatic pressure of 2.0 ± 0.2 MPa for a minimum of 15 s; or
- (b) the application of an internal air pressure equal to $0.7 + 0.1, -0$ MPa for a minimum of 5 s while the fitting is completely immersed in water.

The test shall be carried out after all machining and screwing operations, where applicable, have been completed and before any protective coating has been applied. The body of the fitting in each case shall not leak.

NOTE: For cast fittings, it is common practice to pressure-test the body of each fitting. Where a sampling plan is adopted, the manufacturer should test all units within a batch from which non-conforming test specimens were drawn.

12.2.9 Short-term pressure test

When determined in accordance with Appendix H, the short-term pressure resistance of the fitting shall be such as to withstand internal pressures of the levels and for the periods specified in Paragraph H6, Appendix H.

12.3 Selection of fittings

Reference should be made to Clause 12.2 and Table 3 to determine the aspect under test and the quantity of fittings to be subjected to the tests.

12.4 Opacity

Fittings that are declared to be opaque shall not transmit more than 0.2% of visible light when tested in accordance with AS/NZS 1462.14.

13 FITTING DIMENSIONS

13.1 Nominal diameter(s) (d_n)

The nominal diameter of a fitting shall correspond to and be designated by the nominal outside diameter of the pipe conforming to AS 5082.1 for which they are designed.

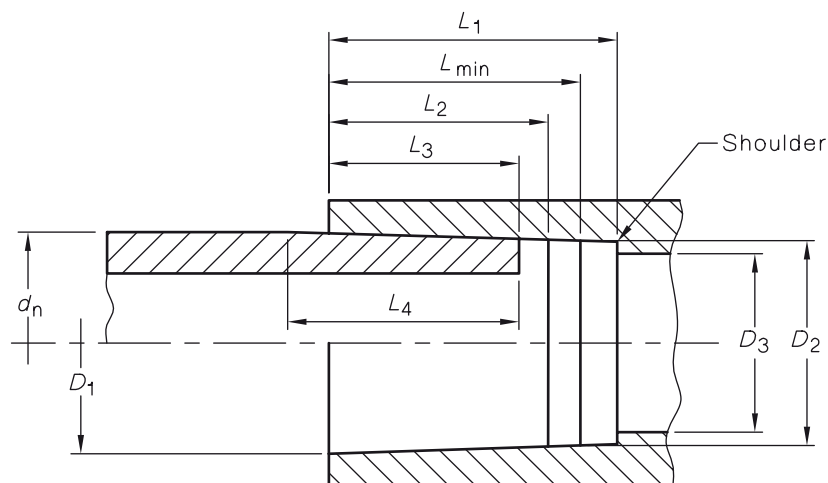
13.2 Threads

Where a thread is used as a fastening thread for jointing an assembly (e.g., union nut) it shall conform to AS 1722 except that these requirements need not apply to the threads used by the manufacturer to join component parts of a fitting together.

13.3 Dimensions of sockets for socket weld and electrofusion fittings

13.3.1 Dimensions of socket weld fittings

The principal dimensions for socket weld fittings shall be in accordance with Figure 1, Table 5 and Table 6 as applicable.



where

- d_n = nominal outside diameter
- D_1 = mean inside diameter of the socket, which comprises the mean diameter of the circle at the inner section of the extension of the socket with the plane of the socket mouth
- D_2 = mean inside root diameter of the socket, which comprises the mean diameter of the circle in a plane parallel to the plane of the mouth and separated from it by a distance of L_{min} (the reference socket length)
- D_3 = minimum bore, which comprises the minimum diameter of the flow channel through the body of a fitting
- L_{min} = reference socket length, which comprises the theoretical minimum socket length used for the purpose for calculations; minimum value of L_{min} is equal to $(0.3 d_n + 8.5 \text{ mm})$
- L_1 = actual length of the socket, which comprises the distance from the mouth to the shoulder (if any); the minimum value of L_1 is L_{min}
- L_2 = heated length of the fitting, which comprises the length of penetration of the heated tool into the socket. The minimum value of L_2 is $(L_{min} - 2.5 \text{ mm})$; maximum value of L_2 is L_{min}
- L_3 = insertion length, which comprises the depth of penetration of the heated pipe end of spigot end of a fitting into the socket; minimum value of L_3 is $(L_{min} - 3.5 \text{ mm})$; maximum value of L_3 is L_{min}
- L_4 = heated length of pipe, which comprises the depth of penetration of the pipe end of spigot end of a fitting into the heated tool; minimum value of L_4 is $(L_{min} - 3.5 \text{ mm})$

FIGURE 1 SOCKET AND SPIGOT DIMENSIONS FOR SOCKET WELD FITTINGS