



WMTS-491:2016

Aluminium alloy piping system with plastics lining for plumbing water services applications

WaterMark Technical Specification

2016



ABCBC



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Aluminium alloy piping system with plastics lining for plumbing water services applications

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2016

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On 25 February 2013 management and administration of the WaterMark Certification Scheme transferred to the Australian Building Codes Board (ABCB). From this date all new technical specifications will be named WaterMark Technical Specifications (WMTS). Within two years all existing ATS will be renamed WMTS. During this initial period both terms may be used and accepted. All new and recertified Certificates of Conformity will reference WMTS. Certificates of Conformity that currently reference ATS will be re-issued referencing the equivalent WMTS during this initial period. The WaterMark Schedule of Specifications lists all current WMTS and, where appropriate, the former ATS name.

This Technical Specification supersedes Standards Australia ATS 5200.491:2010.

The rebranding of this Technical Specification has included additional information about the transition as well as changes to specific details including replacing references to Standards Australia and the National Plumbing Regulators Forum (NPRF) with the ABCB, changing the term Australian Technical Specification (ATS) to WaterMark Technical Specification (WMTS), replacing references to technical committees WS-014 and WS-031 with the WaterMark Technical Advisory Committee (WMTAC).

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PREFACE

WaterMark Technical Specification WMTS-491:2016 Technical Specification for plumbing and drainage products, Aluminium alloy piping system with plastics lining for plumbing water services applications was originally prepared by the Joint Standards Australia/Standards New Zealand Committee WS-031, Technical Procedures for Plumbing and Drainage Products Certification.

The objective of this Technical Specification is to enable product certification in accordance with the requirements of the Plumbing Code of Australia (PCA).

The word 'VOID' set against a clause indicates that the clause is not used in this Technical Specification. The inclusion of this word allows a common use clause numbering system for the WaterMark Technical Specifications.

The term 'normative' has been used in this Technical Specification to define the application of the appendices to which they apply. A 'normative' appendix is an integral part of a Technical Specification.

The test protocol and information in this Technical Specification was arranged by committee members to meet the authorization requirements given in the PCA.

The WaterMark Schedule of Specifications and List of Exempt Products are dynamic lists and change on a regular basis. Based on this function, these lists have been removed from the WaterMark Certification Scheme document known as Technical Specification for Plumbing and Drainage Products and are now located on the ABCB website (www.abcb.gov.au). These lists will be version controlled with appropriate historic references.

ACKNOWLEDGEMENTS

Australian Technical Specification ATS 5200.491–2010, on which this technical specification is based, was prepared by Standards Australia Committee WS-031, Technical Procedures for Plumbing and Drainage Products Certification. It was approved on behalf of the Council of Standards Australia on 31 August 2010.

The following organisations were represented on Committee WS-031 in the preparation of Australian Technical Specification ATS 5200.491–2010.

- Australian Industry Group
- Australian Stainless Steel Development Association
- Copper Development Centre – Australia
- CSIRO Manufacturing and Materials Technology
- Department of the Environment, Water, Heritage and the Arts (Federal)
- National Plumbing Regulators Forum
- Plastics Industry Pipe Association of Australia
- Plumbing Products Industry Group
- South Australian Water Corporation
- Water Services Association of Australia

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1 SCOPE

This Technical Specification sets out requirements for an aluminium alloy piping system for the conveyance of water for above-ground applications, for use at continuous operating temperatures up to 70 °C and a maximum allowable operating pressure of 1920 kPa and a maximum allowable site test pressure of 2000 kPa.

The system comprises aluminium alloy pipe in sizes ranging from DN 15 to DN 150, with an internal plastics lining for use with—

- (a) aluminium alloy fittings with an internal plastics lining and mechanical compression joint system in sizes ranging from DN 15 to DN 50; and
- (b) roll-grooved system utilizing polymeric-coated ductile iron couplings and associated fittings with rigid elastomeric sealed joints in sizes ranging from DN 50 to DN 150.

The products covered by this technical specification require certification to WaterMark level 1.

2 APPLICATION

This Technical Specification will be referenced on the WaterMark Certification Scheme Schedule of Specifications.

Appendix A sets out the means by which compliance with this Technical Specification shall be demonstrated by a manufacturer for the purpose of product certification.

3 REFERENCED DOCUMENTS

AS

- | | |
|-----------|---|
| 1646 | Elastomeric seals for waterworks purposes |
| 1831 | Ductile cast iron |
| 3688 | Water supply—Metallic fittings and end connectors |
| 4176—1994 | Polyethylene/aluminum and cross-linked polyethylene/aluminum macro-composite pipe systems for pressure applications |

ABCB

Plumbing Code of Australia (PCA)

Procedure for Certification of Plumbing & Drainage Products

AS/NZS

- 1462 Methods of test for plastics pipes and fittings
- 1462.1 Part 1: Method for determining the dimensions of pipes and fittings
- 1867 Aluminium and aluminium alloys—Drawn tubes
- 1874 Aluminium and aluminium alloys—Ingots and castings
- 3500 Plumbing and drainage
- 3500.0 Part 0: Glossary of terms
- 3500.1 Part 1: Water services
- 3500.4 Part 4: Heated water services
- 3500.5 Part 5: Domestic installations
- 3707 Method for testing pressure cycling resistance of pipes and fittings
- 4020 Testing of products for use in contact with drinking water
- 4158 Thermal-bonded polymeric coatings on valves and fittings for water industry purposes

ASTM

- B241/ B241M Standard Specification for Aluminium and Aluminium-Alloy Seamless Pipe and Seamless Extruded Tube

ISO

- 15874 Plastics piping systems for hot and cold water installations—Polypropylene (PP)
- 15874-2 Part 2: Pipes

WSSA

- WSA 109 Industry standard for flange gaskets and O-rings

4 DEFINITIONS

For the purposes of this Technical Specification, the definitions given in AS/NZS 3500.0 apply.

5 MATERIALS

5.1 General

This Clause specifies requirements for materials used in the construction of the product.

5.2 Aluminium alloy

5.2.1 *Pipe material*

Pipe shall be manufactured from aluminium alloy designation 6063/T5 as specified in AS/NZS 1867, ASTM B241/B241M or an alloy exhibiting equivalent properties, including corrosion resistance and mechanical strength.

5.2.2 *Fittings*

Fittings up to and including DN 50 shall be manufactured from aluminium magnesium alloy in accordance with AS/NZS 1874.

5.2.3 *Lining*

Pipe and fittings (up to and including DN 50) shall be lined with polypropylene (PP-R) plastics material meeting the requirements of ISO 15874-2.

The use of the manufacturer's own reprocessable material obtained during production and works testing of products conforming to this Technical Specification is permitted in conjunction with virgin material. Reprocessable material obtained from external sources and recyclable material shall not be used.

5.3 Ductile iron

Fittings manufactured from ductile iron shall comply with AS 1831, allowable grades 400-10, 400-15, 450-10 or 500-7.

5.4 Coating

Fittings manufactured from ductile iron shall be coated externally and internally in accordance with AS/NZS 4158.

5.5 Joint component materials

5.5.1 *General*

Materials used for components in the joint shall be suitable for the intended application and, when assembled, be capable of compliance with the performance tests of this Technical Specification.

5.5.2 *Stainless steel*

Components manufactured from stainless steel shall be grade 316.

5.5.3 *Elastomeric sealing components*

Elastomeric seals, including roll groove gaskets, shall comply with AS 1646. Flange gaskets shall comply with WSA 109.

6 MARKING

6.1 Pipes

Each pipe shall be permanently and legibly marked in letters of minimum 3 mm height and at intervals of not more than 1 m with the following:

- (a) Manufacturer, or supplier's name, brand or trademark.
- (b) Nominal size.
- (c) The maximum working pressure in the form 'PN16'.
- (d) The date of manufacture in the form 100601 (i.e. 1st June 2010) as appropriate.
- (e) WaterMark.
- (f) Licence number.
- (g) The number of this Technical Specification, i.e. WMTS-491.

NOTE: Where space is limited, the number of the Technical Specification may be in an abbreviated form, i.e. S491.

6.2 Fitting

Each fitting shall be permanently and legibly marked with the following:

- (a) Manufacturer's or supplier's name, brand or trademark.
- (b) The nominal size of the pipe, for which the fitting is designed.
- (c) Licence number.
- (e) The number of this Technical Specification, i.e. WMTS-491.

NOTE: Where space is limited the number of the Technical Specification may be an abbreviated form, i.e. S491.

7 PACKAGING

The product shall be packaged in such a manner so as to avoid damage during transportation and handling and in a manner that will maintain its physical and dimensional integrity.

8 DESIGN

8.1 General

When a pipe-fitting joint is assembled in accordance with the manufacturer's instructions, the aluminium alloy material shall be prevented from contact with water and isolated electrically to prevent any potential for galvanic corrosion. Where the jointing system contains elements of another manufacturer's jointing systems, an endorsement shall be obtained from the manufacturer as to its suitability for use with the product.

8.2 Pipes

8.2.1 Dimensions

When measured in accordance with AS/NZS 1462.1, pipe dimensions shall comply with the requirements of Table 1.

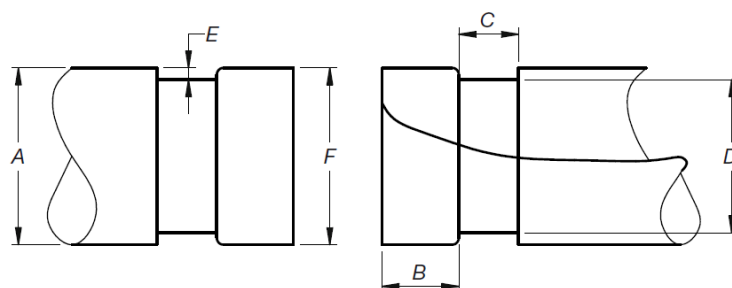
**TABLE 1
PIPE DIMENSIONS**

millimetres

Nominal size DN	Mean outside diameter (D_m)		Ovality outside diameter	End square	Wall thickness of inside plastics lining		Aluminium alloy pipe thickness	
	Min.	Max.	Max.	Max.				
15	19.70	20.40	1.2	0.76	2.1	±0.4	0.7	±0.10
20	24.70	25.40	1.2	0.76	2.3		0.7	
25	31.70	32.40	1.2	0.76	2.4		0.9	
32	39.70	40.40	1.3	0.76	2.7		1.1	
40	49.70	50.40	1.5	0.76	3.0		1.4	
50	59.69	60.91	2.0	0.76	3.7		1.9	
65	72.26	73.74	3.0	0.76	3.6		1.9	
80	88.11	89.79	3.2	0.76	4.5		1.9	
100	113.51	115.44	4.0	1.14	5.4		2.2	
150	167.51	169.90	5.0	1.14	5.7		2.9	

8.2.2 Roll-grooved ends

Pipes suitable for use with roll-grooved joints shall include a groove complying with the dimensions specified in Figure 1.



millimetres

Pipe nominal size DN	Pipe mean OD	Gasket seat (B)		Groove width (C)		Groove dia. (D)		Groove depth (E)	Allowable flare dia. max.
		Basic	Tolerance	Basic	Tolerance	Basic	Tolerance	Reference only	
50	60.3	14.53	+0.00 -0.51	6.35	+0.38 -0.00	57.15	+0.00 -0.38	1.60	63.0
65	73.0	14.53	+0.00 -0.51	6.35	+0.38 -0.00	69.09	+0.00 -0.46	1.98	75.7
80	88.9	14.53	+0.00 -0.51	6.35	+0.38 -0.00	84.94	+0.00 -0.46	2.11	91.4
100	114.3	15.49	+0.00 -0.51	7.62	+0.51 -0.00	110.08	+0.00 -0.51	2.11	116.8
150	168.3	15.49	+0.00 -0.51	7.62	+0.51 -0.00	163.96	+0.00 -0.56	2.16	170.9

FIGURE 1 ROLL GROOVE DIMENSIONS

8.2.3 Length

Pipes shall be supplied in straight lengths with a tolerance of +0.10, -0 m on the nominated length, as measured in accordance with AS/NZS 1462.1. All measurements shall be adjusted to an equivalent length at 20°C.

8.2.4 Pipe ends

When measured in accordance with AS/NZS 1462.1, pipe ends shall be normal to the main axis of the pipe end within the tolerances of end squareness given in Table 1.

8.2.5 Freedom from defects

Defects shall not affect the performance or function of the pipe in service. Pipes shall be free from burrs, fins and sharp edges. Where grooves, wrinkles, rippling, dents or projections are present, the pipe shall comply with the dimensional requirements of Table 1.

8.3 Fittings

8.3.1 *Fittings with mechanical compression joint ends*

Fittings with mechanical compression joints shall be the manufacturer's own design subject to compliance with the performance requirements of Clauses 9.3 and 9.4. Mechanical joint ends shall include a component to provide sealing, a grab ring to prevent longitudinal movement and a nut with a minimum of 2 wrenching flats or other method to ensure joint seal.

8.3.2 *Fittings with roll-grooved ends*

Fittings suitable for use with roll-grooved couplings shall include a groove complying with the dimensions specified in Figure 1.

8.3.3 *Roll-grooved couplings*

Couplings used for joining pipes and fittings having a roll groove in accordance with Figure 1 shall comply with the performance requirements of Clause 9.3 and Clause 9.5.

8.3.4 *Adaptor end connections*

Adaptor end connectors for connection to either copper, copper alloy or stainless steel pipes or fittings shall comply with AS 3688 and the performance requirements of Clause 9.3.3. Other adaptor end connectors shall comply with the requirements of the Australian Standard or Technical Specification relevant to the piping system and, where this piping system is metallic or metallic composite, the performance requirements of Clause 9.3.3.

8.3.5 *Freedom from defects*

Fittings 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 the fittings shall be free from irregularities that may restrict the free flow of fluids. Connection ends shall be parallel within $\pm 2^\circ$ of the appropriate axis of the fitting.

Fittings, including components of metallic materials, shall be sound and free from folds, laps, blisters, blowholes or other imperfections that could affect the performance or function of the fitting in service. Pitting shall not be present on sealing faces or thread faces. Pitting shall be permissible in other locations, provided the minimum wall thickness provisions of the manufacturer's specifications are maintained and the pits will not affect the performance or function of the fitting in service.

9 PERFORMANCE REQUIREMENTS AND TEST METHODS

9.1 Products in contact with drinking water

Products in contact with drinking water shall comply with AS/NZS 4020.

9.2 Pipes

9.2.1 *Burst test*

When tested in accordance with the 'burst test' of AS 4176—1994 at $20 \pm 2^\circ\text{C}$, the pipe shall not burst at a pressure less than 5000 kPa.

NOTE: The pipe need not be taken to burst where the pressure has been taken to 7000 kPa without failure.

9.2.2 *Pressure resistance*

When tested in accordance with the 'pressure resistance test' of AS 4176—1994 at $80 \pm 2^\circ\text{C}$, the pipe shall withstand a pressure of 2500 kPa for not less than 10 h.

9.3 Fittings

9.3.1 *Watertightness pressure test*

When tested in accordance with the 'watertightness pressure test' of AS 3688, fittings shall show no signs of weeping, cracks, leakage or other failure. For the purpose of type testing, fittings shall be subjected to the hydrostatic pressure test.

9.3.2 *Pressure resistance*

When tested in accordance with the pressure resistance test of AS 4176—1994 at $80 \pm 2^\circ\text{C}$, each fitting configuration and size shall withstand a pressure of 2500 kPa for not less than 10 h.

9.3.3 *Insulated joint using adaptors*

When a copper or copper alloy or stainless steel pipe connected to a lined aluminium alloy pipe using an adaptor (see Clause 8.3.4) is tested as follows, the electrical resistance between the copper or copper alloy or stainless steel test pipe and the aluminium alloy test pipe shall be not less than 50 000 Ω :

- (a) Join a length of clean aluminium alloy pipe to a length of clean copper or copper alloy pipe using a suitable adaptor.
- (b) Abrade a small area on each pipe less than 25 mm from the end of the adaptor to provide clean contact points.

- (c) Place the assembly on an electrically insulated surface.
- (d) Measure the resistance between the abraded areas of the pipes with an insulation resistance tester with a driving voltage of not less than 500 V.

9.4 Mechanical jointing systems

9.4.1 Torque test—Connector nuts

When tested in accordance with Appendix B, the connector nut shall show no signs of splitting, cracking, distortion or thread damage.

9.4.2 Compatibility of fittings with pipe—Joint strength

When tested in accordance with the compatibility of fittings with pipe test of AS 4176—1994 at $80 \pm 2^\circ\text{C}$, each type and size of pipe to fitting joint shall withstand a pressure of 2500 kPa for not less than 10 h.

9.4.3 Strength of joint assembly (pressure cycling test)

When fittings are tested in accordance with AS 3707 and the strength of joint assembly (pressure cycling) test of AS 3688 at $80 \pm 2^\circ\text{C}$, the joint assembly shall withstand not less than 50 000 pressure cycle pulsations. At the completion of cyclic testing, the joint assembly shall be depressurized and removed from the immersion bath and permitted to stabilize at ambient temperature for not less than 4 h, after which it shall be subjected to a hydrostatic pressure test of not less than 2000 kPa for 60 +15, -0 min. The joint assembly shall show no signs of cracks, leakage or other failure at any stage of testing procedures.

9.4.4 Resistance to pull-out of assembled joints

When fittings are tested in accordance with the 'resistance to pull-out of assembled joints' test of AS 3688 at $80 \pm 2^\circ\text{C}$ (for joints that contain non-metallic components) using aluminium alloy pipe, the pipe shall not pull out of the assembled fitting when the longitudinal force, as given in Table 2, is applied.

TABLE 2
LONGITUDINAL PULL OUT FORCE

Nominal size DN	Longitudinal pull-out force N	
15	1000	-0 +2%
20	1300	
25	2000	
32	2500	
40	4000	
50	6500	

9.4.5 *Thermal cycling test*

When tested in accordance with the 'thermal cycling test' for joints containing non-metallic components of AS 3688 with the temperature baths at $20 \pm 5^{\circ}\text{C}$ and $80 \pm 2^{\circ}\text{C}$, there shall be no leakage through the joint.

9.4.6 *Resistance to leakage when subjected to bending*

When fittings are tested in accordance with the 'watertightness under internal hydrostatic pressure test' of AS 3688 whilst subjected to the bending test of AS 3688, the fitting under test shall show no visible signs of leakage or damage.

9.5 **Roll-grooved jointing system**

9.5.1 *Roll-grooved assembly—Joint pressure resistance test*

When assembled in accordance with the manufacturer's instructions and tested in accordance with the 'joint pressure resistance test' of AS 3688 at 2 MPa or 1.5 times the specified maximum operating pressure and at ambient and $80 \pm 2^{\circ}\text{C}$, the joint assembly shall not leak.

9.5.2 *Strength of joint assembly (pressure cycling test)*

When fittings are tested in accordance with AS 3707 and the strength of joint assembly (pressure cycling test) of AS 3688 at $80 \pm 2^{\circ}\text{C}$ and at a maximum cycling pressure of 2 MPa or 1.5 times the specified maximum operating pressure, the joint assembly shall withstand not less than 50 000 pressure cycle pulsations. At the completion of cyclic testing, the joint assembly shall be depressurized and removed from the immersion bath and permitted to stabilize at ambient temperature for not less than 4 h, after which it shall be subjected to the joint pressure resistance test of Clause 9.5.1. The joint assembly shall show no signs of cracks, leakage or other failure at any stage of testing procedures.

9.5.3 *Roll-grooved joint—Seal integrity test*

When the roll-grooved joint is assembled in accordance with the manufacturer's instructions and tested in accordance with Appendix C, there shall be no evidence of leakage.

10 **TEST SEQUENCE AND TEST SAMPLE PLAN**

10.1 **Test samples**

10.1.1 *Pipes*

Independent samples covering the range of nominal sizes shall be used for testing the performance requirements of Clauses 9.2.1 and Clause 9.2.2 prior to testing and the dimensional and design requirements of Clause 8 shall be confirmed.

10.1.2 *Fittings*

Independent samples covering the range of nominal sizes, configurations and design of fittings shall be used for testing the performance requirements of Clauses 9.3, 9.4 and 9.5.

NOTE: For pressure and thermal cycling testing, consideration should be given to testing of assemblies of fittings covering the range of nominal sizes and configurations.

10.1.3 *Piping system*

For the purposes of testing to AS/NZS 4020, the samples shall represent all materials in contact with drinking water at the highest surface to volume ratio. The tests shall be undertaken at a maximum holding water temperature of 80°C.

10.2 **Test sequence**

10.2.1 *Pipes*

For performance tests, the 'burst test' (see Clause 9.2.1) shall be undertaken before the 'pressure resistance test' (see Clause 9.2.2).

10.2.2 *Fittings*

For performance tests, the 'watertightness test' (see Clause 9.3.1) shall be undertaken prior to other tests, which may be undertaken in any order.

11 **PRODUCT DOCUMENTATION**

11.1 **General**

Technical information relating to the piping system and correct installation methods shall be readily available to aid the user and installer. The information may be in the form of a technical manual or equivalent document and written in plain English and supplemented by figures and diagrams, as applicable. The information shall satisfy the requirements of a warranty as referenced in the Plumbing Code of Australia (PCA) and the requirements of the AS/NZS 3500 series of Standards.

11.2 **Product data**

Product data shall be available. As a minimum, the following critical product characteristics shall be identified:

- (a) Product range and model identification.
- (b) Maximum allowable operating pressure and temperature.
- (c) Hydraulic performance of the piping system.

- (d) Methods of jointing and adaptation to other piping systems.
- (e) De-rating data, if applicable.

11.3 Installation instructions

Instructions that give full details of installation procedures for the piping system shall be provided and include the following:

- (a) References to AS/NZS 3500.1, AS/NZS 3500.4 and AS/NZS 3500.5, where applicable.
- (b) Detailed step-by-step instruction.
- (c) Suitability for above-ground use only.
- (d) Suitability of roll-grooved jointing system for rigid joint applications only.
- (e) Details of any special tools or training that may be required for—
 - (i) the assembly of roll-grooved joints, including reference to appropriate dimensional requirements (see Figure 1); and
 - (ii) tightening requirements of mechanical compression joints.
- (f) Troubleshooting guide.
- (g) Contact details for after-sales service.

Appendix A MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS TECHNICAL SPECIFICATION

(Normative)

A.1 SCOPE

This Appendix sets out the means by which compliance with this Technical Specification has to be demonstrated by a manufacturer under the WaterMark Certification Scheme.

A.2 RELEVANCE

The long-term performance of plumbing systems is critical to the durability of building infrastructure, protection of public health and safety, and protection of the environment.

A.3 PRODUCT CERTIFICATION

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with this Technical Specification.

The certification scheme serves to indicate that the products consistently conform to the requirements of this Technical Specification.

The frequency of the sampling and testing plan, as detailed in Paragraph A5, shall be used by the WaterMark Conformity Assessment Body. Where a batch release testing program is required, it shall be carried out by the manufacturer as detailed in Paragraph A5 and Table A2.

A.4 DEFINITIONS

A.4.1 Sample

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

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

A.4.2 Sampling plan

A specific plan that indicates the number of units of components or assemblies to be inspected.

A.4.3 Type test batch

Schedule of units of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The batch is defined by the manufacturer.

A.4.4 Type testing

Testing performed to demonstrate that the material, component, joint or assembly is capable of conforming to the requirements given in the Technical Specification.

A.5 TESTING

A.5.1 Type testing

Table A1 sets out the requirements for type testing and frequency of re-verification.

A.5.2 Batch release testing

Table A2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to this Technical Specification on an ongoing basis. However, where the manufacturer can demonstrate adequate process control to the WaterMark Conformity Assessment Body, the frequency of the sampling and testing nominated by the manufacturer's quality plan and/or documented procedures shall take precedence for the purposes of WaterMark product certification.

A.5.3 Retesting

In the event of a batch release test failure, the products within the batch may be retested at a frequency agreed to with the WaterMark Conformity Assessment Body and only those batches found to comply may be claimed and/or marked as complying with this Technical Specification.

Table A1—TYPE TESTS

Characteristic	Clause	Requirement	Test method	Frequency
Materials	5	Composition, temper, etc.	Review material parts lists and compliance certificates	Any change in material specification
Marking	6	Labelling/markings	Review of documentation/physical examination	Any change in design/specification
Packaging	7	Protection from damage in transportation and handling		
Design	8.2.1	Pipes-Dimensions	AS/NZS 1462.1	
	8.2.2	Pipe-Roll-grooved ends	AS/NZS 1462.1	
	8.2.3	Pipes-Length	AS/NZS 1462.1	
	8.2.4	Pipes-Pipe ends	AS/NZS 1462.1	
	8.2.5	Pipes-Freedom from defects	Visual inspection/qualified instructions	
	8.3.1	Fittings-Mechanical compression joints	Clause 9.3	
	8.3.2	Fitting-Roll-grooved ends	AS 3688	
	8.3.3	Fittings-Roll-grooved couplings	Clause 9.3	
	8.3.4	Fittings – Adaptor end connections	Relevant Standard	
	8.3.5	Fittings-Freedom from defects	Visual inspection/qualified instructions	
Performance	9.1	Products in contact with drinking water	AS/NZS 4020	At any change in materials, formulation or design or every five years whichever occurs first
	9.2.1	Pipes – Burst test	AS 4176-1994	At any change in design or manufacturing process
	9.2.2	Pipes-Pressure resistance test	AS 4176-1994	
	9.3.1	Fittings-Watertightness pressure test	AS 3688	
	9.3.2	Fittings – Pressure resistance	AS 4176-1994	
	9.3.3	Insulated joint using adaptors	Clause 9.3.3	

(continue)

Table A1 (continued)

Characteristic	Clause	Requirement	Test method	Frequency
Performance	9.4.1	Mechanical jointing systems – Torque test – Connector nuts	Appendix B	At any change in design or manufacturing process
	9.4.2	Mechanical jointing systems – Compatibility with pipe – Joint strength	AS 4176-1994	
	9.4.3	Mechanical jointing system-Strength of joint assembly (pressure cycling test)	AS 3707 and AS 3688	
	9.4.4	Mechanical jointing system – Resistance to pull-out of assembled joints	AS 3688	
	9.4.5	Mechanical jointing system – Thermal cycling test	AS 3688	
	9.4.6	Mechanical jointing systems-Resistance to leakage when subject to bending	AS 3688	
	9.5.1	Roll-grooved jointing systems-Joint pressure resistance test	AS 3688	
	9.5.2	Roll-grooved jointing systems – Strength of joint assembly (pressure cycling test)	AS 3707 and AS 3688	
	9.5.3	Roll-grooved jointing systems – End seal integrity test	Appendix C	
Product documentation	11	Product data, installation and maintenance instructions	Documentation review	At any change factors that require a change in documentation (e.g. amendments to AS/NZS 3500 series of Standards)

Table A2— BATCH RELEASE TESTS

Characteristic	Clause	Requirement	Test method	Frequency
Materials	5	Composition, temper, etc	Delivery acceptance tests or supplier's test data	Each delivery batch
Marking	6	Labelling/markings	Review of documentation/physical examination	Continuous
Design	8.2.1	Pipes-Dimensions	AS/NZS 1462.1	Once per hour
	8.2.3	Pipes-Length	AS/NZS 1462.1	Once per hour
	8.2.4	Pipes-Pipe ends	AS/NZS 1462.1	Once per hour
	8.2.5	Pipes-Freedom from effects	Visual inspection	Continuous
	8.3.2	Fittings – Roll grooved ends	Dimensional and AS 3688	Once per batch
	8.3.4	Fittings – Adaptor end connections	AS 3688 and relevant Standard	Once per batch
	8.3.5	Fittings – Freedom from defects	Visual inspection	Continuous
Performance	9.2.1	Pipes – Burst test	AS 4176-1994	Once per size change
	9.2.2	Pipes – Pressure resistance test	AS 4176-1994	
	9.3.1	Fittings Watertightness pressure test	AS 3688	100%

Appendix B TORQUE TEST

(Normative)

B.1 SCOPE

This Appendix sets out the method of torque testing a connector nut and assembly. It measures the ability of the nut and assembly to withstand the torques that would normally be encountered in installation.

B.2 PRINCIPLE

The fitting assembly is held on one side of a test rig and a predetermined torque is applied to the nut. The nut and assembly are then inspected for cracks or other failure.

B.3 APPARATUS

The following apparatus is required:

- (a) A fixing jig to hold one side of the fitting assembly firmly at the opposing connection end.
- (b) A torque wrench with accuracy of $\pm 5\%$.

B.4 PROCEDURE

During testing, the threaded section of the component shall not be supported in any way as to influence the results of the test. The torque loading shall be applied to the nut in the same manner as would normally be applied in field conditions.

The procedure shall be as follows:

- (a) Mount the fitting assembly into a fixing jig that is designed to hold one side of the fitting assembly firmly.
- (b) Hand-tighten the nut and apply the torque as specified in Table B1 within 5 s and maintain for 10 s to 20 s.
- (c) Remove torque and repeat Step (b) on the other nuts (if any).
- (d) Remove the fitting assembly from the jig and inspect all components for cracking, breakage or thread damage.

**TABLE B1
TORQUE LOADINGS**

Nominal size DN	Torque, N.m $\pm 5\%$
15	20
20	35
25	40
32	45
40	50
50	55

B.5 REPORT

The following shall be reported:

- (a) Manufacturer, model, type and size of fitting.
- (b) Torque applied and duration of application.
- (c) Any splitting, cracking, distortion or thread damage or other failure.
- (d) Reference to this test method, i.e. Appendix B, WMTS-491.

Appendix C ROLL-GROOVED JOINT – END SEAL TEST

(Normative)

C.1 SCOPE

This Appendix sets out the method of testing the pipe joint interface of a joint assembly. It measures the ability of the joint gasket to seal the end face of the pipe.

C.2 PRINCIPLE

A roll-grooved joint is assembled with pipe samples prepared with holes drilled around the circumference of the pipe end at the interface of the aluminium and plastic through to the roll groove 'well' and exterior of the pipe. The joint is then subjected to hydrostatic pressure and seal integrity is observed by manner of leakage through the joint or to the exterior of the pipe by way of drilled holes.

C.3 SAMPLE PREPARATION

Two samples of pipe of 300 mm in length, with a roll groove made in accordance with the manufacturer's instructions, shall be selected. A series of holes shall be drilled around the circumference of the roll-grooved end of the pipe at 45 mm intervals at the interface of the aluminium and plastic layer through to the exterior surface in the roll-grooved 'well'. The diameter of the hole shall be approximately 25% of the wall thickness of the plastic layer.

NOTE: See the detail in Figure C1 for a typical hole drilled through to the surface of a roll-grooved 'well'.

C.4 APPARATUS

The following is required:

- (a) Pressurizing system—a hydraulic system capable of producing the test pressure $\pm 2\%$ of set pressure.
- (b) End caps to seal off both ends, one cap with a connection to the pressurizing system, the other incorporating a method to bleed air from the assembly.

NOTE: See Figure C1 for a typical apparatus.

C.5 PROCEDURE

The procedure shall be as follows:

- (a) Assemble the roll-grooved joint and end caps.
- (b) Pressurize the assembly, ensuring air is bled from the assembly.

- (c) Increase the pressure to 1600 kPa and hold for 10 min.
- (d) Observe any leakage of the joint or from the drilling holes of the test sample.

C.6 REPORT

The following shall be reported:

- (a) Manufacturer of piping system and full description of components.
- (b) Test pressure and duration.
- (c) Any leakage observed.
- (d) Reference to this test method, i.e. Appendix C, WMTS-491.

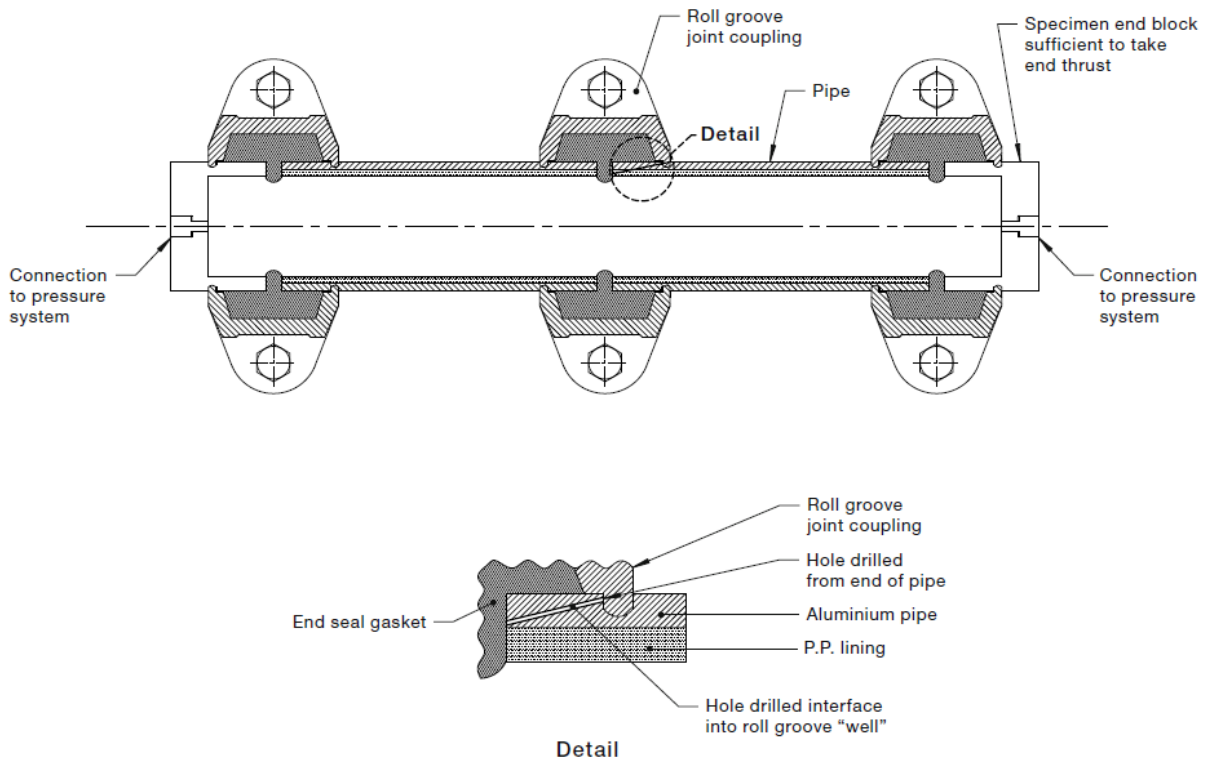


FIGURE C1 TYPICAL TEST APPARATUS

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