

AS/NZS 5065:2005

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AS/NZS 5065:2005
(Incorporating Amendment Nos 1 and 2)

Australian/New Zealand Standard™

Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

First published as AS/NZS 5065:2005.
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PREFACE

This Australian/New Zealand Standard was prepared by Committee PL-006, Polyolefin Pipe Systems.

This Standard incorporates Amendment No. 1 (February 2010) and No. 2 (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 objective of this Standard is to provide manufacturers, specifiers and purchasers with minimum requirements for the manufacture and performance of polyethylene (PE) and polypropylene (PP) pipes and fittings for gravity sewerage and drainage applications.

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.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard. Notes to text are for information and guidance only.

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FOREWORD

A1 | In this Standard, pipes and fittings are classified in terms of stiffness, based on minimum ring-bending stiffness values measured in short-term tests. Four common stiffness classes are given: SN 2, SN 4, SN 8 and SN 16, which are based on the requirements of ISO 8772:2006, *Plastics piping systems for non-pressure underground drainage and sewerage—Polyethylene (PE)*, and ISO 8773:2006, *Plastics piping systems for non-pressure underground drainage and sewerage—Polypropylene (PP)*. Stiffness class of SN 1.25 can only be used for pipes of nominal outside diameter (DN) greater than 600 mm.

Changes to this edition include the exclusion of additives containing compounds based on lead, cadmium or mercury and changing the reporting requirements for ring flexibility to reflect the changes in the test method.

By convention, plastics pipe systems are often designed on the basis of 50 year extrapolated test data. This is established international practice but is not intended to imply the service life of drainage pipe is limited to 50 years. For correctly manufactured and installed systems, the actual life cannot be predicted, but can logically be expected to be well in excess of 100 years before major rehabilitation is required.

The test criteria specified in this Standard apply to pipes and fittings at the time of manufacture. Storage prior to installation, the passage of time since manufacture and use in service may alter pipe and fitting properties such that the pipes or fittings may no longer meet the performance requirements of this Standard.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for polyethylene (PE) and polypropylene (PP) pipes and fittings for sewerage and drainage applications, above and below ground, inside and outside of buildings, and intended to be used where the pipeline is operating under gravity flow and the operating pressure is low. It includes requirements for both plain and structured wall pipes and fittings.

A1 | Pipes manufactured to this Standard are intended to be installed in accordance with AS/NZS 2033, AS/NZS 2566.2, AS/NZS 3500.2, AS/NZS 3500.3, WSA 02 and other utility/authority requirements.

1.2 MEANS FOR DEMONSTRATING COMPLIANCE

Compliance with this Standard shall be demonstrated in accordance with Appendix A.

1.3 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix B.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 3500.0 and those below apply. Where there is conflict between the definitions of AS/NZS 3500.0 and this Standard, the definitions in this Standard apply.

1.4.1 Co-extruded 'jacket' pipes

A pipe comprised of two layers, where the melts are bonded simultaneously in a die head as part of the extrusion process.

1.4.2 Effective seal

A1 | That part of the interface between the elastomeric seal and the spigot and socket where the contact pressure is greater than 0.4 MPa for vulcanized seals and 0.47 MPa for thermoplastic seals.

1.4.3 Effective sealing length**1.4.3.1 Socket-mounted seals**

The distance between the cross-sectional centre of the elastomeric sealing ring installed in the socket and the root of the socket.

1.4.3.2 Spigot-mounted seals

The distance from the position of effective seal of the elastomeric sealing ring to the mouth of a socket or the point at which the mouth of a socket flares.

1.4.4 Fabricated fitting

A fitting built up by joining together a number of components, which may be—

- (a) moulded, extruded or manufactured by other means;
- (b) formed by reshaping of pipe or fittings, or both; or
- (c) a combination of the above.

NOTE: Moulded fittings joined by means of moulded sockets complying with this Standard are not considered to be fabricated fittings.

1.4.5 Inside wall thickness

The thickness of the wall section in direct contact with the medium being transported.

1.4.6 Maximum differential displacement

A relative transverse displacement between the spigot and socket surfaces at one point.

1.4.7 Minimum jointing compression conditions

The jointing condition brought about by a combination of spigot, socket and ring dimensional tolerances and ring hardness, such that, with the spigot concentric with the socket, a minimum compressive force is generated between the elastomeric seal and the pipe surface.

1.4.8 Out-of-roundness (ovality)

The difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-section of the pipe.

1.4.9 Plain wall construction

A pipe or fitting of a homogeneous material with plain inside and outside surface including co-extruded jacket and striped pipes.

1.4.10 Structured wall

A term used to collectively describe sandwich, ribbed and hollow profile pipes and fittings covered in this document.

1.4.11 Ribbed or hollow profile construction

A pipe or fitting with a plain inside surface with a solid or hollow outside helical or annular ribbed or corrugated external surface.

1.4.12 Sandwich construction

A pipe or fitting with smooth inside and outside surfaces in which the inner and outer wall layers are of solid PE or PP, connected by a foam or solid intermediate layer of PE or PP, and the same resin type (PE or PP) is used for all layers.

1.5 PACKAGING, STORAGE AND TRANSPORTATION

A1 | Whilst under the manufacturer's control, pipes and fittings manufactured in accordance with this Standard shall be packaged, stored and transported in accordance with AS/NZS 2033, AS/NZS 2566.2, AS/NZS 3500.2, AS/NZS 3500.3, WSA 02 and other utility/authority requirements, as appropriate, in a manner that will maintain their physical and dimensional integrity.

SECTION 2 MATERIALS

2.1 MATERIALS

2.1.1 Composition requirements for PE and PP

Pipes and fittings shall be manufactured from materials containing antioxidants, UV stabilizers and pigments necessary for their manufacture into pipes and fittings.

2.1.2 Stripe and jacket materials

Striping and jacket compounds shall be fully pre-compounded and shall comply with the requirements of Clauses 2.1.3 to 2.1.9.

A1 2.1.3 Black PE and PP compounds

When determined in accordance with ISO 6964, black PE and PP compounds shall contain $2.25 \pm 0.25\%$ by mass of carbon black.

A1 When determined in accordance with ASTM D3849 or equivalent, the average particle size of carbon black shall be in the range of 10 nm to 25 nm.

When determined in accordance with Appendix B of AS/NZS 4131, the toluene extract of carbon black shall be not greater than 0.1%.

2.1.4 Volatile content

When compounds are tested in accordance with Annex A of ISO 4437, the volatile content shall be not greater than 350 mg/kg at the time of manufacture.

2.1.5 Melt mass-flow rate (MFR)

A1 When determined in accordance with ISO 1133, MFR values of materials taken from pipes and fittings shall be as follows:

- (a) PE pipes and injection moulded fittings— $0.2 \text{ g/10 min} \leq \text{MFR} \leq 1.1 \text{ g/10 min}$ (temperature 190°C ; loading mass 5.0 kg, condition T).
- (b) PE rotational moulded fittings— $1.6 \text{ g/10 min} \leq \text{MFR} \leq 3 \text{ g/10 min}$ (temperature 190°C ; loading mass 5.0 kg, condition T).
- (c) PP— $\text{MRF} \leq 1.5 \text{ g/10 min}$ (temperature 230°C ; loading mass 2.16 kg, condition M).

2.1.6 Thermal stability of PE compounds

A1 PE compounds shall contain antioxidants, such that when determined, using oxygen, in accordance with ISO 11357-6, the oxidation induction time at a test temperature of 200°C shall be in accordance with Table 2.1 or a demonstrated equivalent time at higher temperature.

Other test methods may be used provided that they can be demonstrated to give an accuracy of the same or higher degree than that given in ISO 11357-6.

TABLE 2.1
OXIDATION INDUCATION TIME
AT A TEST TEMPERATURE OF 200°C

	Minimum oxidation induction time (minutes)
Injection moulded pipes and fittings	40
Rotation moulded fittings	10

2.1.7 Environmental stress cracking resistance (ESCR) of PE compounds

PE compounds materials or material taken from the pipe or fitting, when tested in accordance with AS/NZS 1462.25, at a stress of 15% of actual yield stress, as derived in accordance with Clause 2.1.8, shall not fail in less than 24 h. Compounds that comply with AS/NZS 4131 may be deemed to comply with this Clause.

2.1.8 Tensile properties of PE compounds

When PE compound is tested in accordance with AS 1145.2 at a strain rate of 5 mm/min, the minimum values of tensile properties shall be established.

2.1.9 Internal pressure resistance of PP compounds

PP copolymer (PP-B) and PP homopolymer (PP-H) materials shall comply with ISO 8773.

2.1.10 Decohesive resistance of jackets and stripes

Jacketed and striped pipe shall be tested in accordance with ISO 13954. Decohesion between jacket or stripe and parent pipe shall not occur over more than 30% of the socket fusion zone as defined in Table 5.4.

2.2 WEATHERING RESISTANCE FOR HANDLING AND STORAGE

The weathering resistance test shall apply to all non-black compounds with less than 0.2% by mass of HALS, including those used for jackets and stripes. Compounds complying with AS/NZS 4131 shall be deemed to comply with this Clause.

The weathering resistance, including resistance to ultraviolet light radiation, of PE or PP compounds determined in accordance with AS/NZS 4131, Appendix C, on samples exposed to at least 3.5 GJ/m² total global radiation shall be such that—

- (a) the thermal stability has been established as above; and
- (b) for PE, the mean elongation at break is $\geq 350\%$, and for PP, the mean elongation at break shall not change by more than 50% of the value of the unexposed material.

NOTE: The intent of the weathering test is to provide assurance of resistance to weathering encountered during storage and transport of pipe. The test does not provide similar assurance for installations exposed to the elements long term. Reference should be made to AS 1745.2 for typical incident energy at various sites around Australia.

2.3 ELASTOMERIC SEALS

A1 | The elastomeric seals shall comply with AS 1646.

SECTION 3 PERFORMANCE REQUIREMENTS

3.1 TESTS ON PIPES AND FITTINGS—THERMAL STABILITY

A1

PE pipes and fittings shall contain antioxidants, such that when determined, using oxygen, in accordance with ISO 11357-6, the oxidation induction time at a test temperature of 200°C shall be in accordance with Table 3.0 or a demonstrated equivalent time at a higher temperature.

Other test methods may be used provided that it can be demonstrated that they give the same or a higher degree of accuracy to that given in ISO 11357-6.

TABLE 3.0
OXIDATION INDUCATION TIME
AT A TEST TEMPERATURE OF 200°C

	Minimum oxidation induction time (minutes)
Injection moulded pipes and fittings	20
Rotation moulded fittings	10

3.2 TESTS ON PIPES

3.2.1 Reversion (applicable to plain wall pipes only)

The longitudinal reversion of pipes shall not exceed 3% for PE, and 2% for PP, as determined in accordance with AS/NZS 1462.4, under the following conditions:

- Test temperature: $T = 110^{\circ}\text{C}$ for PE.
- Test temperature: $T = 135^{\circ}\text{C}$ for PP random copolymers.
- Test temperature: $T = 150^{\circ}\text{C}$ for PP homopolymers and block copolymers.

3.2.2 Stiffness

When tested in accordance with AS/NZS 1462.22, the pipe stiffness shall be not less than that given in Table 3.1 for the relevant pipe class.

NOTE: For plain wall pipes the pipe stiffness can be approximated to standard dimension ratio (SDR) as follows:

Class	Stiffness N/m.m	PE SDR	PP SDR	Class	Stiffness N/m.m	PE SDR	PP SDR
SN1.25	1 250	—	—	SN8	8 000	21	23
SN2	2 000	33	41	SN10	10 000	—	21
SN4	4 000	26	33	SN16	16 000	17	—

TABLE 3.1
MINIMUM PIPE STIFFNESS VALUES

Class	Stiffness N/m.m
SN1.25	1 250
SN2S	2 000
N4	4 000
SN8	8 000
SN10	10 000
SN16	16 000

3.2.3 Ring flexibility

A1 | When tested in accordance with AS/NZS 1462.23, using a force raised continuously to achieve a 30% deflection, a test specimen of pipe shall not exhibit any cracking in any part of the wall structure, wall delamination, rupture or permanent buckling.

3.3 TESTS ON FITTINGS

3.3.1 Hydrostatic pressure test

A1 | When an assembled fitting with inspection or test openings or fabricated fittings is tested in accordance with the hydrostatic pressure test of AS/NZS 1462.8, at an internal pressure of 85 +5, -0 kPa for 60 +5, -0 min., the assembled fitting shall not leak.

3.3.2 Liquid infiltration test

When an assembled fitting with inspection or test openings, tightened to a torque of 15 +1, -0 N.m where applicable, tested in accordance with AS/NZS 1462.8, is subjected to an internal vacuum or external hydrostatic pressure, resulting in a pressure differential of 80 +5, -0 kPa, for 60 +5, -0 min, it shall not leak.

3.3.3 Cohesive resistance test for electrofusion sockets

When tested in accordance with ISO 13954 and ISO 13955 at 23°C, the fracture shall be ductile with yield within the rupture zone, except that for socket assemblies, initial rupture may be in the brittle mode over a maximum length of $L_2/3$.

3.3.4 Stiffness (for structured wall fittings only)

A1 | When tested in accordance with ISO 13967, the stiffness value shall be not less than 8 000 N/m/m.

3.4 TESTS ON ELASTOMERIC SEAL JOINTS

3.4.1 Hydrostatic pressure test

A1 | When tested in accordance with AS/NZS 1462.8, with a diametral distortion of 7.5%, the assembled joint shall withstand an internal pressure of 80 +5, -0 kPa for 60 +5, -0 min. without leakage.

3.4.2 Liquid infiltration test

When tested in accordance with AS/NZS 1462.8, with a diametral distortion of 7.5%, the assembled joint shall not leak, when subjected to an internal vacuum corresponding to a gauge pressure of -80 kPa to -85 kPa for 60 +5, -0 min.

3.4.3 Contact width and pressure

A1 | When determined in accordance with AS/NZS 1462.13, elastomeric seals manufactured to:

- (a) AS 1646 and AS 681.1 shall have a contact pressure exceeding 0.4 MPa over a continuous width of 4 mm.
- (b) AS 1646 and AS 681.2 shall have a contact pressure exceeding 0.47 MPa over a continuous contact width of 4 mm.

3.2.3 Ring flexibility

A1 | When tested in accordance with AS/NZS 1462.23, using a force raised continuously to achieve a 30% deflection, a test specimen of pipe shall not exhibit any cracking in any part of the wall structure, wall delamination, rupture or permanent buckling.

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A1 | When an assembled fitting with inspection or test openings or fabricated fittings is tested in accordance with the hydrostatic pressure test of AS/NZS 1462.8, at an internal pressure of 85 +5, -0 kPa for 60 +5, -0 min., the assembled fitting shall not leak.

3.3.2 Liquid infiltration test

When an assembled fitting with inspection or test openings, tightened to a torque of 15 +1, -0 N.m where applicable, tested in accordance with AS/NZS 1462.8, is subjected to an internal vacuum or external hydrostatic pressure, resulting in a pressure differential of 80 +5, -0 kPa, for 60 +5, -0 min, it shall not leak.

3.3.3 Cohesive resistance test for electrofusion sockets

When tested in accordance with ISO 13954 and ISO 13955 at 23°C, the fracture shall be ductile with yield within the rupture zone, except that for socket assemblies, initial rupture may be in the brittle mode over a maximum length of $L_2/3$.

3.3.4 Stiffness (for structured wall fittings only)

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A1 | When tested in accordance with AS/NZS 1462.23, using a force raised continuously to achieve a 30% deflection, a test specimen of pipe shall not exhibit any cracking in any part of the wall structure, wall delamination, rupture or permanent buckling.

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A1 | When an assembled fitting with inspection or test openings or fabricated fittings is tested in accordance with the hydrostatic pressure test of AS/NZS 1462.8, at an internal pressure of 85 +5, -0 kPa for 60 +5, -0 min., the assembled fitting shall not leak.

3.3.2 Liquid infiltration test

When an assembled fitting with inspection or test openings, tightened to a torque of 15 +1, -0 N.m where applicable, tested in accordance with AS/NZS 1462.8, is subjected to an internal vacuum or external hydrostatic pressure, resulting in a pressure differential of 80 +5, -0 kPa, for 60 +5, -0 min, it shall not leak.

3.3.3 Cohesive resistance test for electrofusion sockets

When tested in accordance with ISO 13954 and ISO 13955 at 23°C, the fracture shall be ductile with yield within the rupture zone, except that for socket assemblies, initial rupture may be in the brittle mode over a maximum length of $L_2/3$.

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- (b) AS 1646 and AS 681.2 shall have a contact pressure exceeding 0.47 MPa over a continuous contact width of 4 mm.

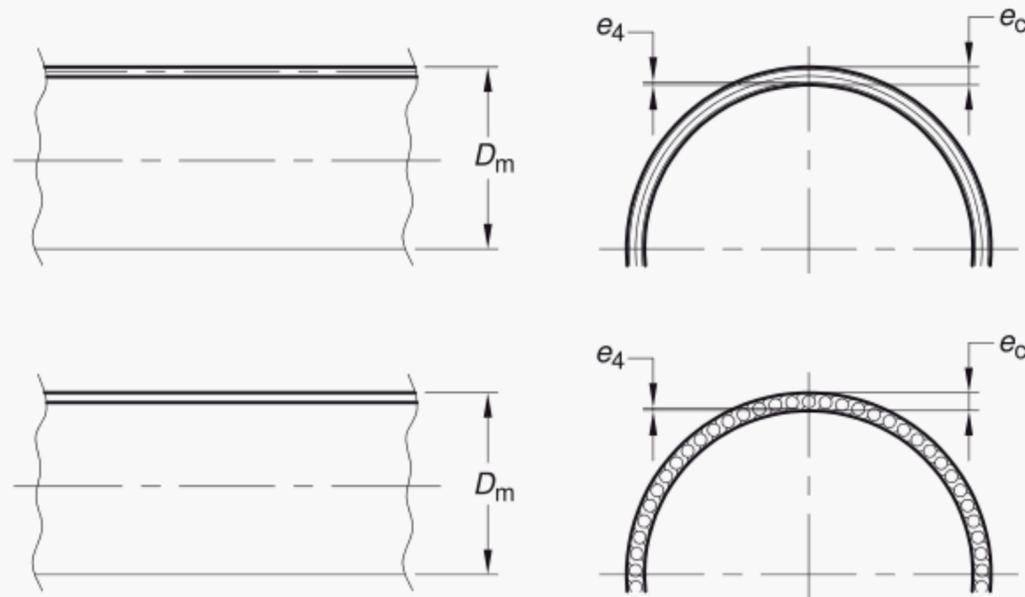


FIGURE 4.1 TYPICAL EXAMPLES OF WALL CONSTRUCTIONS—TYPE A1 PIPE

4.1.3.2 Dimensions—OD series

The mean outside diameter (D_m), and the minimum mean inside diameter ($D_{i\ min}$) of OD series pipes shall comply with Table 4.3.

The mean outside diameter (D_m) of fittings of OD series pipes shall comply with Table 4.3. The minimum mean inside diameter ($D_{i\ min}$) of the fitting shall be not less than 98% of the minimum mean inside diameter of the pipe for which it is designed.

4.1.3.3 Wall thickness of pipes—OD series

The wall thickness of the inside layer (e_4) of pipes shall comply with Table 4.3 (see also Figure 4.1). The construction height (e_c) for pipes up to 200 mm DN shall be at least as specified for e_{min} for the SDR 26 series and SDR 33 series given in Tables 4.1 and 4.2 for PE and PP respectively.

4.1.3.4 Dimensions of sockets and spigots—OD series

The mean outside diameter ($D_{m\ min}$) of spigots for OD series pipes shall comply with Table 4.3. The dimensions of sockets for OD series pipes shall comply with Table 4.4 (see also Figure 4.2). For a plain spigot and/or socket, the wall thicknesses e , e_2 and e_3 shall comply with Table 4.5. Values are calculated to the second decimal place and rounded to the next higher 0.1 mm.

The ring stiffnesses of sockets and spigots, when measured in accordance with ISO 9969, shall comply with the following:

$$S_{\text{socket}} + S_{\text{spigot}} \geq SN_{\text{pipe}}$$

NOTE: It is permitted to use a cut off straight socket part for the test even if it does not comply with the length requirements specified in ISO 9969.

TABLE 4.3
DIMENSIONS—TYPE A1 OD SERIES PIPES

Nominal outside diameter DN	Mean outside diameter		Inside layer wall thickness		Minimum mean inside diameter for PE and PP $D_{i \text{ min}}$
	$D_{m \text{ min}}$	$D_{m \text{ max}}$	$e_{4 \text{ min}}$		
110	110.0	111.0	0.4	0.6	90
125	125.0	125.3	0.4	0.6	105
160	160.0	161.5	0.5	0.8	134
200	200.0	201.8	0.6	1.0	167
244	244.1	246.4	0.7	1.1	203
250	250.0	252.3	0.7	1.1	209
315	315.0	317.9	0.8	1.2	263
355	355.0	358.2	0.9	1.4	297
400	400.0	403.6	1.0	1.5	335
450	450.0	454.1	1.6		376
500	500.0	504.5	1.8		418
630	630.0	635.7	2.0		527
710	710.0	716.4	2.2		594
800	800.0	807.2	2.3		669
900	900.0	908.1	2.5		753
1000	1000.0	1009.0	2.8		837
1200	1200.0	1210.0	3.4		1005

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

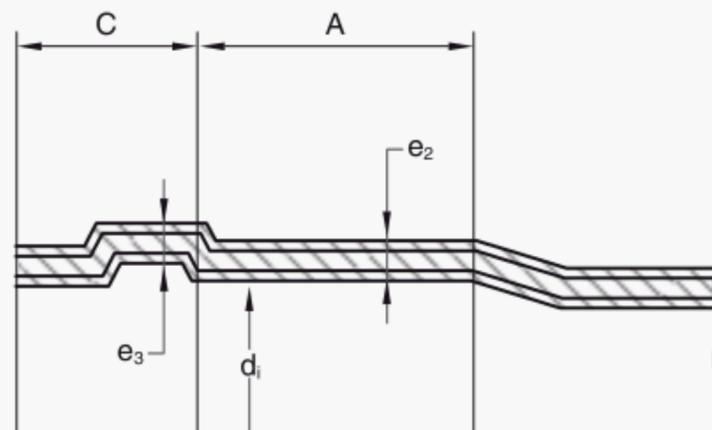


FIGURE 4.2 TYPICAL EXAMPLE OF TYPE A RING JOINTS WITH THE SEALING RING LOCATED IN THE SOCKET

TABLE 4.3
DIMENSIONS—TYPE A1 OD SERIES PIPES

Nominal outside diameter DN	Mean outside diameter		Inside layer wall thickness		Minimum mean inside diameter for PE and PP
	$D_m \text{ min}$	$D_m \text{ max}$	$e_4 \text{ min}$		$D_i \text{ min}$
110	110.0	111.0	0.4	0.6	90
125	125.0	125.3	0.4	0.6	105
160	160.0	161.5	0.5	0.8	134
200	200.0	201.8	0.6	1.0	167
244	244.1	246.4	0.7	1.1	203
250	250.0	252.3	0.7	1.1	209
315	315.0	317.9	0.8	1.2	263
355	355.0	358.2	0.9	1.4	297
400	400.0	403.6	1.0	1.5	335
450	450.0	454.1	1.6		376
500	500.0	504.5	1.8		418
630	630.0	635.7	2.0		527
710	710.0	716.4	2.2		594
800	800.0	807.2	2.3		669
900	900.0	908.1	2.5		753
1000	1000.0	1009.0	2.8		837
1200	1200.0	1210.0	3.4		1005

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

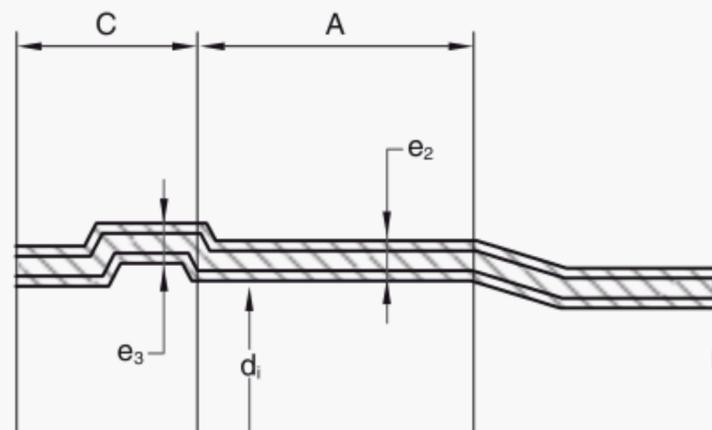


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TABLE 4.3
DIMENSIONS—TYPE A1 OD SERIES PIPES

Nominal outside diameter DN	Mean outside diameter		Inside layer wall thickness		Minimum mean inside diameter for PE and PP
	$D_{m \text{ min}}$	$D_{m \text{ max}}$	$e_4 \text{ min}$		$D_{i \text{ min}}$
110	110.0	111.0	0.4	0.6	90
125	125.0	125.3	0.4	0.6	105
160	160.0	161.5	0.5	0.8	134
200	200.0	201.8	0.6	1.0	167
244	244.1	246.4	0.7	1.1	203
250	250.0	252.3	0.7	1.1	209
315	315.0	317.9	0.8	1.2	263
355	355.0	358.2	0.9	1.4	297
400	400.0	403.6	1.0	1.5	335
450	450.0	454.1	1.6		376
500	500.0	504.5	1.8		418
630	630.0	635.7	2.0		527
710	710.0	716.4	2.2		594
800	800.0	807.2	2.3		669
900	900.0	908.1	2.5		753
1000	1000.0	1009.0	2.8		837
1200	1200.0	1210.0	3.4		1005

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

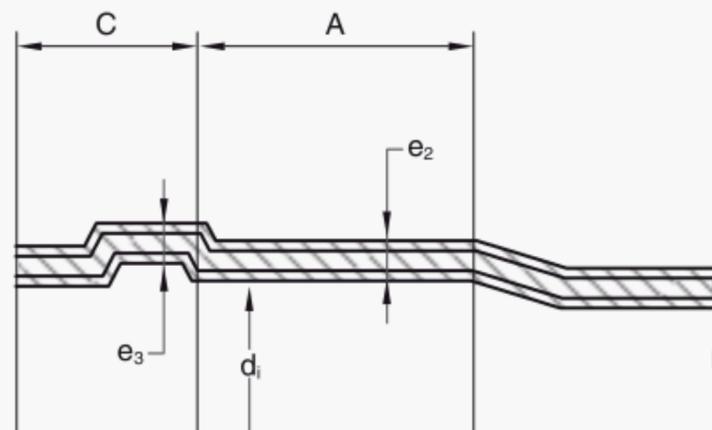


FIGURE 4.2 TYPICAL EXAMPLE OF TYPE A RING JOINTS WITH THE SEALING RING LOCATED IN THE SOCKET

TABLE 4.3
DIMENSIONS—TYPE A1 OD SERIES PIPES

Nominal outside diameter DN	Mean outside diameter		Inside layer wall thickness		Minimum mean inside diameter for PE and PP
	$D_m \text{ min}$	$D_m \text{ max}$	$e_4 \text{ min}$		$D_i \text{ min}$
110	110.0	111.0	0.4	0.6	90
125	125.0	125.3	0.4	0.6	105
160	160.0	161.5	0.5	0.8	134
200	200.0	201.8	0.6	1.0	167
244	244.1	246.4	0.7	1.1	203
250	250.0	252.3	0.7	1.1	209
315	315.0	317.9	0.8	1.2	263
355	355.0	358.2	0.9	1.4	297
400	400.0	403.6	1.0	1.5	335
450	450.0	454.1	1.6		376
500	500.0	504.5	1.8		418
630	630.0	635.7	2.0		527
710	710.0	716.4	2.2		594
800	800.0	807.2	2.3		669
900	900.0	908.1	2.5		753
1000	1000.0	1009.0	2.8		837
1200	1200.0	1210.0	3.4		1005

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

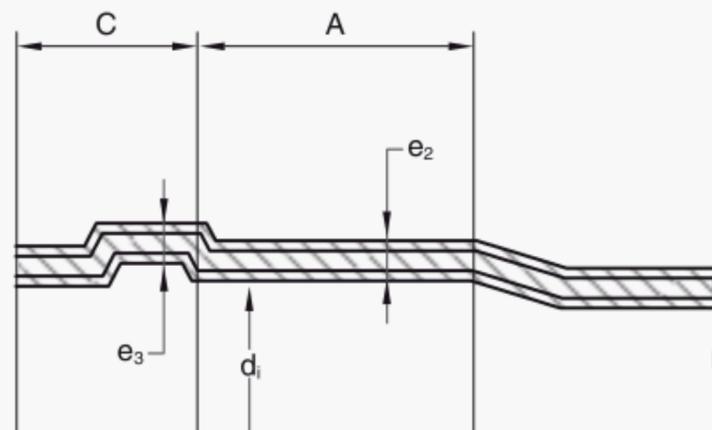


FIGURE 4.2 TYPICAL EXAMPLE OF TYPE A RING JOINTS WITH THE SEALING RING LOCATED IN THE SOCKET

TABLE 4.6
DIMENSIONS—TYPE B ID SERIES PIPES

millimetres

Nominal outside diameter	Inside layer wall thickness between profile	Inside layer wall thickness at profile	Minimum mean inside diameter for PE and PP
DN	e_4 min	e_5 min	D_i min
100	1.0	1.0	97
110	1.1	1.0	107
125	1.2	1.0	118
140	1.2	1.0	135
150	1.3	1.0	145
180	1.4	1.1	172
200	1.5	1.1	194
225	1.7	1.4	216
250	1.8	1.4	243
280	1.9	1.6	270
300	2.0	1.7	292
350	2.3	2.0	340
375	2.4	2.1	361
400	2.5	2.3	383
450	2.8	2.8	432
500	3.0	3.0	486
525	3.2	3.2	515
560	3.3	3.3	540
600	3.5	3.5	584
675	3.9	3.9	655
700	4.1	4.1	680
750	4.3	4.3	723
800	4.5	4.5	766
900	5.0	5.0	864
1000	5.0	5.0	960
1050	5.0	5.0	1008
1100	5.0	5.0	1050
1200	5.0	5.0	1152
1500	5.0	5.0	1450

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

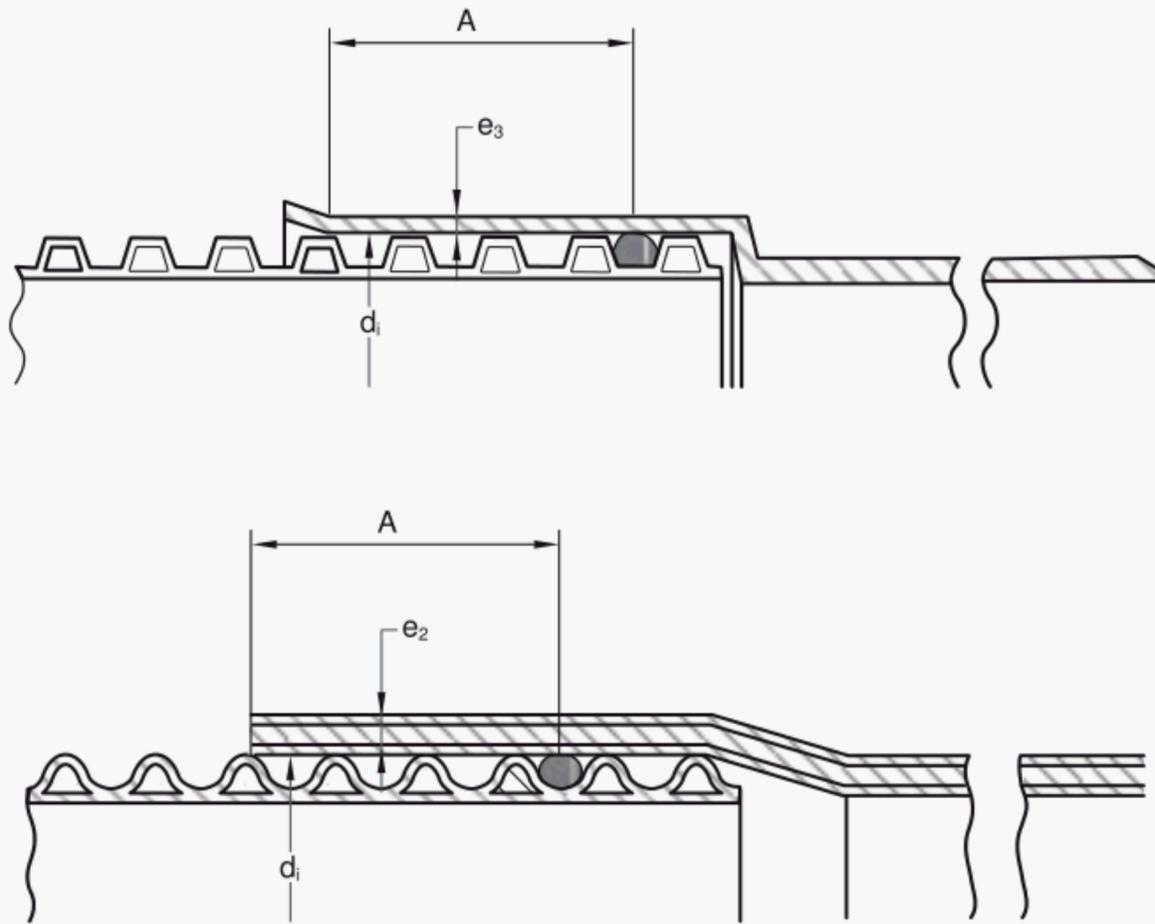


FIGURE 4.5 TYPICAL EXAMPLES OF TYPE B RING JOINTS WITH THE SEALING RING LOCATED ON THE SPIGOT

TABLE 4.7
SOCKET DIMENSIONS—SEALING RING JOINTS WITH ID SERIES TYPE B AND
MINIMUM WALL THICKNESS e_4 —INJECTION-MOULDED FITTINGS

millimetres				
Nominal outside diameter DN	A_{min}	C_{max}	L_1 min	e_4 min for injection moulded fittings
100	32	26	60	2.0
110	35	26	67	2.0
125	39	28	73	2.0
140	42	32	81	2.0
150	44	34	87	2.0
180	50	40	99	2.0
200	53	55	112	2.0
225	55	70	125	2.0
250	58	70	128	2.0
280	60	70	132	2.0
300	62	70	134	2.0
350	64	80	150	2.3
375	64	80	150	2.4
400	66	80	155	2.5
450	70	—	—	2.8
500	75	—	—	3.0
525	77	—	—	3.1
560	80	—	—	3.3
600	85	—	—	3.5
700	85	—	—	4.1
750	85	—	—	4.3
800	85	—	—	4.5
900	85	—	—	5.0
1000	85	—	—	5.0
1050	85	—	—	5.0
1100	85	—	—	5.0
1200	85	—	—	5.0

TABLE 4.8
DIMENSIONS—TYPE B OD SERIES PIPES

Nominal outside diameter DN	Mean outside diameter		Inside layer wall thickness between profile e_4 min	Inside layer wall thickness at profile e_5 min	Minimum mean inside diameter for PE and PP D_i min
	D_m min	D_m max			
110	109.4	110.4	1.0	1.0	90
125	124.3	125.4	1.1	1.0	105
160	159.1	160.5	1.2	1.0	134
200	198.8	200.6	1.4	1.1	167
250	248.5	250.8	1.7	1.4	209
315	313.2	316.0	1.9	1.6	263
355	352.9	356.1	2.1	1.7	297
400	397.6	401.2	2.3	2.0	335
450	447.3	451.4	2.5	2.3	376
500	497.0	501.5	2.8	2.8	418
630	626.3	631.9	3.3	3.3	527
710	705.8	712.1	3.8	3.8	594
800	795.2	802.4	4.1	4.1	669
900	894.6	902.7	4.5	4.5	753
1000	994.0	1003.0	5.0	5.0	837
1200	1192.8	1203.6	5.0	5.0	1005

NOTE: The actual minimum inside diameter of the pipe should be specified by the manufacturer.

TABLE 4.9
**SOCKET DIMENSIONS—SEALING RING JOINTS WITH OD SERIES TYPE B
AND MINIMUM WALL THICKNESS e_4 —INJECTION-MOULDED FITTINGS**

Nominal outside diameter DN	Minimum inside diameter d_i min	A min	C max	L_1 min	e_4 min for injection moulded fittings
125	125.4	35	26	67	2.0
160	160.5	42	32	81	2.0
200	200.6	50	40	99	2.0
250	250.8	55	70	125	2.0
315	316.0	62	70	132	2.0
355	356.1	66	70	136	2.1
400	401.2	70	80	150	2.3
450	451.4	75	80	155	2.5
500	501.5	80	—	—	2.8
630	631.9	93	—	—	3.3
710	712.1	101	—	—	3.8
800	802.4	110	—	—	4.1
900	902.7	120	—	—	4.5
1000	1003.0	130	—	—	5.0

4.2 PIPE EFFECTIVE LENGTH

The manufacturer's nominated effective length of the pipe shall be determined in accordance with AS/NZS 1462.1.

The effective length of socketed pipes shall be the overall length of pipe less insertion depth(s). The effective length of plain-ended pipes is the overall length (see Figure 4.6).

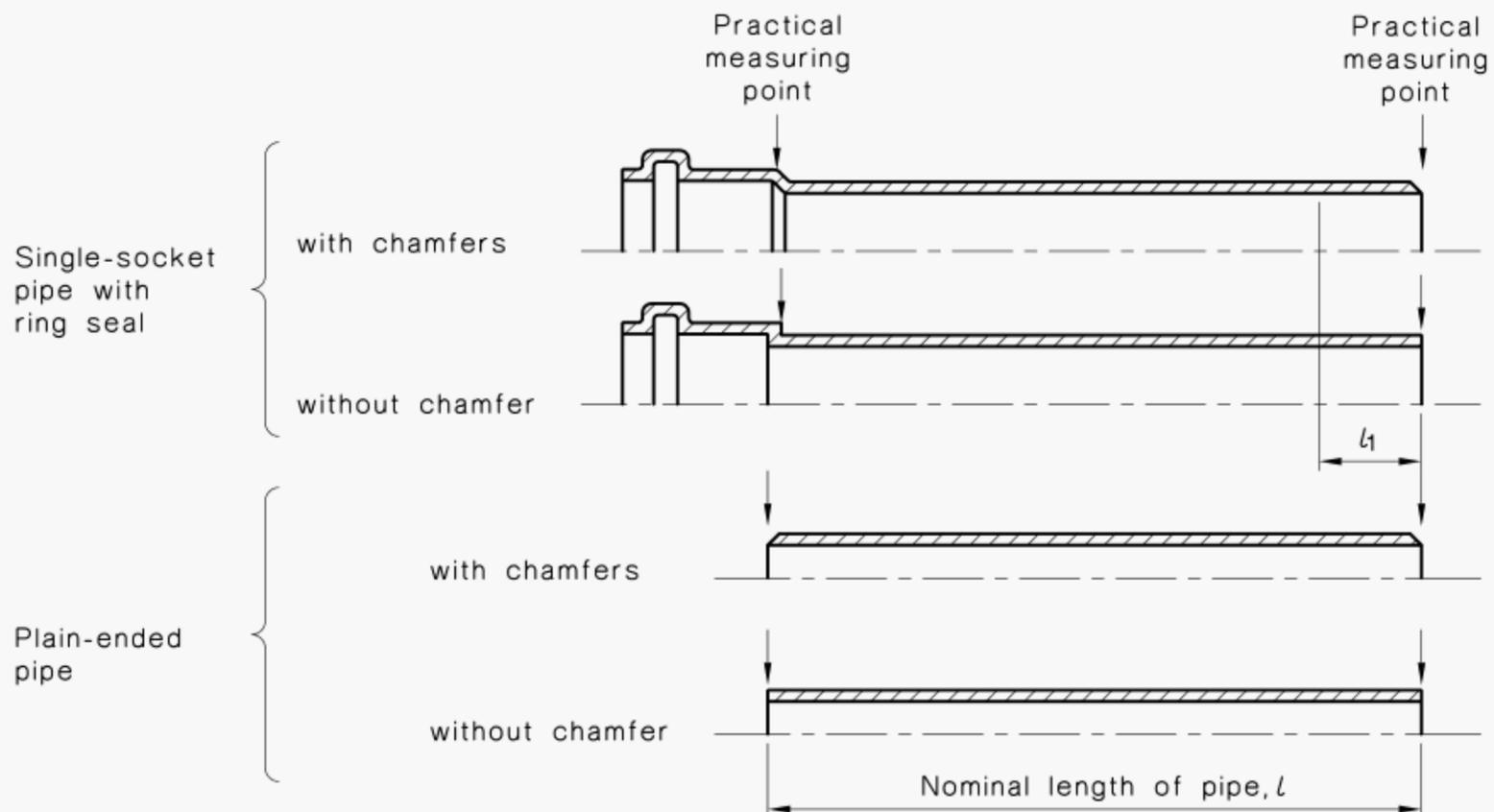


FIGURE 4.6 EFFECTIVE LENGTH OF PIPES

4.3 SPIGOT ENDS

Spigot ends shall be nominally square.

4.4 STRIPES

A1

There shall be not less than 4 stripes and they shall be opaque. For Pipes <DN280, not less than 15% of the external surface will be covered with striping compound.

For pipes \geq DN280 and <DN630 the percent coverage shall be not less than 10% of the external pipe surface.

For pipes \leq DN630 the coverage will be not less than 8% of the external pipe surface.

4.5 SOCKETS FORMED ON PIPE ENDS

Sockets formed on the ends of pipe shall be parallel within 2° of the pipe axis. Sockets shall be concentric with the pipe to within 2.5% of pipe mean outside diameter for pipes up to and including DN 160 and 1.0% for larger pipes. Assessment may be by visual means without measurement.

4.6 FREEDOM FROM DEFECTS

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

Defects shall not affect the performance or function of the pipe in service.

Pipes and fittings shall be free from blisters and heat marks. When grooves, wrinkles, rippling, dents or projections are present, the pipe shall comply with the dimensional requirements of this Standard.

Spigot ends of pipes and fittings shall be free from chips and rough edges.

4.7 MARKING

Marking details shall be legibly printed or formed on the pipe in such a way that—

- (a) the marking does not initiate cracks or other types of failure; and
- (b) with normal storage, weathering and processing, and the permissible method of installation and use, legibility is maintained for the life of the pipe.

The letters of the marking shall be a minimum height of 5 mm, which shall be repeated at intervals such that the distance between markings is not greater than 1 m.

Marking shall show the following:

- (i) Manufacturer's name or registered trademark or both.
- (ii) Nominal size in the form 'DN 110', as appropriate.
- (iii) Class in the form, SN 1.25, SN 2, SN 4, SN 8, SN 10, SN 16, or as applicable.
- (iv) For plain wall pipes, the SDR in the form 'SDR 17', as appropriate.
- (v) The letters 'PP' or 'PE', as appropriate.
- (vi) For structural wall pipes of sandwich construction the letters 'SC'.
- (vii) Date of manufacture, in the form 060515 (i.e., the 15th of May 2006), as appropriate.
- (viii) Identification of place of manufacture. The manufacturer's code is acceptable, e.g., P1.

NOTE: Alternative methods of marking the pipe with the above information may be used by agreement between the purchaser and manufacturer.

Example:

TRADE NAME DN 110 SN 8 SDR 17 PP 060515 P1

4.8 WITNESS MARK

Pipes with a socket for elastomeric seal jointing shall carry a witness mark on the spigot end to indicate the insertion length (see Figure 4.6).

SECTION 5 FITTINGS

5.1 GENERAL

This Section specifies the dimensional requirements for PE and PP plain wall fittings. Dimensions of fittings used specifically with the pipes outlined in the previous Section are detailed herein for ease of reference.

Fitting types are not restricted to the basic designs nominated in this Document. Variations shall ensure that the finished product complies with the requirements in this Standard.

A1 | Rotomoulded fittings may be welded together in the factory to like rotomoulding materials. Rotomoulded fittings shall not be welded to pipes, or injection moulded fittings, see Clause 5.4.

5.2 DIMENSIONS OF FITTINGS

Fitting dimensions shall comply with the appropriate values given in Tables 5.1, 5.2, 5.3 and 5.4. Dimensions of fittings shall be determined in accordance with AS/NZS 1462.1.

5.2.1 Wall thickness

The wall thickness of the body of the fitting shall comply with the values given for the appropriate pipe thickness.

The wall thickness of fabricated fittings shall conform to the requirements of the corresponding pipe. Wall thickness reductions due to the process shall be allowed, provided the stiffness of the fitting is at least equal to its nominal stiffness in accordance with ISO 13967.

5.2.2 Spigot ends

Outside diameters of spigot ends on moulded fittings shall comply with the values given for plain wall pipes. Wall thicknesses of spigot ends on moulded fittings shall be as above. Radii used on bevelled spigot ends shall extend for no more than 50% of the wall thickness.

5.2.3 Sockets on moulded fittings

Sockets formed on the ends of fittings shall be parallel to the axis of the fitting when visually inspected. Sockets on moulded fittings for elastomeric seal jointing shall comply with Clause 3.4.

5.2.4 Socket wall thickness

The minimum wall thickness of sockets for sealing joints shall comply with Table 5.2 or Table 5.3 (see also Figures 5.3, 5.4, 5.5).

5.2.5 Inside diameter

The minimum mean inside diameter of the cylindrical part of the socket ($D_{s, m \min}$) shall be in accordance with Table 5.1.

NOTES:

- 1 The values are calculated using the following formula:

$$D_{s, m \min} = 1.009 D + 0.1 \text{ mm}$$

- 2 The maximum mean inside diameter depends on the seating ring shape, dimensions and hardness specified by the manufacturer.

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$$D_{s, m \min} = 1.009 D + 0.1 \text{ mm}$$

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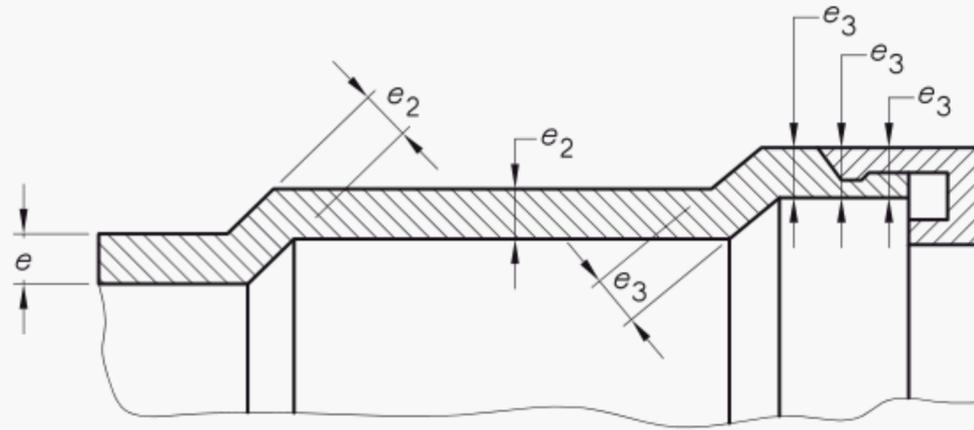
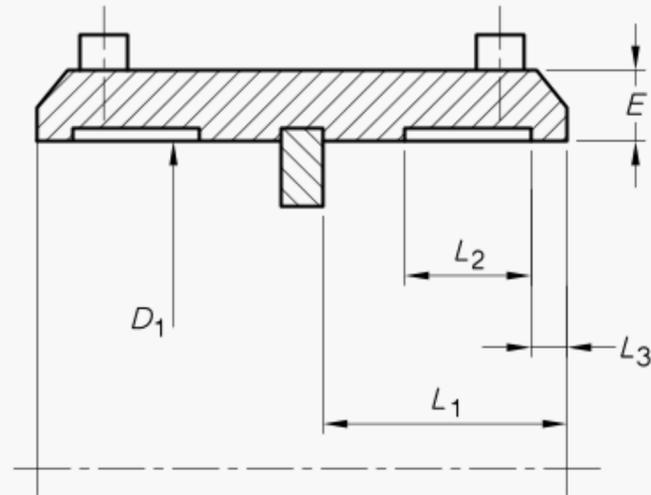


FIGURE 5.5 EXAMPLE OF A SEAL RETAINING CAP

TABLE 5.4
DIMENSIONS OF ELECTROFUSION SOCKETS

millimetres				
Nominal size	Nominal outside diameter	Minimum depth of penetration	Minimum length of fusion zone	Minimum unheated entrance length
DN	d_n	L_1	L_2	L_3
110	110	28	15	5
125	125	28	15	5
160	160	28	15	5
200	200	50	25	5
250	250	60	25	5
315	315	70	25	5
355	355	100	25	8
400	400	100	25	8
450	450	100	25	8
500	500	100	25	8
630	630	120	30	8
800	800	120	30	12
1000	1000	120	35	12



LEGEND:

- L_1 = The depth of the penetration of the pipe or fitting spigot to be stated by the manufacturer.
- L_2 = The nominal length of the fusion zone to be stated by the manufacturer, i.e. the heated length.
- L_3 = The nominal unheated length of the fitting to be stated by the manufacturer, i.e. the distance between the mouth of the fitting and the start of the fusion zone.
- D_1 = The mean inside diameter of the fusion zone, to be stated by the manufacturer, i.e. the internal diameter measured in a plane parallel to the plane of the mouth at a distance of $L_3 + 0.5 L_2$ from the mouth.
- E = The wall thickness of the fitting at any point. The wall thickness should at least be equal to the minimum wall thickness for the corresponding pipe.

FIGURE 5.6 ELECTROFUSION SOCKET

5.3 FREEDOM FROM DEFECTS

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

Defects shall not affect the performance or function of the fittings in service.

Fittings shall be free from blisters and heat marks. When grooves, wrinkles, rippling, dents or projections are present, the fitting shall comply with the dimensional requirements of this Standard.

Spigot ends of fittings shall be free from chips and rough edges.

5.4 MARKING

A1

The body of the fitting, or the packaging as allowed below, shall be legibly and permanently marked or labelled with the following information:

- (a) Manufacturer's name or registered trademark or both.
- (b) Nominal size in the form 'DN 110', as appropriate.
- (c) For rotational moulded fittings, 'RM'.
- (d) The letters 'PP' or 'PE', as appropriate.
- (e) Date or batch code.

The information on Items (b), (c), (d), (e) may be provided on the body of the fittings, or provided using a label, pressure-sensitive tape, or other suitable means on the product packaging.

APPENDIX A

A2 | MEANS FOR DEMONSTRATING CONFORMITY WITH THIS STANDARD
(Normative)

A1 SCOPE

A2 | This Appendix sets out a means for consistent demonstration of conformity with this Standard through the use of a minimum sampling and testing frequency plan. Where variations to this plan are made, demonstration of conformance with the minimum requirements may be necessary.

A2 RELEVANCE

The long-term performance of pipeline systems is critical to the operating efficiency of water agencies in terms of operating licences and customer contracts. The long-term performance of plumbing systems is similarly critical to the durability of building infrastructure, protection of public health and safety and protection of the environment.

A3 DEFINITIONS**A3.1 Acceptable quality level (AQL)**

When a continuous series of lots or batches is considered, the quality level which, for the purpose of sampling inspection, is the limit of a satisfactory process average (see AS 1199.1).

NOTE: The designation of an AQL does not imply that a manufacturer has the right knowingly to supply any non-conforming unit of product.

A3.2 Batch

Schedule of pipes, all of the same nominal diameter, wall thickness and marking, manufactured from the same material or compound on the same machine.

NOTE: The batch is defined and identified by the pipe manufacturer.

A3.3 Batch release test (BRT)

A test performed on a sample from the batch or lot, to confirm conformance to the requirements of this Standard before the batch can be released.

A3.4 Inspection level

The relationship between the batch or lot size and the sample size (see AS 1199.1).

A3.5 Lot

A clearly identifiable subdivision of a batch for inspection purposes.

A3.6 New formulation

A change in material or compound formulation that exceeds the limits given in Appendix A of AS/NZS 4131.

A3.7 Process verification test (PVT)

A test performed on a sample at specific intervals, to confirm conformance to the requirements of this Standard before further batches can be released.

A3.8 Sample

One or more units of product drawn from a batch or lot, selected at random without regard to quality.

NOTE: The number of units of product in the sample is the sample size.

A3.9 Sampling plan

A specific plan that gives the number of samples and the frequency of inspection or testing.

A3.10 Type test (TT)

A2

Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements of the relevant Standard.

A4 'TEXT DELETED'**A5 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN****A5.1 General**

Table A1 sets out the minimum sampling and testing frequency plan for demonstration of conformity to this Standard. Where variations to this plan are made, demonstration of conformance with the minimum requirements may be necessary.

A5.2 Testing

Testing shall be conducted by a testing laboratory or facility that fulfils the requirements of AS ISO/IEC 17025.

NOTE: AS ISO/IEC 17025 can apply to a first-party (i.e. manufacturer or supplier), second-party (i.e. user or purchaser) or third-party testing laboratories and facilities.

A5.3 Retesting

In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements specified in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan in accordance with AS 1199. If the retest requirements are met, the batch may be released and conformance with this Standard for the quarantined batch may be claimed.

Should a failure occur on retesting, then the quarantined batch shall be rejected and claims and/or marking indicating conformity to this Standard shall be suspended until the cause of the failure has been identified and corrected.

A5.4 Rejection after test

In the event of a quarantined batch being rejected after retesting in accordance with the procedures set out in Paragraph A5.3, it may be subjected to 100% testing for the failed requirement(s), and only those items found to conform may be claimed and/or marked as conforming with this Standard.

TABLE A1
MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

Characteristics	Clause	Requirement	Test method	Frequency	
TYPE TESTS (TT)					
A1	Material property	2.1.3	Mass of carbon black	ISO 6964	Any new material formulation or design, or once every 5 years, whichever occurs first
		2.1.3	Particle size of carbon black	ASTM D3849	
		2.1.3	Toluene extract of carbon black	AS/NZS 4131 Appendix B	
		2.1.4	Volatile content	ISO 4437 Annex A	
		2.1.5	Melt mass-flow rate	ISO 1133 Condition 12	
		2.1.6	Thermal stability of PE	ISO 11357-6	
		2.1.7	ESCR of PE	AS/NZS 1462.25	
		2.1.8	Tensile properties	AS 1145.2	
		2.1.9	Internal pressure resistance of PP	ISO 8773	
		2.1.10	Decohesive resistance of jacketed and striped pipe	ISO 13954	
		A1		2.2	
2.3	Elastomeric seals			AS 1646	
A1	Performance	3.1	Thermal stability of pipes and fittings	ISO/TR 10837	Any new material formulation or design, or once every 5 years, whichever occurs first
		3.2.1	Reversion of pipes	AS/NZS 1462.4	
		3.2.2	Stiffness of pipes	AS/NZS 1462.22	
		3.2.3	Ring flexibility of pipes	AS/NZS 1462.23	
		3.3.1	Hydrostatic pressure resistance of fittings	AS/NZS 1462.8	
		3.3.2	Liquid infiltration of fittings	AS/NZS 1462.8	
		3.3.3	Cohesive resistance of electrofusion sockets	ISO 13954, ISO 13955	
		3.4.1	Hydrostatic pressure resistance of elastomeric seal joints	AS/NZS 1462.8	
		3.4.2	Liquid infiltration of elastomeric seal joints	AS/NZS 1462.8	
		3.4.3	Contact width and pressure of elastomeric seals	AS/NZS 1462.13	

(continued)

TABLE A1 (continued)

Characteristics	Clause	Requirement	Test method	Frequency
Dimensions	4.1.3.4, 4.1.4.4, 4.1.4.7	Pipe spigot and socket ring stiffness	ISO 9969	Any new design
BATCH RELEASE TESTS (BRT)				
Performance	3.2.1	Reversion of pipes	AS/NZS 1462.4	Once per batch
Dimensions	4.1	Dimensions of pipes	AS/NZS 1462.1*	Once per hour or start of coil, whichever is the greatest
	4.2	Effective length of pipes	AS/NZS 1462.1	
	4.3	Spigot ends of pipe	Visual inspection	Once per 4 h
	4.4	Stripes on pipes	Clause 4.4	
	4.5	Sockets formed on pipe ends	Clause 4.5	
	5.2	Dimensions of fittings	AS/NZS 1462.1*	
Freedom from defects	4.6, 5.3	Freedom from defects	Clause 4.6	
Marking	4.7, 4.8, 5.4	Marking and witness mark	Visual inspection	

* May also be tested by attributes (e.g., no and no-go gauges).

TABLE A1 (continued)

Characteristics	Clause	Requirement	Test method	Frequency
Dimensions	4.1.3.4, 4.1.4.4, 4.1.4.7	Pipe spigot and socket ring stiffness	ISO 9969	Any new design
BATCH RELEASE TESTS (BRT)				
Performance	3.2.1	Reversion of pipes	AS/NZS 1462.4	Once per batch
Dimensions	4.1	Dimensions of pipes	AS/NZS 1462.1*	Once per hour or start of coil, whichever is the greatest
	4.2	Effective length of pipes	AS/NZS 1462.1	
	4.3	Spigot ends of pipe	Visual inspection	Once per 4 h
	4.4	Stripes on pipes	Clause 4.4	
	4.5	Sockets formed on pipe ends	Clause 4.5	
	5.2	Dimensions of fittings	AS/NZS 1462.1*	
Freedom from defects	4.6, 5.3	Freedom from defects	Clause 4.6	
Marking	4.7, 4.8, 5.4	Marking and witness mark	Visual inspection	

* May also be tested by attributes (e.g., no and no-go gauges).

	AS/NZS	
A1	2033	Installation of polyethylene pipe systems
	3500	Plumbing and drainage
	3500.0	Part 0: Glossary of terms
	3500.2	Part 2: Sanitary plumbing and drainage
	3500.3	Part 3: Stormwater drainage
	4131	Polyethylene (PE) compounds for pressure pipes and fittings.
	ISO	
	1133	Plastics—Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics
	4437	Buried polyethylene (PE) pipes for the supply of gaseous fuels—Metric series—Specifications
	6964	Polyolefin pipes and fittings—Determination of carbon black content by calcination and pyrolysis—Test method and basic specification
	9969	Thermoplastic pipes—Determination of ring stiffness
	8772	High-density polyethylene (HDPE) pipes and fittings for buried drainage and sewerage systems: Specifications
	8773	Polypropylene (PP) pipes and fittings for buried drainage and sewerage systems—Specifications
A1	11357	Plastics—Differential scanning calorimetry (DSC)
	11357-6	Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)
	13954	Plastics pipes and fittings—Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm
	13955	Plastics pipes and fittings—Crushing decohesion test for polyethylene (PE) electrofusion assemblies
	13967	Thermoplastic fittings—Determination of ring stiffness
	ASTM	
	D3849	Standard Test Method for Carbon Black—Morphological Characterization of Carbon Black Using Electron Microscopy
	WSA	
	02	Sewerage Code of Australia

AMENDMENT CONTROL SHEET

AS/NZS 5065:2005

Amendment No. 1 (2010)

REVISED TEXT

SUMMARY: This Amendment applies to the Foreword, Clauses 1.1, 1.4.2, 1.5, 2.1.3, 2.1.5, 2.1.6, 2.3, 3.1, 3.2.3, 3.3.1, 3.3.4(new), 3.4.1, 3.4.3, 4.4, 5.1 and 5.4, Tables 2.1(new), 3.0(new), 4.1, A1 and Appendix B.

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