



Assets Planning and Delivery Group
Engineering

Strategic Product Specification

SPS 497 Polyethylene Tanks for Chemical Service

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FOREWORD

Each Strategic Product Specification has been prepared to inform Water Corporation staff, consultants, contractors and land developers of the requirements for selecting and acquiring a manufactured product to be used in strategic Corporation infrastructure. The definition of ‘Product’ includes items that comprise assembled components, equipment or plant for mechanical, electrical and civil infrastructure applications.

The objective of a Strategic Product Specification is to specify fit-for-purpose Product which will contribute to the provision of effective water services at least whole-of-life cost and with least risk to service standards and safety. A Strategic Product Specification also provides uniform standards for compatibility of new water infrastructure with existing water assets.

Many Strategic Product Specifications have drawn on the design, asset management and operational experience of Product performance in live service gained by the Corporation over time. Some Strategic Product Specifications have drawn on the experience of the water industry nationally by referencing Australian or WSAA standards.

Strategic Product Specifications are intended for reference and use in the following typical procurement scenarios:

- Capital funded infrastructure design and construction work;
- Private developer funded subdivision infrastructure for takeover by the Corporation;
- Operationally funded infrastructure design and construction work;
- Corporation period contracts for Product purchases;
- Product purchases for stock or for miscellaneous minor work.

A published Strategic Product Specification will, in some cases, comprise technical content that is typical of a range of products of the same type (type specification) but may exclude specific requirements that should apply to a particular project or application. In such cases, the project designer is required to document the supplementary project specific requirements in the ‘Project Specific Requirements’ Appendix of the Specification.

The text of a published Specification should not be directly modified. In the event that a text variation is considered necessary to accommodate the needs of a particular project or application, the text modification should be documented in the appropriate Clause of a ‘Project Specific Requirements’ Appendix.

Enquiries relating to the technical content of this Specification should be directed to the Senior Principal Engineer, Water Treatment Section, Engineering to whom all enquiries relating to the technical content of the Specification should be directed. Future Specification changes, if any, will be issued to registered Specification users as and when published.

Head of Engineering

This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.

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Strategic Product Specification

SPS 499

Polyethylene Tanks for Chemical Service

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1 Scope and General

1.1 Scope

This Specification sets out requirements for the design, manufacture, testing, supply, handling and delivery of polyethylene tanks for use as static operational storage facilities for chemical service at the Corporation's facilities.

Storage tanks shall be constructed of virgin HDPE material in a new and unused condition. Storage tanks as defined in this Specification shall have capacities between 500 and 15,000 litres. HDPE storage tanks above 15,000 litres shall only be used with approval of Senior Principal Engineer, Water Treatment.

Polyethylene tanks are commonly used by the Corporation for the storage of chemicals. The chemicals stored vary with the treatment process. The chemical storage tanks covered by this specification are limited to above ground use and are generally of a vertical, circular cross section configuration.

Tanks may be located inside a treatment plant building or under cover where they are subject to normal ambient exterior temperatures but generally protected from solar radiation. For such tanks a design external surface temperature of 45°C would normally apply. Where located outdoors and exposed to solar radiation, a maximum external surface temperature of 60°C may occur.

The Specification also details the means by which compliance with the Specification shall be demonstrated and the criteria for acceptance of Product. This Specification excludes all site work (ancillaries, bunding, controls, pipework, etc.) which are outside the scope of this document.

The following are the most common chemicals stored by the Corporation in polyethylene tanks; however this Specification may also be applied to tanks used to store other chemicals with appropriate guidance to be provided by the Water Corporation Design Manager. Maximum intended product concentrations and maximum intended operating temperatures are included.

- Acetic Acid up to 25%, Max 60°C
- Aluminium Chloro-Hydrate (ACH), Max 60°C
- Aluminum Sulphate Solution, Max 60°C
- Ferric Chloride Solution 20% - 60%, Max 60°C
- Fluosilicic Acid 20% - 25% Max 60°C (GRE tank to SPS498 preferred)
- Hydrochloric Acid up to 30%, Max 60°C
- Hydrogen Peroxide up to 50%, Max 60°C
- Phosphoric Acid 10%, Max 60°C
- Polyelectrolyte Solution, Max 60°C
- Poly Aluminium Chloride (PACl), Max 60°C
- Potassium Chloride Solution, up to saturation solution strength, Max 60°C
- Sodium Chloride Solution, up to saturated solution strength, Max 60°C
- Sodium Hydroxide up to 50%, Max 60°C
- Sulphuric Acid up to 30%, Max 60°C
- Sulphuric Acid between 30% and 90%, Max 48°C

Sodium hypochlorite is specifically excluded from the above list of chemicals due to the Corporation having experienced premature failure of many HDPE tanks in sodium hypochlorite service. For limited sodium hypochlorite service (e.g. chemical waste tanks) or for small sodium hypochlorite storage tanks (≤ 500 L) that are in easily replaceable locations, approval to use a HDPE tank may be sought from the Senior Principal Engineer, Water Treatment, Water Corporation.

1.2 Referenced Documents

The following documents are referenced in this Specification:

Water Corporation “Strategic Product Appraisal Process Manual” (Internally controlled)

The following documents are referenced in this Specification:

AS

- 1111.1 ISO metric hexagon bolts and screws –Product grade C- Bolts
- 1214 Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- 2550.1 Cranes, hoists and winches – Safe use - General
- 2550.3 Cranes, hoists and winches – Safe use – Bridge, Gantry, Portal (including container cranes), jib and monorail cranes
- 2550.5 Cranes, hoists and winches – Safe use - Mobile
- 2550.11 Cranes, hoists and winches – Safe use – Vehicle loading cranes
- 3600 Concrete structures

AS/NZS

- 4087 Metallic flanges for waterworks purposes
- 4130 Polyethylene (PE) pipes for pressure applications
- 4131 Polyethylene (PE) compounds for pressure pipes and fittings
- 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

AS/NZS ISO

- 9001 Quality management systems – requirements

ISO

- 11414 Plastics pipes and fittings - Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion

German Welding Society Standards

DVS

- 2205-1 Calculation of tanks and apparatus made of thermoplastics – Characteristic values
- 2205-2 Calculation of tanks and apparatus made of thermoplastics – Vertical round, non-pressurised tanks
- 2205-3 Design of thermoplastic tanks and apparatus – Welded joints
- 2207-1 Welding of thermoplastics – Heated tool welding of pipes, pipeline components and sheets out of PE-HD
- 2207-4 Welding of thermoplastics – Extrusion welding of pipes, piping parts and panels

ISO/IEC

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

Standards Australia Guides

- HB 18 Guidelines for third-party certification and accreditation
- HB 18.2 Guide 2-General terms and their definitions concerning standardization and related activities
- HB 18.22 Guide 22-Information on manufacturer’s declaration of conformity with standards and other technical specifications

- HB 18.23 Guide 23-Methods of indicating conformity with standards for third-party certification systems
- HB 18.28 Guide 28-General rules for model third-party certification system for products
- MP52 Manual of authorization procedures for plumbing and drainage products

1.3 Definitions and Notation

The following definitions are intended to clarify the terminology used in this Specification.

1.3.1 Aspect Ratio

Ratio of the internal wall height of the tank divided by the internal diameter.

1.3.2 Australian Standards®

Standards that are developed, published and maintained by Standards Australia

1.3.3 Certificate

A formal certificate issued by a Certification Body in accordance with the third party product certification system described in HB 18.28, including associated Product licence schedules.

1.3.4 Certification Body

An independent (or third party) organisation duly accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) to operate product Certification Schemes.

In the case of a non-strategic plumbing Product, a Certification Body means an organisation approved by Standards Australia to administer the National Certification of Plumbing and Drainage Products (NCPDP) Scheme in accordance with SAA MP 52.

1.3.5 Certification Mark

A trademark or other mark of product conformity with a specified standard defined in SAA HB 18.2 and applied in accordance with SAA HB 18.23 that is issued under the rules of a Certification Scheme.

1.3.6 Certification Scheme

A third party product certification system operated in accordance with HB 18.28.

NOTE:The effect of this is to require maintenance by the manufacturer of effective production control planning in addition to full type testing from independently sampled production and subsequent verification of conformity with specified standards.

1.3.7 Compliant Product

Product that has been assessed, by means of Product Appraisal, as conforming to standards and specifications that are specified by the Corporation.

1.3.8 Corporation

The Water Corporation of Western Australia.

1.3.9 Design Manager

The Water Corporation's nominated representative to a specific Contract or project for Engineering related matters.

1.3.10 Global Safety Factor

Factor of safety as referred to in DVS 2205-1. When used in accordance with the DVS specification this margin of safety is ensured with respect to the creep strength of the material.

1.3.11 HDPE

Linear high density polyethylene (HDPE) is a polymer of ethylene, in primary form, having a specific gravity of 0.96 or more. Only PE 80 or PE 100 is classified as HDPE.

1.3.12 Manufacturer

An entity or combination of entities that are responsible for selection, processing and control of Product constituent materials or compounds and for the processing equipment that collectively result in the manufactured product.

1.3.13 Nominal Size

An alphanumeric designation of the size of components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number that is indirectly related to the physical size, in millimetres, of the bore or, in some cases, the outside diameter of the end connections.

1.3.14 Notation

Statements governed by use of the word 'shall' are mandatory or 'normative' requirements of the Specification. Statements expressed by use of the words 'should' or 'may' are 'informative' but not mandatory and are provided for information and guidance. Notes in Specification text are informative. Notes that form part of Specification Tables are normative. An Appendix to the Specification that is designated 'normative' contains mandatory requirements. An Appendix that is designated 'informative' is provided for information and guidance only. The term 'specified' includes requirements of the Specification and requirements stated or referenced in other project documentation.

1.3.15 Officer

A duly authorised representative or appointed agent of the Corporation.

1.3.16 Product

A single unit or multiple units of manufactured end product or an assembly of manufactured component products, materials or equipment. This Specification and accompanying Purchasing Schedule define the nature and details of Product to be supplied.

NOTE 1: An end product is most commonly an output of manufacturing processes that result in finished end products having the same features and characteristics and can be the result of a single or multiple production batches.

NOTE 2: Manufactured equipment and assemblies of Product components or materials are commonly procured for mechanical, electrical and civil infrastructure applications.

1.3.17 Product Appraisal

A formal process whereby Product, including product design, is subjected to systematic engineering assessment to determine Product fitness for prescribed end uses and to evaluate conformity of its production systems with specified standards and requirements. Product Appraisal includes verification of the extent of compliance in accordance with the requirements of a relevant 'Technical Compliance Schedule'.

1.3.18 Product Assessor

An organization, Officer or other person who, having demonstrated specialist product knowledge and competence acceptable to the Corporation, is appointed to evaluate Product, appraises the Product and issues one or more Product Verification Reports.

1.3.19 Product Certification

A formal process whereby the production and management systems for the manufacture of Product, are assessed by a Certification Body to evaluate compliance of these systems with specified product standards and tests, in accordance with Certification Scheme rules.

1.3.20 Product Verification Report

A formal report wherein a Product Assessor evaluates the extent of Product compliance with the specified product standards and specifications.

NOTE: Verification may be on a project-by-project basis or at agreed intervals, as appropriate to the scope of a Purchasing Schedule and Product end use, subject to determination by the Corporation.

1.3.21 Product Warranty

A formal express undertaking by a Supplier or Manufacturer that Product is:

- In conformity with the nominated product specification and referenced standards;
- Fit for the nominated Product end use or application;
- Designed for sustained operation at the nominated service performance levels for the specified design life;
- Adequately packaged for intended transportation, handling and storage conditions;
- Supported by English language installation, operating and servicing instructions;
- Adequately supported by Supplier capacity to provide technical Product support.

NOTE: Where required, a Product Warranty should indemnify the Corporation against claims made or losses suffered as a result of breach of the Warranty by means of Public and Products Liability Insurances as specified in the undertaking.

1.3.22 Purchasing Schedule

A Corporation purchase order, tender, schedule of prices, bill of quantities, or specification that details the nature, quantity and other characteristics of Product to be supplied, purchased or installed.

NOTE: Appendix A of this Specification forms part of the Purchasing Schedule

1.3.23 Quality System

A management system that establishes, documents, implements and maintains organizational structures, resources, responsibilities, processes and procedures for the manufacture of Product and provision of Product related services in accordance with the requirements of AS/NZS ISO 9001.

1.3.24 Standards Australia

The peak non-government standards development body in Australia which develops Australian Standards®.

1.3.25 Strategic Product

An essential infrastructure component whose performance is critical to the elimination or minimization of risk to the safe and effective provision of water services, which are functions of the Corporation under the Water Corporation Act as licensed under the Water Services Coordination Act.

NOTE: Strategic product is a component of permanent Corporation infrastructure. Ancillary operational and safety equipment that does not form part of permanent infrastructure but offers exceptional enhancements in operational performance or personnel safety may also be deemed strategic.

1.3.26 Strategic Product Appraisal Process

The process described in the Strategic Product Appraisal Process Manual whereby manufactured products and equipment are evaluated and, where they comply with specified requirements, authorised for use in Corporation infrastructure.

1.3.27 Supplier

An entity or combination of entities that is responsible for the supply of Product.

NOTE: A Supplier may be a Manufacturer, owner, producer, distributor, vendor, agent, tenderer or contractor for supply of Product or Product related service.

1.3.28 Testing

The determination of Product characteristics by inspection and by the application of specified test procedures.

1.3.29 WSAA

The Water Services Association of Australia of which the Water Corporation is a corporate member.

2 Materials and Components

2.1 General

Linear high density polyethylene (HDPE) as defined in Section **Error! Reference source not found.** shall be used according to the materials specification in Table 2.1. The resin used shall be of 100% virgin material and chemically resistant to the chemical to be stored within the subject tank at the maximum storage temperature. The design life of the tank shall be the criteria for determining chemical resistance.

Low density polyethylene (LDPE), Medium Density Polyethylene (MDPE) or Polyethylene with a cross linked resin structure is not permitted to be used in tanks for chemical service applications.

2.2 HDPE Tank

The HDPE tank shall be constructed as a minimum from materials in accordance with Table 2.1 as listed below.

Table 2.1: Component Materials

Component	Material
Floor, walls, roof	HDPE sheet
Flanges, flange extensions	Fabricated HDPE
Spigots, nozzles	Fabricated HDPE
Gussets, webs, reinforcements	HDPE sheet
Lifting lugs, anchorages	HDPE sheet
Flange backing plates	Hot dipped galvanized steel (Clause 3.3.14)
Flange bolts, fasteners	Hot dipped galvanized steel (Clause 3.3.16)
Welding rod	HDPE equivalent

3 Design

3.1 General

The tank shall be designed suitable for installation in either an indoor or outdoor (shaded) location as required in the Purchasing Schedule. Indoor installations shall be used (unless approval is provided otherwise by the Senior Principal Engineer, Water Treatment) due to the following reasons:

- it reduces the de-rating of the tank due to outdoor higher ambient temperature; and
- it avoids rapid deterioration of the stored chemicals due to the amount of heat that is easily absorbed by the dark colour of the tank.

This section is to be read in conjunction with the following drawings:

- FS04 – 499 – 1C – General Arrangement
- FS04 – 499 – 2C – Tank and Nozzle Connection Details
- FS04 – 499 – 3C – Anchorage and Lifting Lug Details

3.1.1 Safety in Design

Designers shall provide the client with a written Report (Safety in Design Report) on the OSH aspects of their design work in accordance with the requirements of WA OSH Regulation Clause 3.140 (Responsibilities of Designers) and the National Standard for Construction Work 2008 (Designers, Clients and Contractors). The Water Corporation's "Safety in Design" work instruction, which provides instruction on the compilation of this report, can be found within the Water Corporation's Engineering Design Process and associated documents.

3.1.2 DVS Standard and Welder Qualifications

The tank shall be designed in accordance with DVS standard set 2205 and take into account the stresses induced by the attachments, fittings and penetrations. All welding shall be performed in accordance with DVS 2207. All welds shall be spark tested and test certificates shall be supplied. All welders performing work on the tank shall be accredited according to DVS 2207 or equivalent.

3.1.3 Design Service Life

HDPE tanks shall have a design service life of 25 years unless specified otherwise in Appendix A: Project Specific Requirements.

3.1.4 Global Safety Factor

The Global Safety Factor (or Global Safety Concept) shall be applied throughout the calculations of the DVS Standards for Tank Design of Thermoplastics. The safety factor nominated shall be a minimum of 2.

3.1.5 Tank Capacity

The tank storage capacity shall be the internal volume calculated from the floor to the invert level of the tank overflow and shall not be less than the stated capacity. Note this is slightly greater than the useable working volume which is dependent on the placement of the tank outlet.

Alternatively, the tank capacity may be determined by filling the tank with water and measuring the quantity to fill the tank to the invert level of the overflow.

3.2 Tank Construction

3.2.1 Wall Construction

Wall thickness shall comply with DVS 2205 and shall generally be within the range of 0.01 to 0.04 of the shell radius. HDPE sheets shall be butt welded together to form a continuous wall segment. The

wall segment shall be formed into a cylinder and a final butt weld performed to create the tank wall. Butt welding shall comply with DVS 2207-1. The butt welds shall be de-beaded externally.

3.2.2 Roof Construction

The roof shall have a conical geometry with an angle of inclination of no less than 15° and no more than 30° to the horizontal. HDPE sheets shall be butt welded together to form a continuous roof segment and formed into the required geometry. A butt weld shall be used to permanently form the roof segment into a cone.

3.2.3 Bottom Floor Construction

The flat bottom floor of the tank shall be suitable for placement on a flat concrete plinth surface constructed to AS 3600 and designed to support the weight of the tank at maximum fill. HDPE sheets shall be butt welded together according to DVS 2207-1 (heated tool welding).

3.2.4 Bottom Floor-Wall Joint

The constructed flat bottom floor and wall shall be located concentrically to ensure an equal distance between the wall and the edge of the bottom floor segment around the wall. The two components shall be joined using extrusion welding on both the inside and the outside of the wall. The floor shall extend beyond the circumference of the wall to provide material for the appropriate extrusion weld such that at least 25mm of outer material unaffected by the extrusion welding process remains around the entire circumference of the tank. The weld shall comply with DVS 2207-4 (extrusion welding).

3.2.5 False Floor Construction

To facilitate complete emptying of the tank, a false floor shall be constructed with supports inside the tank such that the floor slopes to the scour outlet nozzle on the tank wall with its lowest level flushed with the nozzle's invert level. Alternatively, the floor may be formed in a conical shape with the drain piped out from the bottom of the cone at the centre to the scour outlet nozzle on the tank wall as shown in the drawings. Conical floor shall be supported by at least one, up to three concentric rings of HDPE sheets.

Design of the floor and its supports shall be in accordance with DVS 2205-2.

3.2.6 Wall-Roof Joint

The roof shall be located concentrically in the tank. The conical roof shall sit on an HDPE reinforcement ring which shall be extrusion welded to the inside of the tank wall near the top. The ring shall be at least 80mm wide and the same thickness as the roof sheet. The roof shall be attached to the wall through extrusion welding on the outside of the roof. The extrusion welding process shall comply with DVS 2207-4.

3.3 Pipework, Fittings and Appurtenances

3.3.1 General

All pipework and fittings shall be HDPE complying with AS/NZS 4130 and AS/NZS 4131. Tank nozzles, fittings and appurtenances (such as lifting lugs and anchorages) shall be as shown in the drawings and DVS 2205-2. Welding and installation shall be in accordance with DVS 2205-3, DVS 2207-1 (heated tool welding) and DVS 2207-4 (extrusion welding).

Tank nozzles shall be flanged and comply with the following nozzle schedule:

Table 3.1: Nozzle Schedule

Nozzle	Size
Fill inlet	DN 50
Overflow outlet	DN 80 minimum
Process outlet	DN 50 minimum
Vent on top of tank	DN 100 minimum
Gas purge return	DN 50
Scour outlet	DN 50
Level gauge mounting (2 wall nozzles)	DN 50
Level transmitter impulse line	DN 50
Side inspection port	DN 300

3.3.2 Fill Inlet

The fill inlet shall be located on the roof of the tank such that the direction of flow will not splash or run down the wall of the tank. The inlet shall have a nominal size of DN 50.

3.3.3 Overflow Outlet

The overflow outlet shall be located at a height just above the maximum fill level of the tank with the top of the outlet below the roof reinforcement ring and welds. If a sight tube is incorporated in the overflow line, the nozzle should be orientated such that the sight tube is in the line of sight of the person loading the chemical into the tank. The diameter of the overflow outlet shall be not less than 1.5 times the diameter of the fill inlet or a minimum nominal size of DN 80.

3.3.4 Process Outlet

The process outlet shall be located 100 mm above the lowest point on the false floor or conical floor measured to the underside of the outlet opening. The outlet shall have a nominal size of DN 50 or larger depending on service requirements.

3.3.5 Vent

The vent shall be a vertical outlet mounted at the highest point on the roof of the tank (the centre). The diameter of the vent outlet shall be not less than two times the diameter of the fill inlet or a minimum nominal size of DN 100.

3.3.6 Gas Purge Return

The gas purge return nozzle shall be located at a convenient position on the roof of the tank to allow gas released from chemicals in the dosing panel piping. The inlet shall have a nominal size of DN 50.

3.3.7 Scour Outlet

The scour outlet shall be located 100 mm above the flat bottom floor of the tank measured to the underside of the nozzle. The drain from the conical floor is plumbed internally to the scour outlet. The scour outlet shall have a nominal size of DN 50.

3.3.8 Level Gauge Mounting

Each tank shall be fitted with two DN 50 nozzles vertically in line with each other for magnetic level gauge mounting. The nozzles shall be located such that the level gauge can be easily read by the person loading the chemical into the tank. The upper nozzle shall be located at the same level as the overflow nozzle. The lower nozzle shall be at the same level as the process outlet, 100 mm above the conical floor of the tank measured to the underside of the nozzle.

3.3.9 Level Transmitter Impulse Line

A DN50 nozzle shall be provided for connection of the impulse line to a level (pressure) transmitter that is to be mounted nearby.

3.3.10 Inspection Port

A DN 300 flanged side inspection port shall be provided on the side of the tank with a hot dipped galvanised steel backing plate and blank flange cover complete with handle. The blank flange must be sealed completely with a suitable approved gasket (refer Clause 3.3.15) to protect it from the product. A reinforcing saddle shall be welded around the port opening to strengthen the surrounding tank wall. The inspection port shall be located away from other fittings with a height of approximately 1000 mm measured from the floor of the tank to the centre of the opening.

3.3.11 Gusseting

All nozzles shall be gusseted four times in the 12, 3, 6 and 9 o'clock positions. The gusseting shall be 10 mm HDPE sheet in the form of a right angle triangle with equal height and length. Refer to the drawings for more information.

3.3.12 Lifting Lugs

The lifting lugs shall be designed and fabricated in accordance with DVS 2205-2 and as shown in the drawings. A spreader cross bar shall be used to lift the tank at all times.

3.3.13 Anchorages

HDPE anchorage points for the tank shall be constructed with base dimensions of 100 x 100 x 20 mm for tanks smaller than 10 kL and 150 x 150 x 25 mm for tanks greater than 10 kL. The anchorages shall be extrusion welded to the bottom floor extension and side wall of the tank. The anchorage base shall be reinforced using 10 mm thick gussets as shown in the drawings.

3.3.14 Flanges

Flanges shall be drilled in accordance with AS/NZS 4087 for pressure class PN16. All flanges shall be provided with galvanised steel backing plates and gaskets at the flanged interfaces. The backing plates shall be hot dipped galvanised in accordance with AS/NZS 4680 and supplied with fasteners in accordance with Clause 3.3.16. Gaskets shall be as specified in Clause 3.3.15.

3.3.15 Gaskets

Gaskets shall be supplied by the tank fabricator for all tank flanges. Gasket material selection and specification shall be based on the chemical to be stored in the tank with consideration of chemical concentration and maximum design temperature as per table 3.2 below. Gaskets shall be a minimum 3mm thickness.

Table 3.2 - Gasket Material Selection

	Max. Concentration %	Max. Temperature °C	Suitable Gasket Material
Aluminium Chloro-Hydrate (ACH)	50%	60	EPDM or FPM (Viton)
Aluminum Sulphate Solution		60	EPDM or FPM (Viton)
Ferric Chloride Solution	60%	60	FPM (Viton)
Fluosilicic Acid	25%	60	FPM (Viton)
Hydrochloric Acid	30%	60	FPM (Viton)
Polyelectrolyte Solution	Any	60	EPDM or FPM (Viton)
Poly Aluminium Chloride (PACl)	Any	60	EPDM or FPM (Viton)
Sodium Chloride Solution	Any	60	EPDM or FPM (Viton)
Sodium Hydroxide	50%	60	Expanded Virgin PTFE

3.3.16 Fasteners

All flange fasteners shall comply with AS 1111.1 and AS 1112.3. Fasteners and anchorage bolts shall be hot dip galvanised in accordance with AS 1214.

NOTE: Grade 316 stainless steel fasteners are considered to have no advantage over galvanised steel fasteners due to risk of stress corrosion cracking and problem with galling.

4 Testing

4.1 General

Product shall be tested in accordance with the test requirements of this Specification. Testing shall be deemed acceptable when test outcomes have been formally verified by a Certification Body or witnessed by a testing Officer. Product for which a test requirement has not been met shall be classified as non-compliant Product.

NOTE 1: Testing should be carried out by an organisation accredited by NATA or in accordance with ISO/IEC 17025.

NOTE 2: A testing Officer should normally be an Officer who has specialist knowledge of or training in product or materials testing appropriate to the Product characteristics to be tested.

4.2 Notification of Testing

The Corporation shall be notified in writing of each formal test proposal, allowing as a minimum the period nominated in Table 11.1, prior to the preparation of Product for testing except where a specified test has been the subject of a current valid Certificate issued by a Certification Body. This notification is required to enable the Corporation to make all necessary arrangements including appointment of a testing Officer in a timely manner.

4.3 Access to the Place of Manufacture

The testing Officer shall be afforded access, at all reasonable times, to all places of manufacture of Product or product components and shall be authorised to arrange or undertake such testing there as the Corporation deems appropriate to the testing regime specified.

4.4 Place of Manufacture other than WA

Where any Product or product component is being manufactured other than in Western Australia the Corporation may appoint a local inspecting Officer to undertake inspections and witnessed testing as required. The testing Officer shall be provided with all due authority and permits required to carry out testing at the place of manufacture.

NOTE 1: The cost of witnessed testing arranged by the Corporation will normally be borne by the Corporation unless otherwise negotiated.

4.5 Performance Test Requirements

4.5.1 Hydrostatic Testing at Place of Manufacture

The following outlines the test procedure for hydrostatic pressure testing at place of manufacture. The test shall be witnessed by the Officer:

- Mount the tank on a level test base and visually inspect before commencement of test
- Secure all nozzles with blind flanges except the fill inlet, vent and overflow outlet
- Fill the sealed tank to the maximum fill level using potable water and leave overnight
- Visually inspect all welds and joints for any leakage of water
- Visually inspect the tank for any leakage of water, all welds/sheets/fittings shall be drip tight
- Record all relevant details and the results of the test
- Certificates shall be supplied upon delivery

Any leakage of water will be regarded as failed Product.

4.5.2 Hydrostatic Site Testing

The following sequence outlines the hydrostatic test procedure once the tank has been installed at site. The test shall be witnessed by the Officer:

- Close upstream and downstream pipework isolating valves
- Fill tank to maximum fill level and leave overnight
- Visually inspect all tank welds and joints for any leakage of water
- Inspect all installed pipework for water leakage
- If no visible indication of water leakage, award manufacturer hydrostatic test pass

Any leakage of water will be regarded as a failure of the Product or installation.

4.5.3 Test Certificates

For the purposes of acceptance, each test certificate shall, as a minimum, bear the relevant Product item serial number and shall certify that the Product item has complied with the specified test requirements.

5 Marking and Packaging

5.1 Marking

5.1.1 Manufacturer Compliance Plate

Each tank shall have a compliance plate clearly displayed and permanently secured using corrosion resistant fasteners. The plate shall provide the following information in clear minimum 5mm high lettering:

- b) Manufacture's name or registered trademark
- c) Date of manufacture (month and year)
- d) Serial number
- e) Tank Identification number or Tag number
- f) Capacity (Volume L and Weight kg)
- g) Chemical
- h) Maximum design service pressure and temperature
- i) Maximum design Specific Gravity of content
- j) Material of manufacture and grade
- k) Design Code or Standard

5.2 Packaging

5.2.1 General

Product shall be packaged with appropriate protection, which shall prevent damage or defects as a result of handling, storage, transportation and installation. Flexible packaging material shall have a minimum expected life in outside storage conditions of 12 months from the date of delivery.

5.2.2 Identification Tag

Wherever requested in the Purchasing Schedule the tank packaging shall be identified using a weatherproof marking pen on a corrosion resistant metal identification tag securely wired to the Product in a conspicuous position using a galvanized tie wire with the following information:

- a) Contract number
- b) Purchase order number
- c) Tank capacity
- d) Material of manufacture

6 Manuals

6.1 Format and Language

Where required, Product shall be supplied complete with appropriate installation, operation and maintenance instructions or manuals, in clear diagrammatic and text format, in English

6.2 Content

The manuals shall contain all the relevant information required to commission, operate and maintain the Product in live service, including the following:

- a) Details of Product features
- b) Operational adjustments
- c) Installation and commissioning instructions
- d) Preventative maintenance requirements and intervals
- e) Testing procedures
- f) Trouble shooting guidelines
- g) Complete list of parts and associated exploded views or sectional diagrams and reference part numbers

7 Manufacturer's Data Report

7.1 General

The Manufacturer's Data Report (MDR) shall be provided on completion, delivery and installation (as applicable) of the Product.

The MDR is the compilation of all technical details and records of activities carried out as part of the tank manufacture including design, materials procurement, fabrication, installation, quality assurance, inspection, testing and commissioning. All documents for inclusion in the MDR shall be written in the English language with measurements in SI units.

7.2 Content

The MDR shall include at least the following:

- a) Design Calculations and Summary Report
- b) Inspection and Test Plans (ITPs)
- c) Material Certificates
- d) Welding and Welder Qualification Records
- e) Test Records and Certificates
- f) As-built drawings

8 Spare Parts and Special Tools

8.1 Spare Parts

8.1.1 Interchangeability

All spare parts shall be interchangeable for a manufacturer's Product of the same size and model.

8.1.2 Availability

Spare parts and servicing facilities for the product shall be readily available in Western Australia.

8.2 Special Tools

Any special tools required for service and maintenance of the product shall be supplied.

9 Transportation, Handling and Storage

9.1 General

Transportation, handling and storage facilities shall be designed to prevent Product damage or defects and to maintain Product free of deleterious matter. Product shall not be dropped off elevated vehicle platforms or sites. Mechanical handling equipment shall be in accordance with AS 2550.1, AS 2550.3, AS 2550.5 and AS 2550.11 and shall be appropriate to the loads to be lifted. Manual handling shall be in accordance with the National Standard for Manual Handling and the National Code of Practice for Manual Handling, published by National Occupational Health and Safety Commission, Australia. Product restraint during transportation shall be in accordance with Load Restraint Guide—Guidelines for Safe Carriage of Loads on Road Vehicles, published jointly by the Federal Office of Road Safety and the National Road Transport Commission, Australia.

NOTE: Where wire ropes or chains are used for loading and unloading, they should not come into direct contact with Product. Lifting elements in direct contact with Product should be of a non-abrasive design eg elastomeric or fabric webbing straps. During transportation, Product restraints should be checked for tension at regular intervals of travel and should not be released until the transporting vehicle is resting in a secure stable disposition on level ground.

9.2 Preservation of Product in Storage

Product shall be stored in original Product packaging in accordance with the published requirements of the manufacturer, prior to installation. Sensitive component materials shall be protected from extended exposure to direct sunlight and high temperatures e.g. elastomeric components shall be stored in accordance with the general principles of AS 1646. Designated Product storage areas shall be of sufficient size to accommodate Product deliveries and shall be flat, reasonably level and free of combustible vegetation, sharp stones or projections that could cause Product damage or defects.

10 Quality Assurance

10.1 Certification

10.1.1 Certification of Product

Wherever this Specification requires compliance with nominated Product and test Standards, conformance shall be certified by means of a Certification Scheme, conducted by a Certification Body. Each Certificate shall expressly attest compliance of all Product items with the nominated Standards. Wherever specified, Certificates shall be submitted to the Officer nominated for this purpose. Product shall be marked in accordance with the requirements of the Certification Body.

NOTE: Compliance of Product including related accessories and services with nominated Standards and specified requirements may be verified by means of a Product Verification Report provided by a Product Assessor. The Product Verification Report should identify all relevant Certificates of Product compliance, duly issued in accordance with Certification Scheme rules.

10.1.2 Quality System

The processes for manufacture, testing, supply, transportation, handling, delivery and storage of Product to be supplied in accordance with this Specification shall form part of a documented Quality System. The System shall be certified by a Certification Body as complying with the requirements of AS/NZS ISO 9001 and shall provide for identification and traceability, control of production and delivery to the specified destination, customer verification and control of documents and records.

10.1.3 Product Re-verification

Product compliance with the Specification shall be subject to re-verification by a Product Assessor when, during the agreed Product supply period, there occurs any:

- substantive change in Product design, material formulation or performance
- Product failure to perform in operational service to the nominated performance specification.

Re-verification shall require the issue of a new or supplementary Product Verification Report. Product components and test outcomes that are not significantly affected by the Product change or failure may be excluded from the scope of re-verification, provided that these outcomes have already been reported in a current valid Product Verification Report that is acceptable to the Corporation.

Wherever the requirements of the Specification apply to a Product supply period in excess of three years, continuing acceptance of Product shall be subject to re-verification. The purpose of re-verification shall be to confirm the continuing compliance of Product quality and production control processes with the requirements of the Specification

10.2 Compliance and Acceptance

10.2.1 Means of Demonstrating Compliance

Compliance with this Specification shall be demonstrated by means of Product Appraisal and issue by a Product Assessor of a Product Verification Report that confirms compliance. Otherwise, Product shall be deemed non-compliant and ineligible for registration as Product authorised for use in Corporation infrastructure.

NOTE 1: Where a project includes design work including Product design, Product Appraisal may form part of the project design review process and the Product Assessor may be a member of the project design review team.

NOTE 2: A Product Verification Report should verify the extent of compliance with the Specification including all relevant 'Technical Compliance Schedule' Appendices and the currency of a Certificate where relevant to the Product.

10.2.2 Acceptance Criteria

For acceptance, Product shall be supplied as specified in the Purchasing Schedule.

Prior to the implementation of any arrangement to supply Product, the Supplier shall, in accordance with specified requirements:

- nominate applicable Product Warranty terms; and
- provide documentary verification in the form of a current valid Certificate or Product Verification Report as appropriate to the Product; and
- detail each element of Product that does not comply with the specified requirements together with the extent of non-compliance.

NOTE : Where the Specification includes Technical Compliance Schedules, the nature and extent of all non-compliances should be provided in accordance with the appropriate Schedules.

10.3 Non-compliant Product

10.3.1 General

Product whose design, workmanship or performance fails to conform to the specified requirements shall be clearly tagged and quarantined by the Supplier as non-compliant and shall be subject to rejection for return to and replacement by the Supplier.

Where the Specification includes a ‘Technical Compliance Schedule’, Product shall be deemed non-compliant except where a Supplier has demonstrated compliance in accordance with the requirements of the ‘Technical Compliance Schedule’ Appendices of the Specification.

10.3.2 Manufacturing Repairs (In-process)

Welding, the use of fillers and other repairs shall generally not be permissible on Product which is in the course of production. Repairs to custom-built Products such as axially-split pumps and large valves may be considered only if determined by the Corporation to be minor casting repair work in non-strategic locations. Accordingly, details of any defect which the Manufacturer considers can be repaired; together with details of proposed repair procedures shall be submitted in writing for determination by the Corporation.

The Manufacturer shall make provision in its production Quality System and in the appropriate ITP’s for sufficient hold points whenever casting defects are encountered. Production work on non-compliant components shall cease and repair work shall not commence until the following details have been confirmed by the Corporation in writing:

- (a) that repair of the non-compliant components in lieu of their replacement is acceptable; and
- (b) that proposed repair procedures are acceptable; and
- (c) that any proposal to vary the terms of the original Product Warranty as a consequence of the in-process repair is acceptable.

10.3.3 Product Warranty

The Supplier shall replace non-compliant Product with Product that conforms to the acceptance criteria or shall repair or rectify all faults, damage or losses caused by defective Product. Except as may otherwise be specified, the Product Warranty shall indemnify and keep indemnified the Corporation against all losses suffered by the Corporation as a result of non-compliant Product for a period no less than 24 months after Product delivery or 12 months after Product installation, whichever period elapses first.

10.3.4 Product Repair

All reasonable proposals for repair or remedy of defects will be considered, provided that each such proposal is accompanied by a methodology statement that accords with the performance objectives of this Specification, as determined by the Corporation. For acceptance, a proposal for repair or remedy of Product defects shall not void or otherwise diminish the provisions of the Product Warranty.

11 Appendix A: Project Specific Requirements (Normative)

11.1 General

Project specific information and requirements, not included elsewhere in this Strategic Product Specification, shall apply as specified in the following Clauses.

11.2 Technical Requirements

Table 11.1 details project specific requirements for the pumps to be procured.

TABLE 11.1: PROJECT SPECIFIC REQUIREMENTS

Tank No.	Size (L)	Specific Requirements		
		Process Outlet Size (DN)	Vent Size (DN)	Description of Other Requirements

12 Appendix B: Technical Compliance Schedules (Normative)

12.1 Compliance Schedules

Suppliers shall demonstrate Product compliance with the Specification by completing Technical Compliance Schedule 1 as shown in **TABLE 12.1** on an item by item basis. For acceptance, the extent of scheduled technical item compliance shall be supported by verifiable documentary evidence. Each scheduled item nominates a Specification clause number with which the extent of Product compliance shall be demonstrated.

The Supplier shall denote compliance of an item by ticking the unshaded ‘Yes’ column appropriate to that item. Where Product does not comply with specified requirements, the Supplier shall tick the ‘No’ column and shall detail the reasons for non-conformance and any proposed alternatives in the ‘Comments’ column. The Supplier shall denote acceptance and understanding of a Specification clause by ticking the corresponding ‘Noted’ column wherever unshaded.

Failure to notify the Corporation of all non-compliant Product components, including the extent of non-compliance, may void an accepted offer to supply or may result in rectification of all non compliant Product elements, at the Supplier’s cost.

When requested by the Corporation, the Supplier shall provide the additional information required by Technical Compliance Schedule 2 as shown in **TABLE 11.2**.

TABLE 11.1: TECHNICAL COMPLIANCE SCHEDULE 1

HDPE Storage Tanks for Chemical Service					
Technical Compliance Schedule 1					
Section/Clause		Noted	Compliance		Comments
			Yes	No	
1. SCOPE AND GENERAL					
1.1	Scope				
1.2	Referenced Documents				
1.3	Definitions and Notations				
2. MATERIALS AND COMPONENTS					
2.1	General				
2.2	HDPE Tank				
3. DESIGN AND MANUFACTURE					
3.1	General				
3.1.1	Safety in Design				
3.1.2	DVS Standard and Welder Qualification				
3.1.3	Design Service Life				
3.1.4	Global Safety Factor				
3.1.5	Tank Capacity				
3.2	Tank Construction				
3.2.1	Wall Construction				
3.2.2	Roof Construction				
3.2.3	Bottom Floor Construction				
3.2.4	Bottom Floor-Wall Joint				
3.2.5	False Floor Construction				
3.2.6	Wall-Roof Joint				
3.3	Pipework, Fittings and Appurtenances				
3.3.1	General				
3.3.2	Fill Inlet				
3.3.3	Overflow Outlet				
3.3.4	Process Outlet				
3.3.5	Vent				
3.3.6	Gas Purge Return				
3.3.7	Scour Outlet				
3.3.8	Level Gauge Mounting				
3.3.9	Level Transmitter Impulse Line				
3.3.10	Inspection Port				
3.3.11	Gusseting				
3.3.12	Lifting Lugs				
3.3.13	Anchorage				
3.3.14	Flanges				
3.3.15	Gaskets				
3.3.16	Fasteners				
4. TESTING					
4.1	General				
4.2	Notification of Testing				
4.3	Access to Place of Manufacture				
4.4	Place of Manufacture other than Western Australia				
4.5	Performance Test Requirements				
4.5.1	Hydrostatic Testing at Place of Manufacture				
4.5.2	Hydrostatic Site Testing				
4.5.3	Test Certificates				
5. MARKINGS AND PACKAGING					
5.1	Marking				
5.1.1	Manufacturers Compliance Plate				
5.2	Packaging				
5.2.1	General				
5.2.2	Identification Tag				
6. MANUALS					
6.1	Format and Language				
6.2	Content				
7. MANUFACTURERS DATA REPORT					
7.1	General				

7.2	Content				
8. SPARE PARTS & SPECIAL TOOLS					
8.1	Spare Parts				
8.1.1	Interchangeability				
8.1.2	Availability				
8.2	Special Tools				
9. TRANSPORTATION, HANDLING AND STORAGE					
9.1	General				
9.2	Preservation of Product in Storage				
10. QUALITY ASSURANCE					
10.1	Certification				
10.1.1	Certification of Product				
10.1.2	Quality System				
10.1.3	Product Re-verification				
10.2	Compliance and Acceptance				
10.2.1	Means of Demonstrating Compliance				
10.2.2	Acceptance Criteria				
10.3	Non-compliant Product				
10.3.1	General				
10.3.2	Manufacturing Repairs (In-process)				
10.3.3	Product Warranty				
10.3.4	Product Repair				

Name of Supplier:

Signature:

Date:

TABLE 11.2: TECHNICAL COMPLIANCE SCHEDULE 2

HDPE Storage Tanks for Chemical Service		
Technical Compliance Schedule 2		
1. SUPPLIER’S REPRESENTATIVE		
1.1	Full Name	
1.2	Postal Address	
1.3	Email Address	
1.4	Facsimile Number	
1.5	Phone Number	
2. QUALITY ASSURANCE		
2.1	Extent of Third Party Accreditation of Supplier	
2.2	Extent of Third Party Accreditation of Manufacturer	
2.3	Details of Certificates and Verification Reports Attached	(Yes/No)
2.4	Details of Welder’s certification/ticket/license	(Yes/No)
2.5	Details of Welder’s Qualification Supplied	(Yes/No)
3. TECHNICAL INFORMATION		
3.1	Material Certificates Supplied	(Yes/No)
3.2	Hydrostatic Test Certificate Supplied	(Yes/No)
3.3	Spark Test Certificate Supplied	(Yes/No)
4. TANK DESIGN SUMMARY		
4.1	Manufacturer’s Name	
4.2	Place of Manufacture	
4.3	Global Safety Factor	
4.4	Tank Capacity	(kL)
4.5	Tank Height	(m)
4.6	Tank Wall Height (internal)	(m)
4.7	Tank Diameter (internal)	(m)
4.8	Tank Wall Sheet Thickness	(mm)
4.9	Tank Roof Sheet Thickness	(mm)
4.10	Tank Bottom Floor Sheet Thickness	(mm)
4.11	Tank Conical Floor Sheet Thickness	(mm)
4.12	Tank Conical Floor Support Ring Sheet Thickness	(mm)
4.13	Nozzle and Spigot Thickness	(mm)
4.14	Flange Thickness	(mm)
4.15	Tank Roof Pitch Angle	(deg)
4.16	Tank Conical Floor Pitch Angle	(deg)
4.17	Process outlet size	(DN)
4.18	Vent size	(DN)
5 MATERIALS		
5.1	HDPE Sheets PE Grade	
5.2	Fittings PE Grade	
5.3	Pipework material, standard and grade	
5.4	Backing rings material	
5.5	Backing rings galvanizing standard	
5.6	Fasteners galvanizing standard	

Name of Supplier:

Signature:

Date:

END OF DOCUMENT