INDUSTRY STANDARD FOR PLASTICS COLLECTION TANKS FOR PRESSURE AND VACUUM SEWERS

WSA 129—2011

WATER SERVICES ASSOCIATION

OF AUSTRALIA

PREFACE

This Standard was prepared by the Water Services Association of Australia (WSAA).

The objective of this Water Industry Standard is to provide design, manufacturing and performance requirements for manufacturers of plastics collection tanks for storage of sewage in pressure and vacuum sewerage systems and which are specifically designed for buried installation. Given that a standard for this product is not available from Standards Australia and other overseas standards organisations, it is likely that further improvements to this initial standard may be necessary as experience is gained with its use.

Performance requirements in this Standard have been drawn from AS/NZS 1546.1, AS/NZS 4766, AS 3571.1 (ISO 10467) and other published standards, wherever practicable.

This Standard necessarily deals with existing conditions, but is not intended to discourage innovation or to exclude designs, materials, and manufacturing methods that may be developed in future.

Attention is drawn to the proposed publication of WSAA Rulings to this Standard. Where rulings of public significance are issued, they will be available from the WSAA website www.wsaa.asn.au. When rulings are included in an amendment, the specific ruling will be withdrawn at the time of publication of the amendment. Inquiries should be directed to info@wsaa.asn.au.

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.

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1 SCOPE AND GENERAL

1.1 SCOPE

This Industry Standard specifies the design, manufacturing and performance requirements for manufacturers of plastics collection tanks for storage of sewage in pressure and vacuum sewerage systems and which are specifically designed for buried installation.

1.2 LIMITATIONS

This Standard does not provide design criteria for —

(a) storage temperatures of sewage above 40°C; and

(b) superimposed pressure exceeding 0.25 m head of water, or 2.5 kPa, above the maximum recommended fill level;

Where criteria in Items (a) and (b) apply, special design consideration shall be given.

Wall thickness for circular straight walled tanks may be determined by hoop stress data. All other tanks shall be designed by appropriate engineering design methods, which may include finite element analysis (FEA).

2 OBJECTIVE

The objective of this Standard is to —

(a) ensure secure storage of sewage without ingress of light and inflow and/or infiltration of surface water and/or soilwater;

(b) ensure performance and workmanship of the finished tank is adequate for the intended application;

(c) ensure the tank is suitable for buried application subject to superimposed mechanical forces such as traffic, mine subsidence and seismic loads; and

(d) specify design criteria, material requirements and performance tests to ensure the above.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

681.1	Elastomeric seals—Material requirements for pipe joint seals used in water and drainage applications Part 1: Vulcanized rubber (EN 681-1:1996)
1199	Sampling procedures and tables for inspection by attributes
1565	Copper and copper alloys—Ingots and castings
1646	Elastomeric seals for waterworks purposes
1722.1	Pipe threads of Whitworth form - Sealing pipe threads
1722.2	Pipe threads of Whitworth form - Fastening pipe threads
2345	Dezincification resistance of copper alloys

AS

3571.1	Plastics piping systems—Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin Part 1: Pressure and non-pressure drainage and sewerage (ISO 10467:2004, MOD)
4087	Metallic flanges for waterworks purposes

AS/NZS

1260	PVC-U pipes and fittings for drain, waste and vent application
1546.1	On-site domestic wastewater treatment units - Septic tanks
1567	Copper and copper alloys—Wrought rods, bars and sections
1568	Copper and copper alloys—Forging stock and forgings
3500	Plumbing and Drainage
3500.0	Glossary of terms
3879	Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings
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

ASTM

A276	Specification for Stainless and Heat-Resisting Steel Bars and Shapes

BS

3396	Woven glass fibre fabrics for plastics reinforcement. Specification for finished fabrics for use with polyester resin systems
3749	Specification for E glass fibre woven roving fabrics for the reinforcement of polyester and epoxy resins systems
4994	Specification for design and construction of vessels and tanks in reinforced plastics

EN

1277	Plastic Piping Systems - Thermoplastics Piping Systems For Buried Non-pressure Applications - Test Methods For Leaktightness Of Elastomeric Sealing Ring Type Joints
14118-1	Reinforcement. Specifications for textile glass mats (chopped strand and continuous filament mats). Designation
14118-2	Reinforcement. Specifications for textile glass mats (chopped strand and continuous filament mats). Methods of test and general requirements
14118-3	Reinforcement. Specifications for textile glass mats (chopped strand and continuous filament mats). Specific requirements

ISO

62	Plastics - Determination of water absorption
75-3	Plastics - Determination of temperature of deflection under load - Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics
178	Plastics - Determination of flexural properties
179-2	Plastics - Determination of Charpy impact properties - Part 2: Instrumented impact test
180	Plastics - Determination of Izod impact strength
527	Plastics - Determination of tensile properties - Part 1: General principles
1133	Plastics - Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics
1172	Textile-glass-reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral-filler content - Calcination methods
1183-3	Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pyknometer method
1268-1	Fibre-reinforced plastics - Methods of producing test plates - Part 1: General conditions
2859	Sampling procedures for inspection by attributes
2859-1	Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.
3951	Sampling procedures and charts for inspection by variables for percent nonconforming

SAA/SANZ

HB 18	Guidelines for third-party certification and accreditation
HB 18.28	Guide 28: General rules for a model third-party certification scheme for products (ISO/IEC Guide 28)

WSA

PS – 290	Access covers for water supply and sewerage to WSA 132
PS – 291	Access covers for water supply and sewerage to EN 124
06	Vacuum Sewerage Code of Australia
07	Pressure Sewerage Code of Australia

4 DEFINITIONS

For the purpose of this specification, the definitions given in WSA 06 Vacuum Sewerage Code of Australia and WSA 07 Pressure Sewerage Code of Australia and those below apply.

4.1 CIRCULAR OPENING (CO)

The diameter of the largest circle that can be inscribed in the unobstructed opening in the frame with any removable supporting beams retained in place (see Figure 4.1).

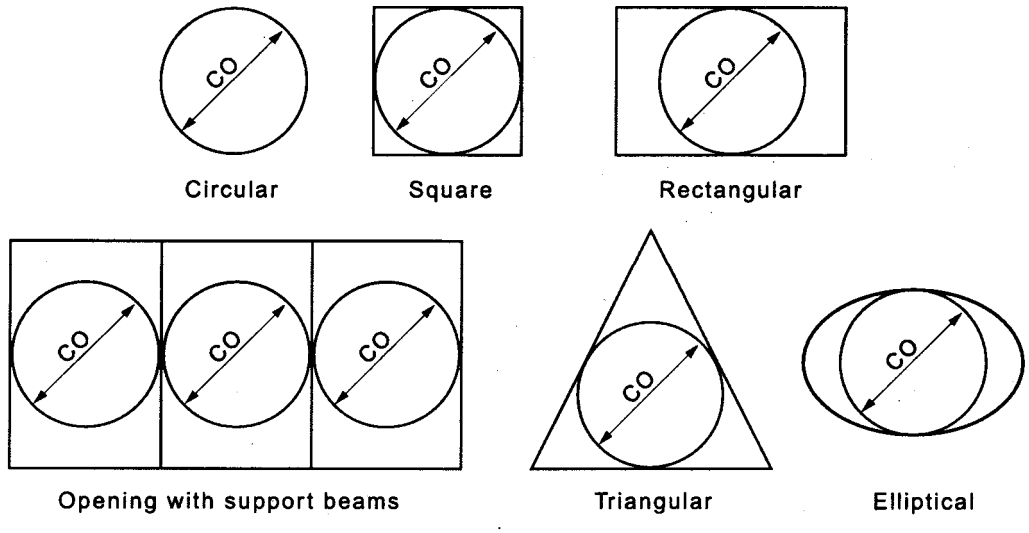

FIGURE 4.1 CIRCULAR OPENING (CO)

4.2 CLEAR OPENING

The dimensions of the unobstructed opening for access, in service, without removable supporting beams in place.

4.3 COLLECTION SUMP

A space provided at the bottom of a collection tank to store flows until the batch volume is sufficient to activate the vacuum interface valve in the case of a vacuum sewerage system or a grinder pump in the case of a pressure sewerage system.

4.4 COLLECTION TANK

A chamber into which a gravity sewer with one or more property connections discharges and where the bottom of chamber is used as a sewage collection sump.

4.5 DESIGNER

Person(s) or company, corporation or legal entity responsible for a design output.

4.6 SYSTEM SUPPLIER

A company, corporation or legal entity that supplies vacuum equipment (primarily vacuum interface valves) or pressure sewerage equipment (principally collection/pump units and control/alarm systems) and technology and reviews and guarantees system hydraulic design (principally design flow and sewer profiles).

5 MATERIALS

5.1 MATERIALS DURABILITY

All materials used to manufacture tanks and their fittings shall have a serviceable life of at least 50 years.

The ultimate durability of some materials is unknown. Accelerated test results are difficult to relate to actual in-service conditions. The use of new materials or formulations is usually justified on the basis of long-term testing, experience, and assessment against existing similar materials. This type of evidence for durability should be available to Asset Owners, Purchasers and be retained by the manufacturer.

5.2 GLASS FIBRE-REINFORCED PLASTICS

5.2.1 Resin

The resin shall be polyester, vinyl ester or equivalent resin that

(a) has a minimum heat distortion temperature of 60°C when tested in accordance with ISO 75-3 and is capable of being used in the manufacture of a laminate that complies with Clause 9.2.2;

(b) will cure at ambient or higher temperature with the addition of an initiator (catalyst) and, if necessary, promoters or accelerators used in accordance with the manufacturer's or supplier's recommendations; and

(c) Contains:

  (i) Not less than 50% w/w of non-volatile materials;

  (ii) No pigment or fillers; and

  (iii) Not more than 2% w/w of thixotropic agents.

5.2.2 Reinforcement

5.2.2.1 Glass-fibre

The reinforcing material shall be a suitable grade of glass fibre having a glass finish compatible with the resin used and complying with BS 3396 Part 3, EN 14118-1, 2 and 3 or BS 3749, as appropriate.

5.2.2.2 Other reinforcement

The use of non-glass reinforcement is permissible provided the finished product meets the test requirements of Clause 10.1.6 excluding Clause 10.1.6.6.

5.2.3 Resin coatings

5.2.3.1 Polyester and vinyl ester

Polyester or vinyl ester resins used for resin-rich internal layers shall be a suitable chemical resistant resin with a minimum heat distortion temperature of 60°C when tested in accordance with ISO 75-3.

Polyester and vinyl ester resins shall comply with the following requirements, as appropriate:

(a) Internal resin-rich layer:

Internal resin-rich layers shall cure with the addition of an initiator and if necessary, promoters or accelerators used in accordance with the manufacturer's or supplier's recommendations.

The resin-rich layer shall be free of any pigment or filler.

Thixotropic agents of up to 3% w/w are permitted.

The resin-rich layer shall be a minimum of 0.4 mm thick.

(b) External flowcoat:

External flowcoats shall cure with the addition of an initiator and, if necessary, promoters or accelerators or waxes used in accordance with the manufacturer's or supplier's recommendations.

The flowcoat for the tank and cover may contain up to 10% w/w pigment paste.

The cured flowcoat shall be free from cracks, pinholes and surface defects and shall not be less than 0.4 mm thick.

5.2.3.2 Other resin coatings

Other materials used as internal resin-rich layers and/or flowcoats shall meet the test requirements of Clause 10.1.6.

These coatings shall be prepared and applied in accordance with the manufacturer's or supplier's instructions.

5.2.3.3 Resistance to strain corrosion

The strain corrosion resistance of fibre-reinforced plastics shall be determined using the requirement and the procedure described in Clause 5.4.2 or Clause 5.4.3 of ISO 10467:2004, whichever the manufacturer decides.

5.3 PLASTICS

5.3.1 PVC-U, PP and PE for injection-moulding

The material shall conform to AS/NZS 1260 (PVC-U) and AS/NZS 5065 (PP and PE).

5.3.2 PE for rotational and extrusion blow moulding

Polyethylene (PE) compounds shall comply with Clauses 5.1 to 5.10 inclusive of AS/NZS 4766:2006 including Amdt 1:2010 or AS/NZS 4131.

5.3.3 PE sheets for butt welding

Polyethylene for sheets for butt welding shall have:

(a) density >950 kg/m3 when tested according to ISO 1183-3;

(b) E modulus of 1060±10 N/mm^2; and

(c) Izod impact value at 23° C of 100±3 kJ/m^2 when tested according to ISO 180.

PE sheets that may be exposed to sunlight in the installed condition e.g. the access cover must have a UV radiation resistance of at least 4.0 GJ/(m^2/a).

5.3.4 Environmental stress cracking resistance (ESCR) of PE compounds

PE compounds or material taken from a tank, when tested in accordance with AS/NZS 1462.5, at a stress of 15% of actual yield stress, as derived in accordance with AS 1145.2 at a strain rate of 5 mm/min, shall not fail in less than 24 h. Compounds that comply with AS/NZS 4131 may be deemed to comply with this Clause.

5.3.5 Components from other standards

Plastics components, fabricated or otherwise, are permitted to be utilised as sub-components of the final assembly provided that they have been manufactured in accordance with AS/NZS 1260 or AS/NZS 5065. Components of other than plastics materials should conform to relevant EN or ISO or AS or AS/NZS for these materials.

5.3.6 Sealing ring retaining components

It is permitted that sealing rings are retained using components other than the actual pipe or fitting PVC-U, PP or PE.

5.3.7 Solvent cements for PVC-U

Solvent cements shall comply with AS/NZS 3879.

5.4 FASTENERS

All fasteners shall be Grade 316 stainless steel complying with ASTM A276 or copper alloys C83600 or C48600 complying with AS 1565 or AS/NZS 1567 or AS/NZS 1568, as appropriate.

5.5 ELASTOMERIC SEALS

Elastomeric seal shall comply with AS 1646 and AS 681.1 (EN 681-1).

6 DESIGN

6.1 GENERAL

6.1.1 Storage capacity

This Standard does not specify minimum storage capacity for tanks. Minimum storage capacity shall be as specified by the Water Agency or the Designer in accordance with WSA 06 and WSA 07.

6.1.2 Chamber

Tanks shall be of single configuration.

6.1.3 Collection sump

Each tank shall be provided with a collection sump, which, in the case of pressure sewerage collection tanks, shall be designed to accommodate a nominated grinder pump(s). This Standard does not specify minimum volume of sumps, which shall be specified by the by the System Supplier or Designer in accordance with WSA 06 and WSA 07.

6.1.4 Loads on tanks

Tanks shall be designed and constructed to resist loads incurred during transport, handling and installation without damage occurring. Tanks shall be capable of resisting lateral and top loads, uplift loads from groundwater, and where applicable superimposed loads from vehicular traffic, ground movement including mine subsidence and seismic loads.

6.1.5 Anchorage

Tanks shall be provided with a means of anchorage to resist flotation due to hydrostatic uplift from a high water-table. This may be by use of ‘extensions’ attached to the tank or by other proven means of holding the tank down, details of which shall be provided by the tank manufacturer with independent verification of the effectiveness of the anchorage method.

6.1.6 Joints

The joints between a fitting and the wall of a tank and between tank components e.g. wall and riser, shall have a durable seal, be watertight, and have sufficient integral strength and/or flexibility to maintain a sound structure.

6.1.7 Access openings and covers

Each tank shall be provided with a minimum 400 mm clear circular opening to provide access to the tank for the purposes of maintenance and removal and/or replacement of equipment.

Access openings shall be:

(a) located to allow lifting equipment access for removal of grinder pumps;

(b) located to allow machine access for desludging of the chamber(s); and

(c) capable of being located at or above finished surface level.

Access covers and frames shall comply with WSA PS-290 or WSA PS-291.

Access covers shall be provided with a lock-down arrangement designed to prevent unauthorised access and removal by children.

Extensions or risers between the tank and the access frame shall provide a watertight seal.

6.2 GLASS FIBRE-REINFORCED PLASTICS TANKS

The design of glass fibre-reinforced plastic tanks shall be in accordance with BS 4994.

6.3 PLASTICS TANKS

6.3.1 General

Tanks shall be designed using appropriate engineering design methods, which may include finite element analysis (FEA).

The design of the tank shall consider all potential internal and external loadings over the design life of the tank including the effects of the service environment and any decrease in long-term physical properties of materials (Refer also to Clause 6.1.3).

6.3.2 Material test data

Material properties used in design analysis shall be those for the plastics compound used to mould the tank and shall be derived from independently verifiable testing conducted in accordance with published Standards.

Supply of material test data for design analysis shall be agreed between the tank designer and the raw material supplier and shall include at least the following:

(a) Raw material name and Standard or Code.

(b) Elastic modulus 30 years at 20°C, MPa.

(c) Poisson’s ratio.

(d) Maximum design stress, MPa.

(e) Yield strength at 20°C.

7 DIMENSIONS AND TOLERANCES

7.1 DIMENSIONS

All dimensions shall be taken at the time of manufacture with the tank in the operating upright position, unfilled. Tank dimensions shall represent the exterior measurements.

The dimensions (wall thickness, diameters, tapers, lengths and lengths of engagement) of tank components, including spigots and sockets for pipe connections, shall not be less than those specified in the relevant Australian Standard for a fitting or component of the same material and nominal diameter, e.g. AS/NZS 1260 for PVC-U.

7.2 TOLERANCES

7.2.1 Outside dimensions

The tolerance for outside dimensions, including out of roundness, shall be ±3% of the specified outside dimensions.

The tolerances of dimensions (wall thickness, diameters, tapers, lengths and lengths of engagement) of tank components, including spigots and sockets for pipe connections, shall not be less than those specified in the relevant Australian Standard for a fitting or component of the same material and nominal diameter, e.g. AS/NZS 1260 for PVC-U.

7.2.2 Tank wall and roof thickness

Wall and roof thickness shall be the design thickness −10%, +unlimited. The total amount of surface area with a thickness below the design thickness shall not exceed 10% of the total surface area, and an individual area shall not exceed 0.10 m^2.

Where wall and roof thicknesses are measured using ultrasonic equipment, this equipment shall be capable of measuring to an accuracy of 0.1 mm.

8 FITTINGS

8.1 GENERAL

The suitability of fabricated fittings, gaskets and other fitting accessories intended for use in tanks shall be based on product data, or advice obtained from the fitting supplier. Fittings shall be compatible with the tank and catchment system materials.

8.2 FITTINGS AND FLANGES

Inlet and outlet fittings may be installed either by the manufacturer prior to delivery of the tank or by the constructor at the time of installation of the tank.

Flanges and fittings integral to the tank shall make a leak proof seal with the tank. Threads shall not be tapped directly into the tank wall unless the thread depth is greater than or equal to the relevant fitting spigot thread length. Threaded sockets formed in the tank wall during the moulding process shall be acceptable.

Where required, connecting flanges should comply with AS 4087 and connecting threads should comply with AS 1722.1 or AS 1722.2.

NOTE: Threads on connecting fittings are often made undersize to ensure they fit a wide range of products with nominally similar threads. A check should be made of the fastening and sealing capability of the tank connecting thread with the fitting intended to connect to it.

9 MANUFACTURE

9.1 GENERAL

9.1.1 Surface finish

At the time of manufacture, the finished tank surface, when viewed without magnification, shall be smooth, clean and free from grooving, blistering, visible impurities or pores and any other surface irregularity likely to prevent their conformity with this standard or impair serviceability.

An internal surface with both high gloss and discolouration shall not be acceptable.

NOTE: Due to differences in resins and in moulding conditions, the interior surface characteristics may vary.

For glass fibre-reinforced plastics acceptance of surface defects shall be in accordance with Appendix ZC of AS 3571.1:2009.

9.1.2 Colour

Tanks if manufactured in layers shall have their surfaces coloured throughout. The internal surfaces of tanks shall be a light colour to permit condition assessment of the tank by CCTV inspection.

9.1.3 Assemblies

Components of tank assemblies can be a combination of two or more of the specified materials, which may also be used for different components of the same fitting.

9.1.4 Inlet and outlet holes

Tank fittings inlet and outlet holes shall be cut or formed in the tank wall prior to the tank leaving the manufacturer's premises. Tank fittings inlet and outlet holes ends shall be cleanly cut and square with the axis of the ends and within any cutting zone provided by the design.

9.2 GLASS FIBRE REINFORCED PLASTICS TANKS

9.2.1 General

The method for the manufacture of components for glass fibre-reinforced plastics tanks shall be by:

(a) The even application of resin and glass to the mould;

(b) Rolling the lay-up to achieve:

  (i) Complete wetting of the fibres;

  (ii) Removal of air bubbles and voids throughout the thickness of the laminate; and

(c) Rounding of all internal corners with a radius of not less than 6 mm;

The mass of glass rovings, if filament winding is used, shall be determined continuously as the material is applied.

9.2.2 Laminate and thickness

The composition and thickness of the laminate shall be as follows:

(a) Tank

The laminate shall contain not less than 30% glass. No pigments shall be included in the laminate.

The thickness of the laminate shall be not less than 4 mm. The thickness shall be increased to be not less than 6 mm for a distance of not less than 40 mm from all edges of openings and the edges of upstands for access and inspection covers. Changes in thickness shall be by smooth transitions.

The external surface of the tanks shall be coated with either a clear layer of initiated (catalysed) resin or an external flowcoat as defined in Clause 5.2.3.1(b), of not less than 0.4 mm thick.

(b) Access opening cover and top of vertical tanks

Access, inspection covers and tops of tanks shall contain not less than 30% chopped glass strands.

The thickness of the laminate shall be not less than 4 mm. This shall be increased to 6 mm within 40 mm of any edge.

9.3 PLASTICS TANKS

Plastics tanks may be rotationally moulded or extrusion blow moulded or injection moulded or fabricated by welding from sheets.

10 TESTING REQUIREMENTS

10.1 TYPE TESTS

10.1.1 General

All tanks shall comply with the type test requirements of Clauses 10.1.2 to 10.1.5 inclusive. These tests may be combined by applying the lateral and top loads to a tank before conducting the watertightness test.

In addition, glass fibre-reinforced plastics tanks shall comply with Clause 10.1.6.

10.1.2 Watertightness

When an assembled tank including access openings and covers, inlet fittings and outlet fittings is tested in accordance with the hydrostatic pressure test of AS/NZS 1462.10, at an internal pressure of 85 +5, −0 kPa for 60 +5, −0 min., the assembled tank shall not leak.

10.1.3 Liquid infiltration test

When an assembled tank including access openings and covers, inlet fittings and outlet fittings is 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, the assembled tank shall not leak.

10.1.4 Resistance to lateral loads

When tested in accordance with EN 1277 Condition A for 100 h at 23±2°C with an internal negative pressure of 300 +5, −0 kPa, the assembled tank shall not suffer any damage to its structure that could be deemed to impair its function.

Following the application of lateral loads, each tank shall pass the watertightness test in accordance with Clause 10.1.2.

10.1.5 Resistance to top load

Following the application of a top load in accordance with Appendix G of AS/NZS 1546.1:2008, each tank shall pass the watertightness test in accordance with Clause 10.1.2.

10.1.6 Glass fibre-reinforced plastics tanks

10.1.6.1 Test specimens

All test specimens shall be prepared in accordance with ISO 1268-1.

10.1.6.2 Flexural strength and modulus of elasticity

When tested in accordance with ISO 178, the flexural strength and modulus of elasticity of each test specimen shall be not less than 110 MPa and 4830 MPa, respectively.

10.1.6.3 Impact resistance

When tested in accordance with ISO 179-2, the test specimen shall have no surface cracks visible to normal or corrected normal vision.

10.1.6.4 Hardness

When tested in accordance with Appendix J of AS/NZS 1546.1:2008, the Barcol hardness number of each test specimen and any part of each test rainwater tank shall be not less than 35.

10.1.6.5 Water absorption

When tested in accordance with ISO 62, the amount of water absorption of each test specimen shall be not greater than 0.75%.

10.1.6.6 Glass fibre content

When tested in accordance with ISO 1172, the glass content of each test specimen shall be not less than 30% w/w. The test specimens shall be through-thickness to exclude the resin-rich internal layers being measured on their own.

10.1.6.7 Tensile strength

When tested in accordance with ISO 527, the tensile strength shall not be less than 63 MPa.

10.1.6.8 Tensile Elongation

When tested in accordance with ISO 527, the tensile elongation shall not be less than 1.5% minimum.

10.2 BATCH RELEASE TESTS

10.2.1 General

Each batch of tanks shall comply with the test requirements of Clauses 10.2.2 to 10.2.4 as appropriate before release.

10.2.2 Vacuum test – all tank materials

When tested in accordance with Appendix B, a sample from each production batch of tanks, and for cast in-situ concrete tanks each tank, shall not leak, collapse, buckle or delaminate.

10.2.3 Glass fibre-reinforced plastics tanks

The following tests shall be conducted on each batch of tanks:

(a) Thickness of laminate (Refer to Clause 7.2.2).

(b) Thickness of internal resin-rich layer at time of application (Refer to Clause 5.2.3).

(c) Hardness (Refer to Clause 10.1.6.4).

(d) Reinforcing fibre content (Refer to Clause 10.1.6.6).

10.2.4 Plastics tanks

10.2.4.1 Test specimen

The test specimen shall reflect the manufacturing process and shall be equivalent to a typical cross section of the tank.

The specimen shall be manufactured at the same time as the batch for release.

The specimen shall be cut from a section of the tank wall using a low speed cutting tool to prevent heat damage or other damage to the specimen.

NOTE: The test specimen is usually taken from an area that is cut out of the tank in the post-moulding operations, often the area where an opening is required.

10.2.4.2 Low temperature impact test

When tested in accordance with Appendix D of AS/NZS 4766, the test specimen shall not fail when subjected to the impact energy specified in Table D1 of AS/NZS 4766.

11 MARKING

Tanks shall be legibly and permanently marked on the tank wall or roof as follows:

(a) Manufacturer’s name or registered trademark.

(b) Date (month and year) of manufacture.

(c) Material identification e.g. PE.

(d) Useable volume in litres.

(e) Safe installation depth in metres*.

(f) Number of this Standard.

NOTE: * Based on any limitations, if applicable, nominated in the installation instructions.

12 INSTALLATION INSTRUCTIONS

Each tank shall be supplied with detailed installation instructions in English, which shall include warnings that the tank constitutes a confined space for any internal cleaning or repair work and that unless adequately ventilated will pose a serious health risk (including possible death) to anybody entering the tank.

APPENDIX A

MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD

(Normative)

A1 SCOPE

This Appendix sets out two means by which compliance with this Standard shall be demonstrated by a manufacturer:

(a) The use of a product certification scheme.

(b) The use of a minimum sampling and testing frequency plan.

A2 RELEVANCE

The long-term performance of buried tanks is important to water utilities that rely upon such systems for the storage of sewage and to the operating efficiency of pressure or vacuum sewerage systems.

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 ISO 2859-1 and ISO 3951)

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

A3.2 Batch

A3.2.1 Material or compound batch

A defined quantity of a homogeneous material or compound produced under uniform conditions. The batch is defined and identified by the material or compound producer.

A3.2.2 Tank batch

Schedule of tanks, all the same nominal diameter, wall thickness and marking, manufactured from the same material or compound on the same machine. The batch is defined and identified by the tank manufacturer.

A3.3 Batch release test

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 Conformity Assessment Body (CAB)

An organisation registered with and approved by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) to conduct assessments leading to product certification.

A3.5 Inspection level

The relationship between the lot or batch size and the sample size (see ISO 2859-1).

A3.6 Lot

A clearly identifiable sub-division of a batch for inspection purposes.

A3.7 New formulation

A change in material or compound formulation that exceeds the limits given in Paragraph A6.

A3.8 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.

A3.9 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.

A3.10 Sampling plan

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

A3.11 Type test (TT)

A test performed on a sample to confirm conformance to the requirements of this Standard before any batches can be released.

A4 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA HB 18.28/SANZ HB 18.28 (ISO/IEC Guide 28) 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 Standard.

Product certification shall be conducted by a CAB.

The frequency of the sampling and testing plan as detailed in Paragraph A5 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality and/or documented procedures shall take precedence for the purpose of product certification.

A5 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A5.1 General

A minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to this Standard shall be prepared for acceptance by the CAB.

A5.2 Retesting

In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in the sampling and testing frequency plan 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 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 (except for failed products) and compliance 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 compliance to this Standard shall be suspended until the cause of the failure has been identified and corrected.

A5.3 Rejection after test

In the event of a quarantined batch being rejected after retesting in accordance with the procedures set out in paragraph A5.2, it may be subjected to 100% testing for the failed requirement(s), and only those items found to comply may be claimed and/or marked as complying with this Standard.

A6 TYPE TESTING FOR RE-EVALUATION

A6.1 Change in material/compound

For PVC-U materials refer to Table A2 of AS/NZS 1260:2009.

For PP, PE and glass fibre-reinforced plastics, the following definitions of changes to compound formulation and the re-evaluation of the necessary type tests apply:

(a) *Change of base polymer*—change of polymer manufacturer, polymerization process or chemical nature of co-monomer.

(b) *Change of base polymer grade:*

  (i) Any change of nominated density and/or MFR out of the following limits:

    (A) Increase in MFR (5 kg) >20% or 0.1 g/10 min., whichever is the greater value.

    (B) Change of density >3 kg/m^3.

  (ii) Production of the same base polymer at a different site.

(c) *Change of pigment:*

  (i) Change of chemical nature or colour of pigment.

  (ii) Change of pigment level by >30%.

(d) *Change of additives other than pigments:*

  (i) Change of chemical nature or addition or deletion of any additive.

  (ii) Change of any additive (other that UV stabilizers) level by >30%.

  (iii) Decrease of UV stabilizers by >30% or increase by >50%.

A6.2 New material/compound

For the purpose of this Standard, the changes listed in Clause A6.1(a), A6.1(b), A6.1(c), A6.1(c)(i) and A6.1(d)(i) shall all constitute a new material/compound and all type tests shall be required.

NOTE:The weathering resistance test can be excluded if the same pigment and additive package, within the limits given in Item A6.1(c) and A6.1(d), are used.

A6.3 Change in Items A6.1(b)(i), A6.1(b)(ii), A6.1(c)(ii), A6.1(d)(ii), or A6.1(d)(iii)

Any change in the requirements listed in Items A6.1(b)(i), A6.1(b)(ii), A6.1(c)(ii), A6.1(d)(ii) or A6.1(d)(iii) shall result in type testing for re-evaluation being done. The tests, as given in Table A2, shall be carried out.

APPENDIX B

METHOD FOR VACUUM TESTING

(Normative)

B1 SCOPE AND GENERAL

B1.1 Scope

This Appendix sets out a method for the vacuum test.

B1.2 Relevance of test

The vacuum test qualitatively demonstrates that the tank is watertight and will not permit inflow and/or infiltration under external hydrostatic pressure.

B1.3 Preparation of test assemblies

A tank assembled with a riser, access cover and sealed fittings shall be used as the test assembly.

B2 TEST PROCEDURE

B2.1 Principle

A test assembly is subjected to an internal vacuum. The assembly is then inspected for air entry as an indication of likelihood of leakage and for distortion.

B2.2 Apparatus

The following apparatus is required:

(a) *Vacuum connection*

A vacuum-tight connection shall be made to the test assembly at an appropriate location to enable connection to the vacuum system.

(b) *Pressurizing system*

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

B2.3 Procedure

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 (negative) gauge pressure of 30 kPa to 35 kPa for not less than 15 minutes.

(c) At the completion of the test period record any buckling or collapse and for glass fibre reinforced plastic tanks any delamination, cracking or splitting.

B3 Test Report

The following information shall be reported:

(a) The batch number of the tank under test.

(b) Any visual evidence of buckling or collapse.

(c) Conformance (or non-conformance) relative to Clause 10.2.2.

(d) Reference to this test method, i.e., Appendix B of WSA 129.