WMTS-509:2018

Polypropylene and Polyethylene Access Chambers and Maintenance Shafts for Plumbing and Drainage

WaterMark Technical Specification

2018

ABCB

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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.

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PREFACE

This WaterMark Technical Specification was originally prepared by the Joint Standards Australia/Standards New Zealand Committee WS-031, Technical Procedures for Plumbing and Drainage Products Certification.

WaterMark Technical Specification WMTS-509:2018 Technical Specification for plumbing and drainage products, Polypropylene and Polyethylene Access Chambers and Maintenance Shafts for Plumbing and Drainage, incorporates the following amendments:-

I. Revision of materials to be used for manufacture of access chambers and maintenance shafts.

The objective of this WaterMark 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 WaterMark 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 WaterMark Technical Specification to define the application of the appendices to which they apply. A 'normative' appendix is an integral part of a WaterMark Technical Specification.

The test protocol and information in this WaterMark 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 documents 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

WaterMark Technical Specification WMTS-509:2013 was prepared by Standards Australia Committee WS-031, Technical Procedures for Plumbing and Drainage Products Authorisation. It was approved by the ABCB on 5 April 2013.

The following organisations were represented on Committee WS-031 in the preparation of WMTS-509:2013:

Australian Industry Group

Australian Stainless Steel Development Association

Copper Development Centre—Australia

CSIRO Manufacturing and Infrastructure Technology

National Plumbing Regulators Forum

Plastics Industry Pipe Association of Australia

Plumbing Products Industry Group

Water Services Association of Australia

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1 SCOPE

This WaterMark Technical Specification sets out requirements for the design, manufacture and performance of polypropylene (PP) and polyethylene (PE) Access Chambers/Maintenance Shafts comprising an injection or rotationally moulded chamber for jointing to extruded PVC-U or PE sewers or drains and riser shafts.

An Access Chamber/Maintenance Shaft is intended for installation in plumbing, sewerage and drainage systems (up to DN225) for transportation of sewage or storm water to operate at atmospheric pressure where the depth of burial, from the invert to the ground surface, is not greater than 4 m and the operating temperature is not greater than a nominal 25°C. Long-term design criteria limits are 50 year extrapolated or predicted values.

An Access Chamber/Maintenance Shaft consists of a chamber and riser with ends suitable for connection to a sewerage or drainage system and sealing of the riser.
An Access Chamber/Maintenance Shaft:

(a) permits maintenance of sewers or drainage systems by operators working from the surface using commonly available remote maintenance and inspection equipment;

(b) permits assessment of sewers and drainage infrastructure from surface level;

(c) does not enable human entry as the riser is limited to a maximum internal diameter of 300mm; and

(d) life expectancy may exceed 50 years provided installation and operating conditions conform to the guidelines in this WaterMark Technical Specification.

2 APPLICATION

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

Appendices B, C and D set out the methods of testing necessary to demonstrate compliance with this WaterMark Technical Specification.

This WaterMark Technical Specification provides the basis for a future Australian Standard for access chamber/maintenance shaft base units made by injection or rotationally moulding in polypropylene (PP) and polyethylene (PE) material.

This WaterMark Technical Specification is a performance specification and includes design verification by type testing to qualitatively demonstrate that the PP and PE Access Chambers/Maintenance Shafts have the inherent structural integrity to provide structural adequacy when subjected to soil loads.

The objective of this WaterMark Technical Specification is to provide performance requirements for manufacturers, suppliers and purchasers of moulded PP and PE Access Chambers/Maintenance Shafts for sewerage and drainage systems.

In-service performance of an Access Chamber/Maintenance Shaft is strongly dependent on a supportive embedment. It should be recognised that it is extremely difficult to anticipate soil

types, soil loadings and future soil movement in all possible locations and conditions. Specific types of embedment and backfill materials and compaction standards for various depths and soil types should be adopted in order to minimise risk of long-term failure. Thus even with compliance with these performance requirements, installation conditions will have a significant influence on the long-term performance of Access Chambers/Maintenance Shafts.

The design criteria of AS/NZS 2566.1 provide guidance. Installation should be in accordance with design drawings and the Sewerage Code of Australia—WSA 02, Part 3.

The test criteria specified apply to an Access Chamber/Maintenance Shaft at the time of manufacture, and should not be used to assess the results from tests on Access Chambers/Maintenance Shafts that have been in service.

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

This WaterMark Technical Specification does not:

a) restate the duties of employers, employees, designers and installers;

b) determine the applicability of regulatory limitations; and

c) determine appropriate health and safety practices.

This WaterMark Technical Specification does not cover Access Chambers and Maintenance Shafts intended for use at pressures other than atmospheric pressure. Special design considerations not covered in this specification should be given to Access Chambers/Maintenance Shafts subjected to superimposed mechanical forces, such as seismic forces and to average service temperatures in excess of 25°C.

3 REFERENCED DOCUMENTS

The following documents are referred to in this WaterMark Technical Specification:

AS

1199.1 Sampling procedures and tables for inspection by attributes - Part 1 Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

1646.1 Elastomeric seals for waterworks purposes - Part 1 General requirements

1646.2	Elastomeric seals for waterworks purposes - Part 2 Material requirements for pipe joint seals used in water and wastewater applications—specified by prescriptive formulation
1646.3	Elastomeric seals for waterworks purposes - Part 3 Material requirements for pipe joint seals used in water and wastewater applications with exception of natural rubber and polyisoprene compounds
2032	Code of practice for installation of UPVC pipe systems
AS/NZS	
1260	PVC pipes and fittings for drain, waste and vent applications
1462.1	Methods of test for unplasticized PVC (UPVC) pipes and fittings - Part 1 Method for determining the dimensions of pipes and fittings
1462.8	Methods of test for unplasticized PVC (UPVC) pipes and fittings - Part 8 Method of test for infiltration
1462.10	Methods of test for unplasticized PVC (UPVC) pipes and fittings - Part 10 Method for hydrostatic pressure testing of fittings and elastomeric seal joints for non-pressure applications
1462.13	Methods of test for unplasticized PVC (UPVC) pipes and fittings - Part 13 Method for the determination of elastomeric seal joint contact width and pressure
1462.22	Methods of test for unplasticized PVC (UPVC) pipes and fittings - Part 22 Method for determination of pipe stiffness
2566.1	Buried flexible pipelines - Part 1 Structural design
3500.0	Plumbing and Drainage - Part 0 Glossary of terms
4131	Polyethylene (PE) compounds for pressure pipes and fittings
4766	Polyethylene storage tanks for water and chemicals
5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
EN	
14830	Thermoplastics inspection chamber and manhole bases – test methods for buckling resistance.

ISO

8773 Plastic piping systems for non-pressure underground drainage and sewerage – Polypropylene (PP).

WSA

02 Sewerage Code of Australia

4 DEFINITIONS

For the purposes of this Specification, the definitions in AS/NZS 1260, AS/NZS 3500.0 and those below shall apply.

4.1 Access Chamber / Maintenance Shaft

An Access Chamber/Maintenance Shaft consists of a chamber and riser. Chamber ends are suitable for connection to a sewerage or drainage system and the riser has a removable sealing cap. An access chamber / maintenance shaft:

a) permits maintenance of sewers or drains by operators working from the surface using commonly used maintenance and inspection equipment;

b) permits condition assessment of sewers and drains; and

c) does not permit persons to enter the sewer or drain through the riser, which is limited to a maximum internal diameter of 300 mm.

4.2 Access Chamber / Maintenance Shaft Chamber

An Access Chamber/Maintenance Shaft chamber comprises a chamber floor, walls and soffit. The chamber floor may contain a formed, graded channel for the passage of sewage or storm water with up to three inlets ≤ DN 225. Chamber configurations include in-line, bend, junction and terminating. A maintenance shaft at the end of a reticulation sewer is known as a terminal maintenance shaft.

4.3 Access Chamber / Maintenance Shaft Riser

An Access Chamber/Maintenance Shaft riser consists of an integral circular PP or PE section or a non-integral 4,000 N/m/m, (SN4) PVC-U pipe as a shaft of nominal shaft size DN 225 or DN 300 and a removable cover (cap or plug) to provide access for inspection and some maintenance equipment, but does not permit entry of a person.

Note: Maintenance shafts and maintenance chambers finish near the surface. A suitably supported access cover and frame to WSA 02 requirements is usually provided above this point.

4.4 Riser cap or plug

A riser cap or plug is attached to the top of the riser to prevent infiltration of ground or surface water and to provide access into the riser for routine operations and maintenance. Caps or plugs can be either a locking type or a type that will permit flow relief.

4.5 Average service temperature

Average service temperature is the average temperature (T_{ms}) that an access chamber / maintenance shaft will attain during service, where

$$T_{ms} = \frac{2T_{sew} + T_{soil}}{3}$$

where:

T_{sew} = average sewage temperature assessed over summer and winter months

T_{sew} = $0.5T_{sew-summer} + 0.5T_{sew-winter}$

T_{soil} = average soil temperature assessed over summer and winter months

T_{soil} = $0.5T_{soil-summer} + 0.5T_{soil-winter}$

The average temperature for the sewage or storm water and soil in contact with the Access Chamber/Maintenance Shaft shall be the weighted average of the temperatures, as assessed in accordance with percentage of time spent at each temperature under operational conditions.

NOTE: For practical purposes, this should be taken to be the average temperature of sewage flowing through the unit during the summer and winter months, which should be taken to be equal 6 monthly periods.

4.6 Effective seal

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.

4.7 Effective sealing length

4.7.1 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.

4.7.2 Spigot-mounted seals

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

5 MATERIALS

5.1 General

This Section specifies the minimum material requirements applicable to the manufacture of PP and PE Access Chamber/Maintenance Shafts, and requirements for freedom from defects, elastomeric seals and riser sections.

5.2 Material

5.2.1 General

Polypropylene and polyethlene materials used in certified product shall be of a type recommended by the polymer manufacturer as suitable and appropriate for use in the manufacture of the product or otherwise demonstrate suitability. Characteristics to be taken into account shall include compatibility and resistance to variations in sewage/water quality and elevated temperatures.

5.2.2 Polypropylene (PP) compounds

The material, from which the manufacture of PP access chambers and maintenance shafts is produced, shall consist of PP material in compliance with ISO 8773 or equivalent. Colour pigments may be added to natural compounds during processing.

5.2.3 Polyethylene (PE) Compounds

The material, from which the manufacture of PE access chambers and maintenance shafts is produced, shall consist of PE material in compliance with AS/NZS 4766 for rotomoulded and AS/NZS 4131 for injection moulded.

5.3 Material data sheets

As appropriate to Clause 8.4, a material data sheet shall be available for each compound and shall include the following:

a) Raw material name and Standard or Code;

b) Relevant short and long-term physical properties; and

c) Poisson’s ratio.

Material test data shall be derived from independently verifiable testing.

5.4 Freedom from defects

NOTE: The defects described in Clauses 5.4.1, 5.4.2 and 5.4.3 cannot be completely quantified. Where the presence, size or frequency of any of these 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.

5.4.1 General

Defects shall not affect the performance or function of an Access Chamber/Maintenance Shaft in service.

Components shall be free from blisters and heat marks. When grooves, wrinkles. rippling, dents or projections are present, the component shall comply with the dimensional requirements of this WaterMark Technical Specification.

5.4.2 Ends

Ends of components shall be free from chips and rough edges and shall have sharp edges removed. Jointing surfaces shall be smooth.

5.4.3 Joints

Internal joints shall be smooth to allow unhindered passage of sewage and maintenance and inspection equipment.

5.5 Requirements for elastomeric seals

The elastomeric seals shall comply with AS 1646.1 and AS 1646.2 or AS 1646.3 or equivalent.

5.6 Solvent cements

Not applicable.

6 MARKING

6.1 General

Access Chambers/Maintenance Shafts shall be legibly and permanently marked with the following:

a) Manufacturer’s name or registered trademark;

b) Date (month and year) of manufacture;

c) Material identification (PP) or (PE);

d) Size and configuration;

e) Safe installation depth.
For alternative marking of installation depth see Item 6.2 (c) below;

f) WaterMark; and

g) Licence number.

h) Risers that do not form an integral part of the assembly shall be marked in accordance with the product Standard with which they comply or as for access chambers / maintenance shafts above.

6.2 Additional marking

Access Chambers/Maintenance Shafts shall be legibly and durably marked on the external surface of the Access Chamber/Maintenance Shaft chamber, adjacent to the riser, with the following information:

(a) The number of this WaterMark Technical Specification, i.e., WMTS-509.

NOTE: Manufacturers making a statement of compliance with this WaterMark Technical Specification on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

(b) For all PP and PE materials other than those that contain UV stabilisers for exposure under Australian conditions, each Access Chamber/Maintenance Shaft chamber shall be durably marked with the following warning statement—

DO NOT STORE UNCOVERED IN DIRECT SUNLIGHT FOR MORE THAN 3 MONTHS.

(c) As an alternative to Clause 6.1(e) safe installation depth may be durably marked using an adhesive label.

7 PACKAGING STORAGE AND TRANSPORTATION

While under the control of the manufacturer, all assembled Access chamber/Maintenance shafts and components shall be transported, handled and stored in accordance with the manufacturer's recommendations in a manner that prevents damage, deterioration or excessive distortion.

Access Chamber/MaintenanceSshaft components may be transported to site separately for assembly before or at installation.

All Access Chamber/Maintenance Shaft chambers and risers shall be stacked in a manner to minimise ovalisation. Ends of chambers and risers shall remain free of loading.

All Access chamber/Maintenance Shaft and components shall not be stored near generators or other heat emitting equipment.

All PP and PE Access Chambers/Maintenance Shafts and components shall not be stored uncovered in direct sunlight for more than three (3) months. If extended storage periods are anticipated, all PP and PE Access Chambers/Maintenance Shafts and components shall be stored under cover in a manner providing ventilation and preventing heat entrapment.

8 DESIGN

8.1 General

An Access Chamber/MaintenanceSshaft shall be designed to meet the manufacturing and performance requirements outlined in Clause 8.5 and Section 9, respectively.

The external shape of an Access Chamber/Maintenance Shaft shall facilitate the free flow of granular embedment materials, which, when placed during installation, will achieve uniform bedding and support around all surfaces of the installed Access Chamber/Maintenance Shaft.

NOTE: The design of the Access Chamber/Maintenance Shaft needs to consider long-term fitness-for-purpose including service environment, long-term creep characteristics, long-term buckling resistance and decrease in physical properties of the material due to environmental effects. Where Access Chambers/Maintenance Shafts are assembled from jointed components the effect of long-term properties and changes in shape on long-term water tightness also needs to be considered.

8.2 Accessibility

The riser may be integral with the chamber or a separate PVC-U, PE or PP pipe joined to the chamber.

In either case, the riser shall:

a) be circular in cross section; and

b) include a cap or plug that can be removed and replaced maintaining a watertight seal to minimise the risk of inflow and infiltration.

NOTE: Caps or plugs can be either a locking type or a type that will permit flow relief.

Non-integral risers shall have a minimum stiffness of 4,000N/m/m, (SN4). The internal diameter of the riser shall be 225 mm to 300 mm inclusive. The tolerance for outside diameter, including out of roundness, shall be ±3% of the specified diameter. Integral risers shall have a wall thickness not less than the design wall thickness of the chamber.

The chamber geometry shall permit access to the sewer for maintenance and inspection equipment. Internal joints shall be smooth to allow unhindered passage of equipment. The performance testing requirements of Clause 9.2 shall be met.

8.3 Chamber wall thickness

The minimum design thickness of the injection and rotationally moulded PP/PE chamber with a structured wall shall be proven by type testing as described in Appendices B, C and D. Sockets and spigots shall comply with the dimensional and performance requirements of the relevant product Standard.

8.4 Structural integrity

8.4.1 General

The design of an access chamber / maintenance shaft shall demonstrate long-term structural adequacy, when subjected to soil loads, by simulated testing, as outlined in Clauses 8.4.2 and 8.4.3 , respectively to demonstrate the predicted 50 year vertical and horizontal deformations.

8.4.2 Design verification of structural integrity

Testing and evaluation shall be in accordance with Appendix B.

The tested Access Chamber/Maintenance Shaft chamber shall not collapse nor show any signs of cracking.

The predicted 50 year vertical deformation evaluations shall be ≤ 5% of the main sewer pipe outside diameter and for horizontal deformations ≤ 10% of the main sewer pipe outside diameter.

8.4.3 Riser and riser joint load resistance

The riser and riser joint(s) shall withstand the frictional down-drag forces generated either by settlement of the embedment and backfill after installation or as each layer of embedment and backfill is compacted during installation.

The Access Chamber/Maintenance Shaft chamber shall be considered adequate for this purpose by:

(a) adopting a telescopic riser system; and

(b) providing an elastomeric seal joint between the Access Chamber/Maintenance Shaft chamber and the riser section with an effective settlement allowance of at least 30mm movement.

If the Access Chamber/Maintenance Shaft chamber does not incorporate attributes (a) or (b), it shall be verified by type test as follows:

When tested in accordance with Appendix C followed by type testing in accordance with Appendix D (Clause D6 and D8.1), an assembled Access Chamber/Maintenance Shaft chamber shall not distort or buckle and joints shall not leak. Changes in external dimensions shall not exceed—

(a) 4% when measured through and at right angles to the centroid of the Access Chamber/Maintenance Shaft chamber and the riser; and

(b) ±5 mm from a straight line or a flat plane along the invert of the Access Chamber/Maintenance Shaft chamber.

8.4.4 Batch release testing (Vacuum Test)

When tested in accordance with Appendix D, each configuration of assembled maintenance shaft shall not distort or buckle and no joint shall leak.

8.5 Manufacture

8.5.1 Configurations

Access Chambers/Maintenance Shafts shall be manufactured with one or more of the following standard configurations:

a) In-line—180°.

b) Bend—90° and 45°.

c) Junction—45°.

d) Terminal—90° vertical bend.

NOTE: Other configurations may be supplied by agreement between the purchaser and the manufacturer.

8.5.2 Dimensions and tolerances

The dimensions of Access Chambers/Maintenance Shafts shall comply with this Section to enable compliance with the performance requirements of Section 9.

8.5.3 Sockets and spigots

The dimensions of sockets or spigots on maintenance shafts and maintenance chambers shall enable compatibility to pipe work in accordance with the product Standard of the pipes they are intended to be connected to.

The effective sealing length of an elastomeric seal joint, when measured in accordance with AS/NZS 1462.1 shall be not less than the value specified in the relevant product Standard. Where the relevant product Standard specifies a length of engagement rather than the effective sealing length, the length of engagement, measured in accordance with AS/NZS 1462.1, shall be not less than the value specified.

8.5.4 Chamber wall thickness

The chamber wall thickness shall be measured in accordance with AS/NZS 1462.1.

The chamber wall thickness shall not be less than the design wall thickness at any point.

8.5.5 Riser

The riser diameter and, where required, the wall thickness, shall be measured in accordance with AS/NZS 1462.1. The internal diameter of the riser shall be 225 mm to 300 mm inclusive. The tolerance for outside diameter, including out of roundness, shall be ±3% of the specified diameter.

NOTE: The maximum entry diameter is restricted to 300 mm.

8.5.6 Welding

Manufacturer's factory welding is accepted subjected to satisfactory quality certification of procedures and ongoing production testing.

9 PERFORMANCE REQUIREMENTS AND TEST METHODS

9.1 General

This Section specifies the minimum performance requirements applicable to manufactured and assembled PP and PE Access Chambers/Maintenance Shafts.

9.2 Accessibility

With an Access Chamber/Maintenance Shaft assembled and set up with a 1 metre length of riser pipe in a vertical position and with 1 metre lengths of sewer pipe connected to all pipe connection ports, a standard shape A, with dimensions as listed in Table 9.1 and Figure 9.1 shall be attached to cables and inserted in through the riser pipe and pulled out through each of the sewer pipe connections. This procedure shall also be repeated for a standard cylindrical shape B, with dimensions in Table 9.1.

The standard shapes A and B shall be capable of insertion with Diameter D1 as the leading edge and shall pass without restriction through all of the connection ports of the Access Chamber/Maintenance Shaft chamber and on into the connecting sewer pipes using a maximum pulling force of 250 N.

The standard shapes shall be manufactured from steel or aluminium alloy with all sharp edges removed.

TABLE 9.1
DIMENSIONS OF STANDARD PROFILES

INLET-OUTLET SEWER SIZE DN	STANDARD SHAPE A (see Figure 9.1)			STANDARD SHAPE B	
	Length, L	Diameter D_1	Diameter D_2	Length, *L*	Diameter D1
100	300	90	65	400	75
150	400	135	90	400	125
225	500	210	120	500	125

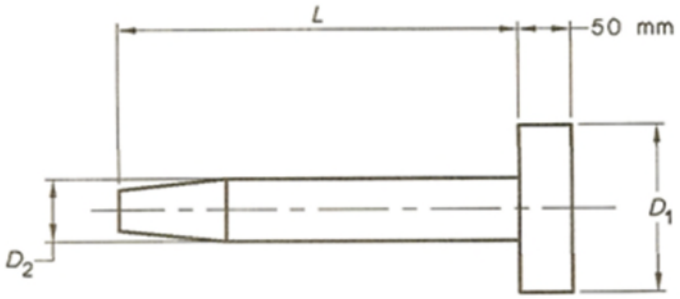


FIGURE 9.1 STANDARD SHAPE A

9.3 Welded joints

All welded joints shall be capable of complying with the performance requirements of this WaterMark Technical Specification.

9.4 Elastomeric seal joints

9.4.1 General

All elastomeric seal joints shall be capable of field assembly and be leak-free and resistant to tree root penetration. Assembled joints shall comply with the requirements of Clauses 9.4.2, 9.4.3 and 9.4.4.

9.4.2 Hydrostatic pressure test

When tested in accordance with AS/NZS 1462.10, with a maximum diametral distortion of 7.5%, each design of assembled joint between the chamber and riser sections, riser to riser sections and chamber inlet/outlet connections shall withstand an internal pressure of 80+5,- 0 kPa for not less than 60 minutes without leakage. The chamber inlet / outlet connections shall be tested

using PVC sewer pipes complying with AS/NZS 1260. Where pipes and fittings that comply with AS/NZS 1260 are used for both the riser and chamber, testing of the assembled joints shall not apply.

NOTE: It has been assumed that where PVC sewer pipes are used in conjunction with PP and PE Access Chambers/Maintenance Shafts the joints will be rubber ring seal jointed. Where other plastic sewer pipes are used (e.g. ABS) it has been assumed that the joint performance will be similar with similar stiffness pipes.

9.4.3 Liquid infiltration test

When tested in accordance with AS/NZS 1462.8, with a diametral distortion of 7.5%, each design of assembled joint between the chamber and riser sections, riser to riser sections and chamber inlet / outlet connections shall not leak, when subjected to an internal vacuum corresponding to a gauge pressure of 80 kPa to 85 kPa for not less than 60 minutes. The chamber inlet/outlet connections shall be tested using PVC sewer pipes complying with AS/NZS 1260. Where pipes and fittings that comply with AS/NZS 1260 are used for both the riser and chamber, testing of the assembled joints shall not apply.

NOTE: It has been assumed that where PVC sewer pipes are used in conjunction with PP and PE Access Chambers/Maintenance Shafts the joints will be rubber ring seal jointed. Where other plastic sewer pipes are used (e.g. ABS) it has been assumed that the joint performance will be similar with similar stiffness pipes.

9.4.4 Contact width and pressure

When determined in accordance with AS 1462.13, the contact pressure of each design of assembled joint between the chamber and riser sections, riser to riser sections and chamber inlet / outlet connections shall exceed 0.4 MPa over a continuous width of 4 mm. Where pipes, fittings and seals that comply with AS/NZS 1260 are used for both the riser and chamber, testing of the assembled joints shall not apply.

NOTE: It has been assumed that where PVC sewer pipes are used in conjunction with PP and PE Access Chambers/Maintenance Shafts the joints will be rubber ring seal jointed. Where other plastic sewer pipes are used (e.g. ABS) it has been assumed that the joint performance will be similar with similar stiffness pipes.

9.5 Vacuum – production test

When tested in accordance with Appendix D (Batch release Clauses D2.4 and D3.2 apply), each configuration of assembled access chamber / maintenance shaft shall not distort or buckle and no joint shall leak.

10 TEST SEQUENCE AND TEST SAMPLE PLAN

10.1 General

For the testing methods of products refer to the Appendices.

11 PRODUCT DOCUMENTATION

VOID

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 WaterMark Technical Specification shall be demonstrated to gain WaterMark certification for a plumbing and drainage product.

A.2 RELEVANCE

A published WaterMark Technical Specification for PP and PE Access Chambers/Maintenance Shafts will enable WaterMark certification and the product to be listed in Table A2.1 of the Plumbing Code of Australia and in Section 5 of AS 5200.000 and enable installation in residential and commercial Body Corporate development.

A.3 PRODUCT CERTIFICATION

The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the nominated Technical Specification / Standard(s).

The certification scheme shall meet the criteria described in AS/NZS ISO/IEC 17067 and meet the criteria of ISO/IEC TR 17026 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

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

Product certification shall be conducted by a ‘WaterMark conformity assessment body’ (WMCAB) accredited by the Joint Accreditation System for Australia and New Zealand (JAS-ANZ) or by another certification body that is acceptable to JAS-ANZ.

The frequency of the sampling and testing plan as detailed in Clause A4 shall be used by the WMCAB for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the WMCAB, the frequency of sampling and testing nominated in the manufacturer’s quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A.4 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A.4.1 General

Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to this WaterMark Technical Specification.

However, where the manufacturer can demonstrate adequate process control, the frequency of sampling and testing nominated in the manufacturer's quality and/or documented procedures shall take precedence.

A.4.2 Retesting

In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined 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 to AS 1199.1 for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with this WaterMark Technical Specification 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 compliance to this WaterMark Technical Specification shall be suspended until the cause of the failure has been identified and corrected.

A.4.3 Rejection after retest

In the event of a quarantined batch being rejected after retesting in accordance with the procedures set out in Clause A4.2, it may be subjected to 100% testing for the failed requirements(s), and only those items found to comply may be claimed and/or marked as complying with this WaterMark Technical Specification.

TABLE A1
TYPE TESTS

Characteristic	Clause	Requirement	Test method	Frequency
General Requirements	5.2	Material compliance	Check licence schedule of moulded components to ISO 8773 / AS/NZS 4766 / AS/NZS 4131 / AS/NZS 1260 / AS/NZS 5065 / ISO 4427, ISO 8772 / ISO 21138.1 / ISO 21138.2 / ISO 21138.3 and for unlicensed components verify process control records	At any change in material formulation or design or process
	5.3	Material Data Sheets	As appropriate, check that required data to ASTM D2990 is available	
	5.4	Freedom from defects	Visual examination	
	5.5	Elastomeric seals	Product certification to AS 1646.1 and AS 1646.2 or AS 1646.3	
	7	Packaging, storage and transportation	Visual verification of AS 2032, Clause 5.2	
Design	8.2	Accessibility	Clause 9.2 Check cross-section and provision of watertight cap or plug Check design wall thickness of integral risers (AS/NZS 1462.1)	At any new material formulation or design
	8.3	Minimum chamber wall thickness	Clause 4.2.3 (AS/NZS 1462.1)	At any new material formulation, design or manufacturing method
	8.4	Structural integrity: - Design verification - Riser and riser joint - Joint load resistance	Clause 8.4.2 including Appendix B Clause 8.4.4 including Appendix C Appendix D	
Manufacture	8.5.1	Configurations	Visual and measurement	At any new design

Characteristic	Clause	Requirement	Test method	Frequency
	8.5.2	Dimensions and tolerances	AS/NZS 1462.1 or ultrasonic equipment	At any new material formulation, design or manufacturing method
	8.5.6	Welding	Verify welding procedures. Check and/or review manufacturers competency levels	At any change in welding procedure
Performance requirements	9.2	Accessibility	Independently witnessed trials	At any new material formulation, design or manufacturing method
	9.4	Elastomeric seal joints: - Watertightness - Liquid infiltration - Contact width and pressure	 AS/NZS 1462.10 AS/NZS 1462.8 AS/NZS 1462.13	

TABLE A2
BATCH RELEASE TESTS

Characteristic	Clause	Requirement	Test method	Frequency
Freedom from defects	5.4	Structural and surface defects, condition of spigot ends and smoothness of internal joints	Visual	Each moulding and assembly
Dimensions	8.3. 8.5.3 and 8.5.4	Product drawings and minimum chamber wall thickness	AS/NZS 1462.1	One random sample per shift, or 8 h of production, or production batch, whichever is the most frequent
Performance	9.5	Vacuum test	Appendix D	
Marking	6	Correct, legible and permanent.	Visual and comparison with production records	Each assembly

APPENDIX B METHOD FOR DESIGN VERIFICATION BY TYPE TESTING

(Normative)

B.1 SCOPE AND GENERAL

This Appendix sets out the method for determining long-term structural integrity of a maintenance shaft by testing to demonstrate the predicted 50 year vertical and horizontal deformations.

B.1.1 Relevance of test

The 1000 hour internal negative pressure test qualitatively demonstrates that the maintenance shaft has inherent structural integrity to provide long-term fitness for purpose.

B.1.2 Principle

When tested for not less than 1,000 h at 20 to 25°C and negative internal pressure of -40 kPa in accordance with this Appendix and EN 14830, the maintenance shaft chamber shall not collapse nor show any signs of cracking.

The predicted 50 year vertical H deformations shall be ≤ 5% of the main sewer pipe outside diameter. The predicted 50 y horizontal W deformation shall be ≤ 10% of the main sewer outside diameter.

B.2 PREPARATION OF TEST ASSEMBLY

A maintenance shaft, assembled with a riser and pipe stubs, each of 300 mm minimum length and sealed with a suitable cap, shall be used as the test assembly.

One of the end caps shall be provided with a fitting to enable connection of a flexible hose for application of a negative pressure.

B.2.1 Testing laboratory

A testing laboratory with appropriate NATA Accreditation shall conduct the testing.

B.2.2 Apparatus

The following is required:

a) **Test environment**. An enclosed area where testing shall be carried out at a temperature of between 20 °C and 25 °C and large enough to accommodate the test assembly including the first 300 mm of riser shaft above the top of the outlet and inlets of the main channel, such that at each side there is a free space of 300 mm minimum between the test assembly and the side/top of the test area.

b) **Vacuum source**. Capable of applying and maintaining the test pressure specified for the Access Chamber/Maintenance Shaft chamber assembly.

c) **Pressure measuring devices.** Calibrated and capable of measuring the internal negative test pressure to within an accuracy of ± 2 %.

d) **Thermometer.** Calibrated and capable of measuring the temperature of the medium surrounding the test assembly to an accuracy of ±0,5 °C.

e) **Deflection measuring equipment.** Calibrated and capable of measuring the deflection of the Access Chamber/Maintenance Shaft chamber at the nominated points to within an accuracy of ± 0,1 mm.

B.2.3 Procedure

The procedure shall be as follows:

(a) Secure the sealed test assembly and condition the test assembly in the enclosed area at 20°C–25°C for 6 h.
Note 1. The test assembly may be turned 180º upside down to simplify the test.

(b) Install the two devices for measuring deflection at points “W” and “H” as shown in Figures 1 and 2. In the case where bases are non-spherical the relative vertical deformation of the base can be measured directly from a datum provided by a stiff beam connected at points *H*L and *H*R. If a separate datum is used the points *H*L, *H*R and *H*M shall be measured from that datum during the test and the final deflection expressed as *Y*V where *Y*V = ((*H*L + *H*R)/2) − *H*M. 1 and 2.

(c) The change of the width of the main channel shall be expressed as *Y*H where this is the change to dimension “*W*”.

(d) Connect the pressure source and pressure-measuring device to the test assembly and apply the internal negative pressure, maintaining it at between 20°C to 25°C for a minimum of 1000 hours within a tolerance of ± 2%.

(e) Deflection measurements shall be taken at the required defined intervals throughout the test.

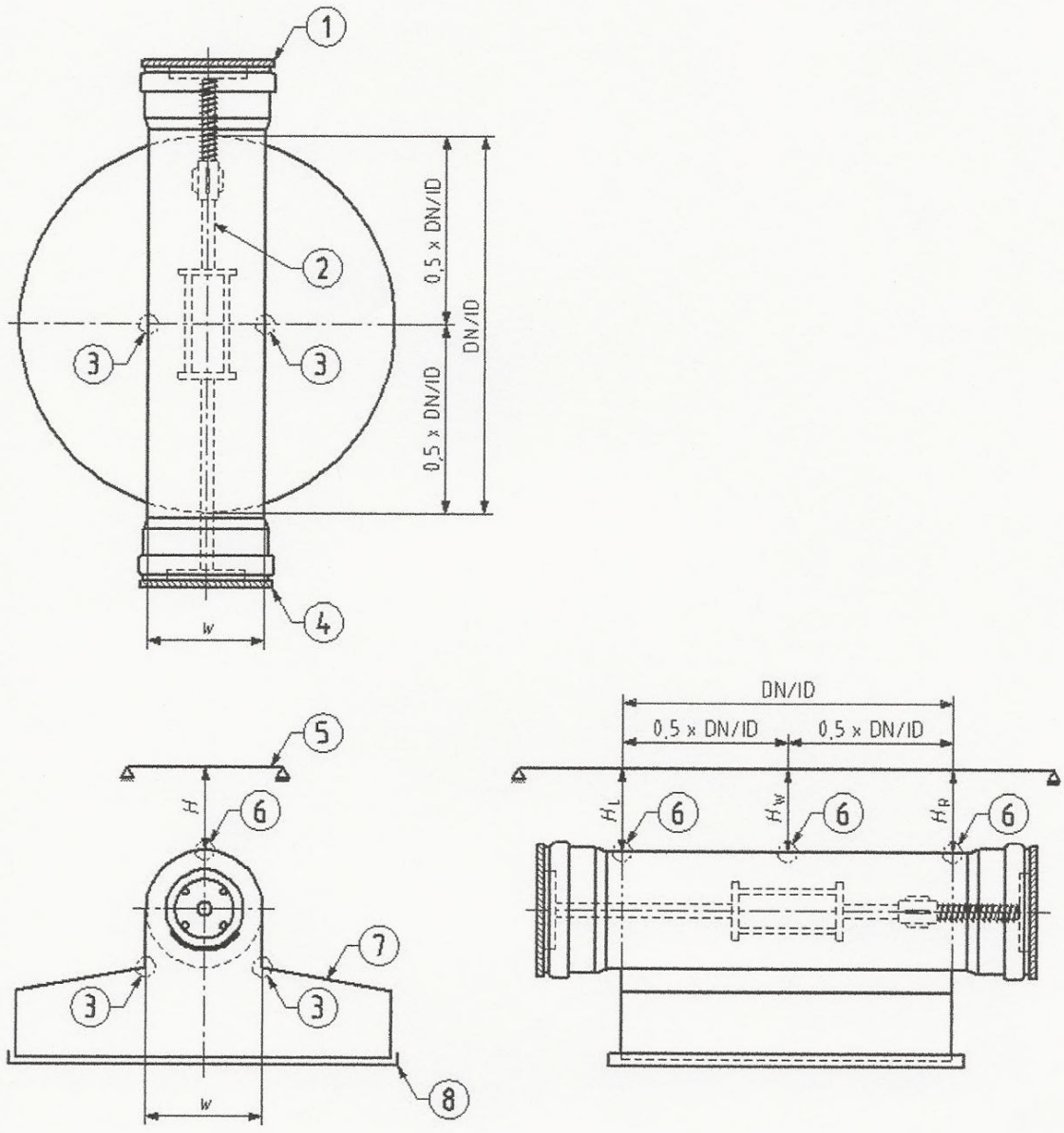
(f) The sample shall be visibly inspected for evidence of cracks after completion of the test.

(g) From the deflection measurements, evaluate the prediction of deformation after 50 years. An example evaluation of the trend line is shown in ISO 13267.

B.3 TEST REPORT

The following information shall be reported:

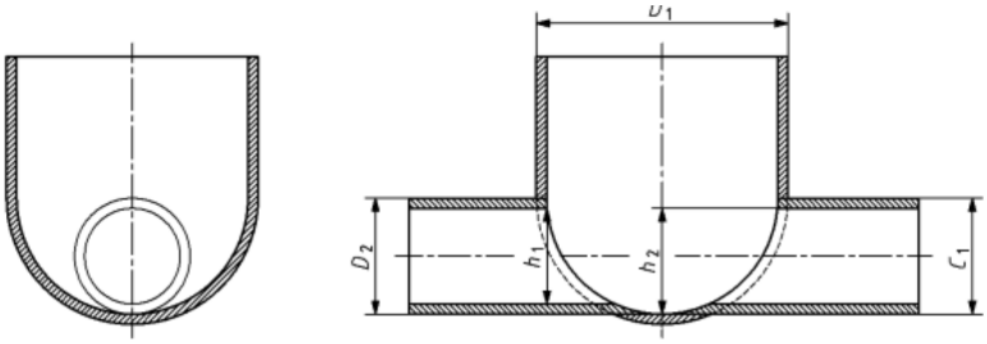
(a) Reference to this test method, i.e., ATS 5200.509.
(b) Identification of the Access Chamber/Maintenance Shaft assembly, including the nominal size(s) of the main pipe sizes.
(c) Test procedure used and the environment conditions.
(d) Test pressure applied.
(e) Test temperature.
(f) Test duration time.
(g) Table of deflections generated at the end of the test.
(h) The graphical presentation of the predicted 50 year deflections as specified.
(i) Visible cracks.
(j) Any factors noted during the test procedure that might have affected the test result, such as any incidents or operating details not covered in this WaterMark Technical Specification.
(k) Date of the test.



Key

1 plug-inlet
2 plug support device
3 measuring points for dimension W
4 plug-outlet
5 reference
6 measuring points for dimension H
7 base section
8 removable cover

Figure 1 — Position of measuring devices in the main channel



Key

*D*1 chamber diameter

*D*2 outlet connection diameter

*C*1 diameter of connection 1

*h*1 measure height at point 1, which points are located at inlet and outlet

*h*2 measure height at point at the middle of the base

Figure 2 — Position of measuring devices for spherical bases

APPENDIX C METHOD FOR VACUUM TESTING

(Normative)

C.1 SCOPE AND GENERAL

C.1.1 Scope

This Appendix sets out a method for the vacuum test.

C.1.2 Relevance of test

The vacuum test qualitatively demonstrates that the Access Chamber/Maintenance Shaft has inherent structural integrity to resist buckling during handling and installation, including compaction of the embedment.

C.1.3 Preparation of test assemblies

An Access Chamber/Maintenance Shaft assembled with a riser and pipe stubs, each of 300 mm minimum length and sealed with a suitable cap, shall be used as the test assembly.

C.2 TEST PROCEDURE

C.2.1 Principle

A test assembly is subjected to an internal vacuum. The assembly is then inspected for distortion.

C.2.2 Apparatus

The following apparatus is required:

a) End connections

Vacuum-tight connections shall be made to the test assembly within the socket, or on the external surface. Provision shall be made for connection to the vacuum system or venting of the pipe or specimen to atmosphere as required.

Vacuum shall be applied through one of the end connections.

b) Pressurizing system

A system capable of producing and maintaining the test vacuum pressure.

C.2.3 Procedure for vacuum type test

The procedure shall be as follows:

a) Secure and condition the test assembly at 20°C–25°C for 2 h.

b) Gradually apply an internal vacuum corresponding to a gauge pressure of -80 kPa to -85 kPa for not less than 60 minutes.

c) At the completion of the test period measure the changes in external dimensions.

d) At the completion of the test period record any buckling or collapse and for chambers with reinforcement any separation between the chamber and reinforcement, and any delamination, cracking or splitting of the reinforcement.

C.2.4 Procedure for vacuum batch release test

The procedure shall be as follows:

a) Secure and condition the test assembly at ambient temperature for 5 minutes.

b) Gradually apply an internal vacuum corresponding to a gauge pressure of -80 kPa to -85 kPa for not less than 15 minutes.

c) At the completion of the test period note any buckling or collapse and for chambers with reinforcement any separation between the chamber and reinforcement, and any delamination, cracking or splitting of the reinforcement.

C.3 TEST REPORT

C.3.1 Type Test Report

The following information shall be reported:

a) The complete identification of the Access Chamber/Maintenance Shaft under test.

b) The test temperature.

c) The vacuum test pressure applied to the test assembly and the duration of test.

d) Any leakage at the assembly joints.

e) Any change in external dimensions.

f) Conformance (or non-conformance) relative to Clause 9.2.

g) Reference to this test method.

C.3.2 Batch Release Test Report

The following information shall be reported:

a) The batch number of the Access Chamber/Maintenance Shaft under test.

b) Any visual evidence of buckling or collapse.

c) Any change in external dimensions.

d) Conformance (or non-conformance) relative to Clause 8.4.4.

e) Reference to this test method.

APPENDIX D METHOD FOR LOAD TESTING

(Normative)

D.1 SCOPE AND GENERAL

D.1.1 Scope

This Appendix sets out a method for the load testing of an Access Chamber/Maintenance Shaft to demonstrate the ability of the maintenance shaft to resist a load on the riser during and following installation. Following application of the load, in accordance with this Appendix, the maintenance shaft is then tested in accordance with Paragraph C2.3 of Appendix C.

D.1.2 Relevance of test

The riser of an Access Chamber/Maintenance Shaft is required to withstand frictional down-drag forces generated, either, by settlement of the embedment and backfill after installation or, as each layer of embedment and backfill is compacted during installation.

D.1.3 Preparation of test assemblies

An Access Chamber/Maintenance Shaft assembled with a riser and pipe stubs, each of 300 mm minimum length, shall be used as the test assembly.

D.2 APPARATUS

The following apparatus is required:

a) Testing stand

A structurally rigid stand shall be used as a support for the test assemblies.

b) Supports

At each end of the Access Chamber/Maintenance Shaft, the centreline of the collar shall be supported by a cradle of matching radius with an arc subtending an angle of 90 degrees. Each cradle shall have a width of 50 mm and be mounted on a pinned roller support.

c) Bearing block

A sufficiently rigid bearing block shall be used to ensure that the load on the riser cap is evenly distributed.

d) Testing device

A device or other means of load application, such as a hydraulic testing machine or pre-weighed elements, such as ingots, sand-filled bags or other suitable means, shall be used for

applying the load. The device shall be capable of applying a load greater than the specified test load.

D.3 TEST PROCEDURE

D.3.1 Principle

A test assembly is subjected to a load.

D.3.2 Procedure for load test

The procedure shall be as follows:

a) Secure and condition the test assembly at 20°C–25°C for 2 h within the test stand, so that the load may be applied to the riser cap.

b) Place the bearing block on the riser cap.

c) Apply a test load of 15 kN, without shock, to the assembly through the bearing block.

d) Sustain the load for a minimum of 5 min.

e) Measure the change in external dimensions in accordance with Clause 8.4.3.

f) Release and/or remove the test load.

g) Inspect and record any evidence of damage including any bucking or collapse and for chambers with reinforcement any separation between the chamber and reinforcement, and any delamination, cracking or splitting of the reinforcement.

h) Within 24 hours, continue testing in accordance with Paragraph C2.3 of Appendix C.

D.4 TEST REPORT

The following information shall be reported:

a) The complete identification of the Access Chamber/Maintenance Shaft under test.

b) The test temperature.

c) The test load applied to the test assembly and the duration of the test.

d) The change in external dimensions due to the applied load.

e) The vacuum test pressure applied to the assembly and the duration of the vacuum test.

f) Any leakage detected during the vacuum test.

g) The change in external dimensions due to the applied vacuum.

h) Any buckling or collapse and for chambers with reinforcement any separation between the chamber and reinforcement, and delamination, cracking or splitting of the reinforcement.

i) Reference to this test method.

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