

| Assets Planning and Delivery Group
Engineering

Strategic Product Specification

SPS 125 Polyethylene and Polypropylene Pipe and Pipe Fittings

VERSION 1
REVISION 4

SEPTEMBER 2020

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, Wastewater Conveyance, Engineering

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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REVISION STATUS

The revision status of this specification is shown section by section below:

REVISION STATUS						
SECT.	VER./REV.	DATE	PAGES REVISED	REVISION DESCRIPTION (Section, Clause, Sub-Clause)	RVWD.	APRV.
1	1/0		All	New Specification	KR	MH
1	1/1	25.6.2014		1.2/1.3.21 minor editorials	KR	DV
1	1/2	11.6.2018		ISO & EN standards referenced. Compliance/certification changed to conformity assessment	KR	KP
1	1/4	31.08.2020	9	Updated definition of Product.	PV	JD
2	1/0		All	New Specification	KR	MH
2	1/1	25.6.2014		2.1/2.4.1/2.4.2 design/selection notes	KR	DV
2	1/2	11.6.2018		Fitting performance and ISO/EN conformity requirements detailed. New PE resin (e.g. PE-HSCR) options added.	KR	KP
2	1/3	19.09.2018		Added requirement for PE100-HSCR in drinking water applications	PV	JD
2.1	1/4	31.08.2020	11	Removed second paragraph, temperature derating factors are described in the Design Standards.	PV	JD
2.1.1	1/4	31.08.2020	11	Added definition for Disinfectant Resistant PE, updated definition for HSCR PE, and removed specification for alternative installation techniques.	PV	JD
2.1.2	1/4	31.08.2020	11-12	Referred to AS/NZS 4129 requirements for spigot fittings, updated definition of HSCR and RC PE, added definition for Disinfectant Resistant PE, replaced EN14525 reference with SPS125, and clarified DN63 limit on compression fittings.	PV	JD
2.5.2	1/4	31.08.2020	15	Removed duplicate WS-2 reference	PV	JD
3	1/0		All	New Specification	KR	MH
3	1/1	25.6.2014		3.2/3.4/3.5/3.8 editorials	KR	DV
3	1/2	11.6.2018		Technical clarifications, editorials and industry references added	KR	KP
3.5	1/4	31.08.2020	16	Corrected wording of second paragraph.	PV	JD
4	1/0		All	New Specification	KR	MH
4	1/1	25.6.2014		4.1.1 editorial; New 4.3.2 added	KR	DV
4	1/2	11.6.2018		Conformity requirements aligned	KR	KP

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SECT.	VER./REV.	DATE	PAGES REVISED	REVISION DESCRIPTION (Section, Clause, Sub-Clause)	RVWD.	APRV.
				with new SA rules and WSAA Technical Note 08		
4	1/3	19.09.2018		Added requirement for resin manufacturer and designation in pipe marking string	PV	JD
4.6	1/4	31.08.2020		Testing need not be undertaken at place of manufacture and testing not limited to agreed test regime.	PV	JD
5	1/0		All	New Specification	KR	MH
5	1/2	30.6.2018	All	MMRs for PN 12.5 product options removed	KR/IP	KP
5	1/4	31.06.2020	21-22	Reference to DS63 update Bulleting 17-2 removed	PV	JD
6	1/4	31.06.2020	26-28	New Section defining Assessment Criteria for Resistance to Disinfectants.	PV	JD

Strategic Product Specification

SPS 125

Polyethylene and Polypropylene Pipe and Pipe Fittings

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1 Scope and General

1.1 Scope

This Specification sets out requirements for the supply, handling and delivery of polyethylene and polypropylene pipe and associated pipe fittings that respectively meet the requirements of AS/NZS 4130 “Polyethylene (PE) pipes for pressure water and wastewater applications” and AS/NZS 5065 “Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications”. The Specification also details the acceptance criteria for polyethylene and polypropylene pipe and pipe fittings intended for infrastructure project use and the means of demonstrating conformance with the Specification.

NOTES:

- 1 Polypropylene pipes and fittings (to AS/NZS 5065) are intended exclusively for non-pressure wastewater conveyance and, subject to project-by-project agreement, drainage applications. They are neither intended nor suitable for drinking water applications.
- 2 Polyethylene pipe systems should be installed in accordance with AS/NZS 2033 Polyethylene (PE). Polypropylene (PP) pipelines for buried applications should be designed and installed in accordance with AS/NZS 2566.

1.2 Referenced Documents

The following documents are referenced in this Specification:

Water Corporation

DS 50	Design and construction requirements for gravity sewers DN 150 to DN 600
DS 51	The Design and Construction of Wastewater Pumping Stations and Pressure Mains 4.5 to 180 Litres Per Second Capacity
DS 60	Water Supply Distribution Standard - Pipelines Other than Reticulation
DS 63	Water Reticulation Standard -Design and Construction Requirements for Water Reticulation Systems up to DN250
DS 66	Urban Main Drainage Standard Strategic Products Register

AS

1646	Elastomeric seals for waterworks purposes (<i>Performance requirements in AS 681 Parts 1 to 4</i>)
681.1	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Vulcanized rubber
681.2	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Thermoplastic elastomers
681.3	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Cellular materials of vulcanized rubber
681.4	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Cast polyurethane sealing elements
1462.24	Methods of test for plastics pipes and fittings Method 24:Determination of resistance to crack propagation—Test methods for slow crack growth in notched pipes(notch test) (This MOT was reproduced from and is equivalent to ISO 13479)
1745.2	Outdoor weathering of plastics in the Australian environment - Part 2: Guide for design purposes
2345	Dezincification resistance of copper alloys
3688	Water supply - Copper and copper alloy body compression and capillary fittings and threaded-end connectors

AS/NZS

1462.6	Methods of test for plastics pipes and fittings - Method 6: Thermoplastics pipes, fittings and assemblies for the transport of fluids under pressure - Resistance to internal pressure (This MOT was based on and is equivalent to ISO 1167.1, 1167.2, 1167.3 and 1167.4)
1462.25	Methods of test for plastics pipes and fittings - Determination of slow-crack-growth of PE (polyethylene) resins - Notched, constant ligament-stress (NCLS) method
1462.29	Methods of test for plastics pipes and fittings - Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation (ISO 9080:2003, MOD)
2033	Installation of polyethylene pipe systems

- 2566.1 Buried flexible pipelines - Part 1: Structural design
- 2566.2 Buried flexible pipelines - Part 2: Installation
- 3500 National Plumbing and Drainage Code
- 4020 Products for use in contact with drinking water
- 4087 Metallic flanges for waterworks purposes
- 4129 Fittings for polyethylene (PE) pipes for pressure applications
- 4130 Polyethylene (PE) pipes for pressure applications
- 4131 Polyethylene (PE) compounds for pressure pipes and fittings
- 5065 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications

POP PIPA (Plastics Industry Pipe Association) Guidelines

- 001 Electrofusion jointing of PE pipe and fittings for pressure applications
- 003 Butt fusion jointing of PE pipes and fittings - Recommended parameters
- 004 Polyethylene pipe compounds
- 004A Supplementary List - Materials Specific to Electrofusion and Moulded Fittings
- 005 Packaging, handling and storage of polyethylene pipes and fittings
- 006 Derating requirements for fittings
- 007 Metal backing flanges for use with polyethylene (PE) pipe flange adaptors
- 008 Striping of polyolefin pipes
- 010A Part 1: polyethylene pressure pipes design for dynamic stresses
- 010B Part 2: fusion fittings for use with polyethylene pressure pipes design for dynamic stresses
- 013 Temperature re-rating of PE Pipes Systems
- 014 Assessment of Polyethylene Welds
- 016 High Stress Crack Resistant PE100 (PE 100-HSCR)
- 017 Material Requirements for White PE Jacket Compounds Suitable for Long Term UV Exposure
- 201 Resistance of plastics pipes and fittings to water and wastewater chemicals
- 204 Expected service life of elastomeric pipe seals
- 205 Water jet cleaning of plastics pipes

ISO

- 228.1 Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation
- 1133 Plastics - Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics
- 1183.1 Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method
- 3126 Plastics piping systems - Plastics piping components - Measurement and determination of dimensions
- 4427-2 Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part 2: Pipes
- 4427-3 Plastics piping systems - Polyethylene (PE) pipes and fittings for water supply - Part 3: Fittings
- 4437-2 Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 2: Pipes
- 4437-3 Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 3: Fittings
- 6964 Polyolefin pipes and fittings - Determination of carbon black content by calcination and pyrolysis - Test method and basic specification
- 9080 Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation
- 11357.6 Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)
- 11413 Plastics pipes and fittings—Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting
- 11414 Plastics pipes and fittings—Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion
- 12162 Thermoplastics materials for pipes and fittings for pressure applications - Classification and designation - Overall service (design) coefficient
- 12176-1 Plastics pipes and fittings—Equipment for fusion jointing polyethylene systems - Butt fusion
- 12176-2 Plastics pipes and fittings—Equipment for fusion jointing polyethylene systems - Electrofusion
- 13477 Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Small-scale steady-state test (S4 test)
- 13478 Thermoplastics pipes for the conveyance of fluids — Determination of resistance to rapid crack propagation (RCP) — Full-scale test (FST)
- 13479 Polyolefin pipes for the conveyance of fluids - Determination of resistance to crack propagation - Test method for slow crack growth on notched pipes

- 16770 Plastics. Determination of environmental stress cracking (ESC) of polyethylene. Full-notch creep test (FNCT)
- 24033 Polyethylene of raised temperature resistance (PE-RT) pipes — Effect of time and temperature on the expected strength

BS EN

- 1555-1 Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 1: General
- 1555-2 Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 2: Pipes
- 1555-3 Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 3: Fittings
- 12201-1 Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 1: General
- 12201-2 Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 2: Pipes
- 12201-3 Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 3: Fittings
- 14525 Ductile iron wide tolerance couplings and flange adaptors for use with pipes of different materials: ductile iron, grey iron, steel, PVC-U, PE, fibre-cement

DIN PAS (Publically available specification)

- 1075 Pipes made from Polyethylene for alternative installation techniques - Dimensions, technical requirements and testing

AS/NZS ISO IEC

- 7.1 **AS/ISO 7.1:** Pipe threads where pressure-tight joints are made on the threads - Dimensions, tolerances and designation
- 9001 **AS/NZS ISO 9001:** Quality management systems – requirements
- 17000 **ISO/IEC 17000:** Conformity assessment – Vocabulary and general principles
- 17025 **ISO/IEC 17025:** General requirements for the competence of testing and calibration laboratories
- 17026 **ISO/IEC 17026 (TR):** Conformity assessment – Example of a certification scheme for tangible products
- 17067 **AS/NZS ISO/IEC 17067:** Conformity assessment – Fundamentals of product certification and guidelines for product certification schemes

1.3 Definitions and Notation

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

1.3.1 Australian Standards®

Standards that are developed, published and maintained by Standards Australia

1.3.2 Certificate

A formal certificate issued by a Conformity Assessment Body as an outcome of a conformance audit in accordance with a Certification System.

1.3.3 Certification Mark

A proprietary mark of product conformity issued in accordance with ISO/IEC 17030.

1.3.4 Certification System

An impartial third party product certification scheme or combination of schemes, as exemplified in ISO/IEC TR 17026, that are in accordance with the fundamentals of AS/NZS ISO/IEC 17067 and with the guiding principles of ISO/IEC Guide 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.

1.3.5 Conforming Product

Product that demonstrably conforms with standards and specifications nominated by the Corporation, where assessed by means of Product Appraisal.

1.3.6 Conformity Assessment Body (CAB)

A third party organisation that has been duly accredited as meeting the requirements of AS/ANZ ISO/IEC 17065 by a signatory member of the International Accreditation Forum (IAF) Multilateral Arrangement (MLA), previously known as a **Certification Body**.

1.3.7 Corporation

The Water Corporation of Western Australia.

1.3.8 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.

1.3.9 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.

1.3.10 Officer

A duly authorized representative or appointed agent of the Corporation.

1.3.11 Product

A single unit or multiple units of manufactured end product or an assembly of manufactured component products, materials or equipment.

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.

1.3.12 Product Appraisal

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

1.3.13 Product Assessor

An organisation, 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.

1.3.14 Product Certification

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

1.3.15 Product Verification Report

A formal report wherein a Product Assessor evaluates the extent of Product conformance 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.

1.3.16 Product Warranty

A formal express undertaking by a Supplier that indemnifies the Corporation against the consequences of supplied Product failure to conform with specified fitness for application and in-service life expectancy performance requirements.

1.3.17 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.

1.3.18 Quality System

A management system that establishes, documents, implements and maintains organisational 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.

1.3.19 Standards Australia

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

1.3.20 Strategic Product

An essential infrastructure component whose performance is critical to the elimination 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.

1.3.21 Strategic Product Appraisal Process

The process described in Section 3 of the Strategic Products Register whereby manufactured products and equipment are evaluated and authorized for use in Corporation infrastructure, subject to demonstrated conformity with the nominated product performance requirements.

1.3.22 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.

1.3.23 Testing

The determination of Product characteristics by inspection and by the application of specified test procedures in order to determine Product conformity with nominated performance requirements.

2 Materials and Components

2.1 PE Pressure Pipe and Fittings

PE pressure pipe and fittings shall be selected and designed to safely sustain the foreseeable ultimate pipeline system design operating pressure specified by the pipeline designer. Pipe and pipe fitting characteristics and applications shall be in accordance with the requirements of the applicable Corporation Design Standard (DS 51, DS 60, DS 63 or DS 66) as appropriate to each project application. All pipe and fittings shall allow for thermal, cyclic fatigue and oxidative derating in accordance with the relevant Design Standard, and shall be a minimum of PN 16 at 20°C.

NOTE: AS/NZS 4130/AS/NZS 4129 PE pipe and pipe fitting dimensional and mechanical performance requirements closely align with those of respective International and European product standards, as follows:

- ISO 4427.2/ISO 4427.3 for water supply applications;
- ISO 4437.2/ISO 4437.3 for gaseous fuel applications;
- EN 1555.2/EN 1555.3 for gaseous fuel applications; and
- EN 12201.2/EN 12201.3 for water supply, drainage and sewerage applications.

2.1.1 PE Pipe

PE pipe for general pressure applications shall be manufactured in accordance with the requirements of AS/NZS 4130 (Series 1) from a pre-compounded PE 100 base resin material that has been assessed for conformity with AS/NZS 4131 and duly listed as such in POP 004.

Disinfectant Resistant PE pipe shall be made entirely of a resin that has been assessed by the Water Corporation as Disinfectant Resistant in accordance with Appendix B and listed as such in the Strategic Product Register.

HSCR PE Pipe shall be made entirely of a resin that has been assessed as HSCR in accordance with POP 016 and duly listed as such in POP 004.

NOTES

- 1 PE pipes should be selected and designed in accordance with the Design Standards and with an acceptable service risk evaluation process. The **cumulative** application of “informative” design factors in Table C1 of AS/NZS 4130 Appendix C is not an acceptable basis for PE pipe selection or design for water industry applications.

2.1.2 PE Pipe Fittings

Pipe fittings including electrofusion and injection moulded fittings made from PE material shall, for pressure pipeline applications, conform with AS/NZS 4129 and the following:

1. Base PE 100 resin material for pipe fittings shall conform with AS/NZS 4131 and shall be subject to formal industry acceptance by its listing in POP 004/POP 004A as a conforming compound;
2. Welded PE component and segment fabrication welding work shall conform with the requirements of WS-2 including POP 003;
3. Fabricated and heat-formed (or post-formed) fittings shall, conform to the mechanical property requirements for spigot fittings in AS/NZS 4129 (Table 6.3).
4. PE 100-HSCR fittings shall be made entirely of resin that has been assessed as HSCR in accordance with POP 016 and duly listed as such in POP 004 or POP004A;
5. PE 100-RC fittings shall be made entirely of resin conforming with DIN PAS1075 requirements and shall be subject to Corporation acceptance;
6. Disinfectant Resistant PE fittings shall be made entirely of a resin that has been assessed by the Water Corporation as Disinfectant Resistant in accordance with Appendix B and listed as such in the Strategic Product Register;

NOTES

- 1 The sustainable working pressure ratings of PE fittings that are typically heat-formed should be demonstrated by type pressure testing or, where agreed, by means of an acceptable FEA design verification supported by type testing confirmation of fitting wall thickness throughout the fitting body. Body dimensions of subsequently (heat-formed) manufactured fittings should be routinely verified during production to demonstrate continuing conformity with fitting dimensions that have been type tested to the duly nominated pressure rating(s).
- 2 Fabricated and heat-formed PE pipe fittings should be selected on the basis of manufacturer declared pressure de-rating factors (≤ 1) duly supported by independently witnessed valid test performance reports, irrespective of manufacturer declared **nominal** fitting dimension ratio (SDR) and **nominal** pressure rating (PN).

Mechanical grip (non-fusion) fitting jointing systems for PE pipe shall incorporate elastomeric seal and joint grip components that have been designed and tested for restraint of internally pressurised PE pipe ends from axial movement relative to the joint. The jointing systems shall maintain joint water-tightness seal, notwithstanding fluctuation of pipeline service pressures between zero and design maximum operating pressure (MAOP). Ductile iron (DI) couplings and flange adaptors for use with PE pipe shall be in accordance with SPS 106.

Mechanical jointing systems to be installed on PE pipelines, that are DN 125 or larger in diameter, shall, for acceptance, incorporate a 316L stainless steel ring stiffening insert that is designed to provide internal support for and tightly fit the nominated PE pipe internal bore.

Mechanical compression and thread jointed pipe fittings (usually in end-of-line property water service and cul-de-sac applications) and fusion jointed fittings in pressure applications shall conform with AS/NZS 4129. Mechanical compression and thread jointed pipe fittings shall not be larger than DN63.

NOTES

- 1 Mechanical couplings and flange adaptors of materials other than DI for use with PE pipe shall comply with a coupling product standard or specification that has been agreed with or endorsed by the Corporation.
- 2 New PE pipeline infrastructure (larger than DN 63) should generally be fusion jointed in accordance with project drawings and specifications, to the exclusion of non-fusion mechanical jointing systems. The use of mechanical jointing systems and products should be limited to in-service PE pipeline repair and replacement operations where fusion jointing methods are impracticable from a service continuity or community acceptance perspective.

2.2 Non-pressure Pipe and Fittings

PE and PP pipe and pipe fittings for non-pressure applications shall conform with AS/NZS 5065 and shall be supplied with integral joint sockets that demonstrably provide long term installed pipe and jointing system integrity, stability and service performance in the proposed service applications. Joint seals for AS/NZS 5065 PE pipelines in non-pressure applications shall be EPDM or NBR in accordance with AS 1646 (incorporating AS 681.1, 681.2, 681.3 and 681.4) for the nominated elastomer IRHD hardness and shall be supplied by the original pipe or pipe fittings manufacturer.

2.3 Colour

PE pipe for buried pipeline network applications shall be externally coloured as follows:

Application	Network Element	Colour
Drinking water	Pressure Main	Black striped blue
	Service Connection	Black striped blue
Wastewater	Pressure/Vacuum Main	Black striped cream
	Non-pressure	Grey
Stormwater	Pressure Main	Black
	Non-pressure	Black
Non-drinking Water	Pressure Main	Black striped purple
	Service Connection	Purple

Pipe Colour specifications shall be in accordance with the following

Colour Specification ³		
Colour	No lighter than	No darker than

Blue	RAL 200 90 10	RAL 200 80 25
Cream	RAL 080 90 20	RAL 075 80 20
Grey	AS 2700 Pearl Grey N11	AS 2700 Cloud Grey N22
Purple	RAL 310 70 15	RAL 330-40-40 or 310 50 30

NOTES

- 1: PE compounds for co-extruded pressure pipe stripes and jackets should be selected from those classified in POP 004 as being AS/NZS 4130 and AS/NZS 4131 conforming.
- 2: Colour striping coverage, as a proportion of external pipe surface, should be no less than that given in POP 008.
- 3: Information on the RAL colour range may be obtained by contacting RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V., Siegburger Strasse 39 D-53757 Sankt Augustin or by visiting www.ral.de

2.4 Effect on Water

Pressure pipe and pipe fitting joint seals and associated components and lubricants shall conform with AS/NZS 4020 for use in contact with drinking and non-drinking water, using a scaling factor of 1 for pipe and a scaling factor in accordance with AS/NZS 4129 for pipe fittings, joint components and associated lubricants.

NOTE: PE pressure pipeline components procured for wastewater and drainage applications should also comply with this requirement in order to eliminate cross-contamination risk arising from their unintentional or intentional use in drinking water applications.

2.5 Joint Configuration

2.5.1 Mechanical Jointing

The use of mechanically bolted jointing systems with elastomeric seals to joint PE pressure pipelines exceeding DN 63 in diameter shall be limited to applications where pipeline fusion jointing is proven to be impracticable and shall be subject to acceptance by the Corporation, based on demonstrated project-by-project need.

The jointing and seal configuration systems of AS/NZS 5065 PE and PP pipes and fittings for non-pressure applications shall be designed to provide pipeline joint structural and dimensional integrity and stability during handling, assembly, installation, hydrostatic testing, burial and operation over a service life in excess of 50 years.

2.5.2 Fusion Jointing

Pipe fittings intended for electrofusion and butt fusion weld jointing shall be manufactured in accordance with the particular performance and dimensional requirements of AS/NZS 4129 Section 3 and AS/NZS 4130 Section 9 respectively. The spigots of pipe fittings intended for butt fusion weld jointing shall also be dimensioned to readily and safely accommodate the configuration, reach and articulation of transporting, handling, clamping and welding equipment to be used for installation.

Polyethylene pipe and fitting fabrication, welding and acceptance testing shall conform with the requirements of WS-2 “Welding & Joining Specification Thermoplastics” and shall be in accordance with POP 014 industry guidelines for the assessment of PE joint welds.

NOTES

- 1 Only PE pressure pipes and fittings designed for fusion jointing should be selected for use in a vacuum reticulation system. Elastomeric seal mechanically-jointed PE pipe and fittings are not designed for and should not be used in vacuum applications.
- 2 Non-pressure and pressure PE pipeline systems including fusion weld, mechanical compression, flanged and threaded jointing work should be in accordance with AS/NZS 2033.
- 3 The design of fusion jointed PE pipeline interconnection with pipelines having unrestrained or flexible joints shall assure positive restraint of the PE pipelines from axial movement relative to the axially unrestrained pipelines.
- 4 Fusion jointing should be undertaken only by welders who have been duly accredited by a Registered Training Organisation (RTO) as having met the competency standard (covered by training modules PMBWELD301B through to PMBWELD311B) that is appropriate to the scope of each particular PE asset delivery project.
- 5: For acceptability of welder competency, the accrediting RTO should have current and appropriate accreditation in accordance with Australian National Training Authority guidelines and should employ trainers that are qualified to deliver training in accordance with the appropriate training module requirements. The accreditation status and currency of an RTO and the content of the PMBWELD training modules may be referenced at training.gov.au.

3 Transportation, Handling and Storage

3.1 General

PE pipe and fittings shall be transported, handled and stored in accordance with the relevant requirements of AS/NZS 2033 and with POP 005 guidelines.

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.

NOTES

- 1: Notwithstanding the use of carbon black and ultraviolet light stabilisers in the manufacture of PE pipes and pipe fittings, neither should be subjected to prolonged exposure to ultra-violet light (e.g. direct strong sunlight) for a period exceeding 12 months. Pipe fittings should be retained in their delivery packaging until their installation is planned and imminent.
- 2: Appropriate consideration should be given to personnel safety when working with loose or stacked PE pipes and pipe fittings because their smooth surface finish can render them slippery, particularly in wet conditions.

3.2 Protection from Elevated Temperatures and Sunlight

Where the total period of exposed storage outdoors - determined from the date of Product manufacture - is likely to exceed the maximum period defined in AS/NZS 2033, pipes, pipe stacks and pipe fittings shall be protected by means of under-cover storage or by covering with an appropriate material - such as hessian - that will not entrap heat in the vicinity of stored pipes or pipe stacks (See Note). Black plastics or other non-permeable sheeting shall not be a permissible shade material.

NOTE: High temperature and uneven heating is likely to soften and deform PE pipe and pipe fittings. The consequent distortion - particularly in lower layers of stacked products - can render PE pipeline components unsuitable for fusion jointing without significant rework including re-rounding and joint re-alignment. Thermal ageing due to extended exposure to high temperatures on project storage sites and in open trenches impairs Product performance and service life permanently and may, in some instances, result in rejection for re-supply

3.3 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. Designated Product storage areas shall be of sufficient size to accommodate Product deliveries and shall be flat, reasonably level and free of combustible vegetation, deleterious material, sharp stones or projections that could cause Product damage or defects.

3.4 Pipe Storage

PE pipe and pipe fittings shall be stored in accordance with the storage requirements of AS/NZS 2033. Designated storage areas at pipe depots and at pipe installation sites shall be of sufficient size to accommodate pipe deliveries securely and fit for purpose.

NOTE 1: Pipe fittings and jointing materials should be stored separately and under cover. Individual discrete or loose pipe components should be stored in original product packaging, prior to their installation.

NOTE 2: Pipes and pipe fittings should be supported on a grid structure of timber or sandbags that avoids direct pipe contact with the ground or soil materials with adequate space provided around stored components for the movement of handling, lifting and construction equipment, without risk to product performance or personnel safety.

3.5 Pipe Stacking

Pipe stacking heights shall be in accordance with those recommended by the pipe manufacturer and shall be kept to a minimum to enable safe handling and lifting and prevent pipe deformation. Provision shall be made for side support to prevent stack collapse during removal.

Where pipes of different pressure rating are stored in a single pipe stack, pipes of lower pressure rating shall be positioned above those of higher pressure rating. Where pipe deformation does occur -

particularly in lower pipe storage stack layers - deformed pipes and pipe fittings shall be liable for removal/re-rounding to regain respective conformity with AS/NZS 4130 and AS/NZS 4129 dimensional requirements or to replacement.

NOTE: Vertical supports and chock blocks should be designed and arranged to prevent accidental slippage, rolling or collapse of pipe stacks.

3.6 Pipe Stringing

Pipe 'stringing' at installation sites shall be restricted to sufficiently short lengths to minimise pipe damage or contamination risks. Pipes shall be strung at a safe distance from spoil heaps, heavy operating machinery and vehicle tracks.

3.7 Lifting

Mechanical equipment and slings used for handling of pipes and fittings shall be in accordance with AS 2550.1 and AS 2550.5 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.

3.8 Transportation and Unloading

Loading, unloading and transport operations shall be carried out in accordance with AS/NZS 2033. Climbing or standing on pipes shall not be permissible.

Pipes and supporting system load restraints shall be secured to the transporter to prevent displacement relative to the transporter during transportation. This may be by means of straps, bolsters or other appropriate restraints 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. Load restraint mechanisms shall be checked for tension at regular intervals not exceeding 300 kilometres of travel and shall not be released until the transporting vehicle is resting in a secure stable disposition on level ground.

4 Conformity with Requirements

4.1 General

Product conformity with the specified requirements shall be verified by means of an acceptable inspection and test plan (ITP). The ITP shall provide for product component structural and durability design, materials control and performance conformity testing throughout production. The inspection and test plan shall be embodied in a duly accredited ISO 9001 production quality management system.

Product shall be deemed to conform with requirements where test outcomes have been formally verified by a Product Assessor or certified by a Conformity Assessment Body (CAB) in accordance with the requirements of a product standard acceptable to the Corporation. Otherwise, it shall be classified as non-conforming Product.

NOTE: For acceptance, performance testing and calibration laboratories should be accredited as meeting the requirements of AS/NZS ISO/IEC 17025 by a signatory member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). The scope of laboratory/facility accreditation should include the competencies and capabilities required to execute the particular product testing and calibration work to be undertaken.

4.2 Certification of Product

Products, in respect of which conformity with a particular nominated product Standard(s) is claimed, shall, for acceptance, be assessed in accordance with an acceptable product certification system and shall be subject to the issue of a certificate of conformity with the nominated Standard(s) by a duly accredited CAB.

The certification system or scheme with which product conformity is claimed shall:

- be based on ISO/IEC TR 17026, Conformity assessment -- Example of a certification scheme for tangible products and shall be in accordance with the fundamentals of AS/NZS ISO/IEC 17067 and with the guiding principles of ISO/IEC Guide 28;
- include product type testing from independently sampled production;
- require the manufacturer's production processes and associated controls to be part of a quality management system that has been certified as meeting the requirements of AS/NZS ISO 9001, Quality management systems - Requirements; and shall
- include subsequent verification that the manufacturer continues to maintain effective production control and product conformity with the nominated product Standard(s), at intervals not exceeding 12 months.

NOTE: Evidence of Product conformity with the specified requirements may be by means of a Product Verification Report provided by a Product Assessor including reference to a current relevant water industry appraisal report or certificate issued by WSAA.

4.3 Product Re-verification

Product conformity 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.

4.4 Acceptance Criteria

For acceptance, Product shall be supplied as specified in the Purchasing Schedule and shall be clearly and indelibly provided with product markings as follows:

- PE pipe markings in accordance with AS/NZS 4130 requirements and PE pipe fitting markings in accordance with AS/NZS 4129 requirements; and
- Additional markings to uniquely identify which PE base resin compound (i.e. PE 100, PE 100-HSRC, PE 100-RC or other recognised proprietary PE material) a pipe or fitting has been manufactured from; and
- Additional markings to identify resin manufacturer and resin manufacturer's resin designation

NOTES:

1 PE base compound identification marking acronyms or abbreviations should be in accordance with ISO 1043-1, ASTM D1600 or AS/NZS 4131 and should also clearly identify compound variants that differ from AS/NZS 4131 and POP 004 defined (third generation) PE 100 compounds.

2 Marking information may be provided on the body of a pipe fitting or by means of a label, pressure sensitive tape on its product packaging, subject to acceptance by the Corporation of marking durability (in long term buried service applications) and positioning.

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

- nominate applicable Product Warranty terms including service longevity limitations; and
- provide documentary verification of conformity with performance requirements in the form of a current valid Certificate, certified evidence of conformance with an inspection and test plan (ITP) or a Product Verification Report that is appropriate to the Product, subject to the acceptability of certification credentials; and
- detail each element of Product that does not conform with any specified requirement together with the extent of non-conformance.

NOTE: Where the Specification includes Technical Compliance Schedules, the nature and extent of all non-conformances should be recorded in the appropriate Schedules to be submitted for acceptance.

4.5 Non-conforming Product

4.5.1 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-conforming and shall be subject to rejection for return to and replacement by the Supplier.

4.5.2 Manufacturing Repairs (In-process)

The Manufacturer shall make provision in its production Quality System and in the appropriate ITP's for sufficient hold points whenever significant defects occur. Production work on non-conforming components shall cease and repair work shall not commence until it has been confirmed by the Corporation in writing that:

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

4.5.3 Product Warranty

The Supplier shall replace non-conforming Product with Product that conforms with the acceptance criteria or shall repair or rectify all faults, damage or losses caused by non-conforming 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-conforming Product for a period no less than 24 months after Product delivery or 12 months after Product installation, whichever period elapses first.

4.5.4 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 non-conformances shall not void or otherwise diminish the provisions of the Product Warranty.

4.6 Access to the Place of Manufacture

The Corporation shall be afforded access, at all reasonable times, to all places of manufacture of Product and shall be authorized to arrange or undertake such testing as the Corporation deems appropriate.

5 Appendix A: Material Master Records (Informative)

The following Material Master Records (MMR) comprise Corporation catalogue numbers that are unique to the particular products described for the purposes of Corporation activities or work.

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polyethylene Pipe (PN16)	
20997	Pipe, Plastic; DN25; PN16; Polyethylene; PE100; Black/4 Stripe Blue; SDR 11; 100m Coil.	M
20998	Pipe, Plastic; DN32; PN16; Polyethylene; PE100; Black/4 Stripe Blue; SDR 11; 50m Coil.	M
22185	Pipe, Plastic; DN63; PN16; Polyethylene; PE100; Black/4 Stripe Blue; SDR11; 100m Coil.	M
22278	Pipe, Plastic; DN63; PN16; Polyethylene; PE100; Black/4 Stripe Blue; SDR11; 6m Length. Note: To be Purchased in 30 x 6m Lengths only. Supplier (Iplex) will run Orders in Conjunction with DN63 Coils.	LG
19963	Pipe, Plastic; DN90; PN16; Polyethylene; PE100; Black/4 Stripe Blue; SDR 11; 100m Coil. Note: Water Corporation Policy - "Farmlands Use Only". Refer I.D.B.	CO
19964	Pipe, Plastic; DN110; PN16; Polyethylene; PE100; Black/6 Stripe Blue; SDR 11; 100m Coil. Note: Water Corporation Policy - "Farmlands Use Only". Refer I.D.B.	CO

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polyethylene Pipe (PN16)	
20130	Pipe, Plastic; DN125; PN16; Polyethylene; PE100; Black/6 Stripe Blue; SDR 11; 12m Length.	LG
22186	Pipe, Plastic; DN125; PN16; Polyethylene; PE100; Black/6 Stripe Blue; SDR 11; 6m Length.	LG
20131	Pipe, Plastic; DN180; PN16; Polyethylene; PE100; Black/6 Stripe Blue; SDR 11; 12m Length.	LG
22107	Pipe, Plastic; DN180; PN16; Polyethylene; PE100; Black/6 Stripe Blue; SDR 11; 6m Length. Please Note: Supplier to cut 1 x 12M Length in half to supply 2 x 6M Lengths. Minimum Order Qty = 2 x 6M Lengths.	LG

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polyethylene Pipe (PN20)	
22182	Pipe, Plastic; DN25; PN20; Polyethylene; High Stress, Crack Resistance PE100; Black/4 Stripe Blue; SDR 9; 50m Coil.	M
22183	Pipe, Plastic; DN32; PN20; Polyethylene; High Stress, Crack Resistance PE100; Black/4 Stripe Blue; SDR 9; 50m Coil.	M
22184	Pipe, Plastic; DN63; PN20; Polyethylene; High Stress, Crack Resistance PE100; Black/4 Stripe Blue; SDR 9; 50m Coil.	M

Note: MMR numbers for High Stress Crack Resistant and Disinfection Resistant PN20 PE pipe to be created in the future.

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polypropylene Compression Type Fittings for Polyethylene Pipe	
19094	Adaptor, Straight, Flange to Pipe; DN75 x 3IN; Polypropylene; Flanged to AS 4087 Figure B7 to Compression Type; C/W Metal Flange; To Suit Metric Polyethylene Pipe.	EA
18328	Adaptor, Straight, Flange to Pipe; DN100 x DN110; Polypropylene; Flanged to AS 2129 Table E to Compression Type; C/W Metal Flange; To Suit Metric Polyethylene Pipe.	EA
19024	Adaptor, Straight, Flange to Pipe; DN150 x DN160; Polypropylene; Flanged to AS 2129 Table E to Compression Type; C/W Metal Flange; To Suit Metric Polyethylene Pipe.	EA
19150	Adaptor, Straight, Pipe to Tube; DN20 x DN25; Polypropylene; Female to Female; Metric Polyethylene Compression Type to Copper Tube; Cold Water Applications Only.	EA
21164	Adaptor, Straight, Pipe to Tube; DN25 x DN32; Polypropylene; Female to Female; Metric Polyethylene Compression Type to Copper Tube; Cold Water Applications Only.	EA
18330	Adaptor, Straight, Pipe to Tube; DN25 x R1(25); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
13984	Adaptor, Straight, Pipe to Tube; DN25 x R3/4(20); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
18972	Adaptor, Straight, Pipe to Tube; DN25 x RP3/4(20); Polypropylene; Metric Polyethylene Compression Type to Female Thread.	EA
13986	Adaptor, Straight, Pipe to Tube; DN32 x R1(25); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
18415	Adaptor, Straight, Pipe to Tube; DN32 x R1-1/4(32); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
13985	Adaptor, Straight, Pipe to Tube; DN32 x R3/4(20); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
19078	Adaptor, Straight, Pipe to Tube; DN32 x RP1(25); Polypropylene; Metric Polyethylene Compression Type to Female Thread.	EA
13987	Adaptor, Straight, Pipe to Tube; DN50 x R1-1/2(40); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
13988	Adaptor, Straight, Pipe to Tube; DN63 x R1-1/2(40); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
13989	Adaptor, Straight, Pipe to Tube; DN63 x R2(50); Polypropylene; Metric Polyethylene Compression Type to Male Thread.	EA
19079	Adaptor, Straight, Pipe to Tube; DN63 x RP2(50); Polypropylene; Metric Polyethylene Compression Type to Female Thread.	EA
13981	Coupling, Pipe; DN25; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18912	Coupling, Pipe; DN25 x DN25; Polypropylene; Push Fit Type; To Suit Metric Polyethylene Pipe.	EA
21196	Coupling, Pipe; PN16; DN25; Polypropylene; Compression Type Slip/Repair Coupling; To Suit Metric Polyethylene Pipe.	EA
13982	Coupling, Pipe; DN32; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18913	Coupling, Pipe; DN32 x DN32; Polypropylene; Push Fit Type; To Suit Metric Polyethylene Pipe.	EA
21197	Coupling, Pipe; PN16; DN32; Polypropylene; Compression Type Slip/Repair Coupling; To Suit Metric Polyethylene Pipe.	EA
7830	Coupling, Pipe; DN50; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polypropylene Compression Type Fittings for Polyethylene Pipe	
19072	Coupling, Pipe; DN63 x DN40; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18230	Coupling, Pipe; DN63; Polypropylene; Compression Type Repair Coupling; To Suit Metric Polyethylene Pipe.	EA
13983	Coupling, Pipe; DN63; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
22200	Coupling, Pipe; DN90; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
22201	Coupling, Pipe; PN16; DN90; Polypropylene; Compression Type Slip/Repair Coupling; To Suit Metric Polyethylene Pipe.	EA
18329	Coupling, Pipe; DN110; Polypropylene; Compression Type Repair Coupling; To Suit Metric Polyethylene Pipe.	EA
18326	Coupling, Pipe; DN110; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
19077	Elbow, Pipe; 90 Degree; DN25 x RP3/4(20); Polypropylene; Compression Type to Female Thread; To Suit Metric Polyethylene Pipe.	EA
18369	Elbow, Pipe; 90 Degree; DN25; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
19074	Elbow, Pipe; 90 Degree; DN32 x RP1/(25); Polypropylene; Compression Type to Female Thread; To Suit Metric Polyethylene Pipe.	EA
19073	Elbow, Pipe; 90 Degree; DN32 x RP3/4(20); Polypropylene; Compression Type to Female Thread; To Suit Metric Polyethylene Pipe.	EA
19076	Elbow, Pipe; 90 Degree; DN63 X R2(50); Polypropylene; Compression Type to Male Thread; To Suit Metric Polyethylene Pipe.	EA
16625	Elbow, Pipe; 90 Degree; DN63 x RP2(50); Polypropylene; Compression Type to Female Thread; To Suit Metric Polyethylene Pipe.	EA
20168	Elbow, Pipe; 90 Degree; DN32; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
13990	Elbow, Pipe; 90 Degree; DN63; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18293	Plug, Pipe; DN25; Polypropylene; Compression Type End Plug; To Suit Metric Polyethylene Pipe.	EA
18294	Plug, Pipe; DN32; Polypropylene; Compression Type End Plug; To Suit Metric Polyethylene Pipe.	EA
18295	Plug, Pipe; DN63; Polypropylene; Compression Type End Plug; To Suit Metric Polyethylene Pipe.	EA
18331	Tee, Pipe; DN25 x DN25 x DN25; Polypropylene; Compression Type x Female Threaded Branch RP1(25); To Suit Metric Polyethylene Pipe.	EA
18327	Tee, Pipe; DN25 x DN25 x DN25; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18414	Tee, Pipe; DN25 x DN25 x DN32; Polypropylene; Compression Type x Female Threaded Branch RP1-1/4(32); To Suit Metric Polyethylene Pipe.	EA
18670	Tee, Pipe; DN25 x DN25 x DN32; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
19071	Tee, Pipe; DN32 x DN32 x DN32; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA
18947	Tee, Pipe; DN63 x DN63 x DN63; Polypropylene; Compression Type; To Suit Metric Polyethylene Pipe.	EA

MMR	PURCHASE ORDER LONG TEXT	BUOM
	Polyethylene Electrofusion Joined Pipe Fittings	
20135	Adaptor, Straight, Flange to Pipe; Stub Flange; DN125; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Hot Dip Galvanised Steel; DN100; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
20136	Adaptor, Straight, Flange to Pipe; Stub Flange; DN125; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Stainless Steel; DN100; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
20141	Adaptor, Straight, Flange to Pipe; Stub Flange; DN180; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Hot Dip Galvanised Steel; DN150; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
20142	Adaptor, Straight, Flange to Pipe; Stub Flange; DN180; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Stainless Steel; DN150; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
21031	Adaptor, Straight, Flange to Pipe; Stub Flange; DN250; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Hot Dip Galvanised Steel; DN250; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
21028	Adaptor, Straight, Flange to Pipe; Stub Flange; DN315; PN16; SDR11; Electrofusion Joined; C/W Flange Backing Ring; Hot Dip Galvanised Steel; DN300; Flanged to AS 4087 Figure B7; Flange ID to Suit Stub OD.	KIT
20132	Coupling, Pipe; DN110; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Without Central Stop (Slip-on); Electrofusion Joined.	EA
19836	Coupling, Pipe; DN125; PN16; SDR 11; Polyethylene PE100; Socket to Socket; C/W Central Stop; Electrofusion Joined.	EA
20139	Coupling, Pipe; DN160; PN16; SDR 11; Polyethylene PE100; Socket to Socket; C/W Central Stop; Electrofusion Joined.	EA
19837	Coupling, Pipe; DN180; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
21030	Coupling, Pipe; DN250; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
21029	Coupling, Pipe; DN315; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
19839	Elbow, Pipe; 45 Degree; DN125; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
19841	Elbow, Pipe; 45 Degree; DN180; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
19838	Elbow, Pipe; 90 Degree; DN125; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
19840	Elbow, Pipe; 90 Degree; DN180; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
20138	Reducer, Pipe; DN125 x DN110; PN16; SDR 11; Polyethylene PE100; Socket to Socket; Electrofusion Joined.	EA
20137	Reducer, Pipe; DN125 x DN110; PN16; SDR 11; Polyethylene PE100; Spigot to Spigot; Electrofusion Joined.	EA
20143	Reducer, Pipe; DN180 x DN160; PN16; SDR 11; Polyethylene PE100; Spigot to Spigot; Electrofusion Joined.	EA
20134	Tee, Pipe; DN125; PN16; SDR 11; Polyethylene PE100; Socket to Socket to Socket; Electrofusion Joined.	EA
20140	Tee, Pipe; DN180; PN16; SDR 11; Polyethylene PE100; Socket to Socket to Socket; Electrofusion Joined.	EA

6 Appendix B: Assessment Criteria for Resistance to Disinfectants (Normative)

Philosophy

The assessment of a PE resin’s Disinfection Resistance is based on the following principle:

“A Disinfection Resistant resin is a resin that does not have its minimum life expectancy reduced when used in a chlorinated water application”

The minimum life expectancy of a Disinfection Resistant polyolefin (e.g. PE100) resin is to be in accordance with the rating factors and minimum life established in PIPA POP 013 in both chlorinated and unchlorinated applications.

Methods for demonstration

To demonstrate Disinfectant Resistance, the resin needs to be evaluated in a method accepted by Water Corporation to demonstrate chlorine resistance. Currently, only one method is accepted, which is based on adopting elements from a number of internationally recognised standards, specifically ASTM 2263 and ISO 9080. Other methods for evaluation may be considered at the Water Corporation’s discretion, although any proposal must be at least as robust as the one described herein.

Methods such as CC ratings (as per PPI TN43), or NOL ring testing are not deemed to be adequate and are not considered suitable methods for demonstrating Disinfection Resistance.

Acceptable method for evaluating Disinfection Resistance

An acceptable method for demonstrating is described as follows:

1. Conduct testing in accordance with ASTM F2263 under the following conditions:
 - ORP \geq 825mV
 - $6.5 \leq \text{pH} \leq 8.0$
 - free chlorine concentration = 4.3mg/L
 - Pipe DN = \leq 20mm
2. Generate a 4 parameter model via multiple linear regression in accordance with ISO 9080 with a minimum R^2 value of 0.9.
3. Plot the failure curve for each temperature listed in Table 1.

Table 1: Baseline PE100 resin performance

Temp (°C)	Minimum Life (yr)	Design Factor	Equivalent Wall Stress (MPa)
20	100	1	8
30	100	1.1	7.3
40	50	1.2	6.7

A PE resin shall be considered Disinfection Resistant if for each temperature and stress combination in Table 1 the predicted time to failure exceeds the minimum life as per Table 1.

Examples

The method described above has been applied to two hypothetical resins shown below. The results shown in Figure 1 are for a resin that is considered Disinfectant Resistant while the results shown in Figure 2 are of a resin not resistant to disinfectant.

Figure 1: Example of a hypothetical resin test results for a resin considered to be Disinfection Resistant

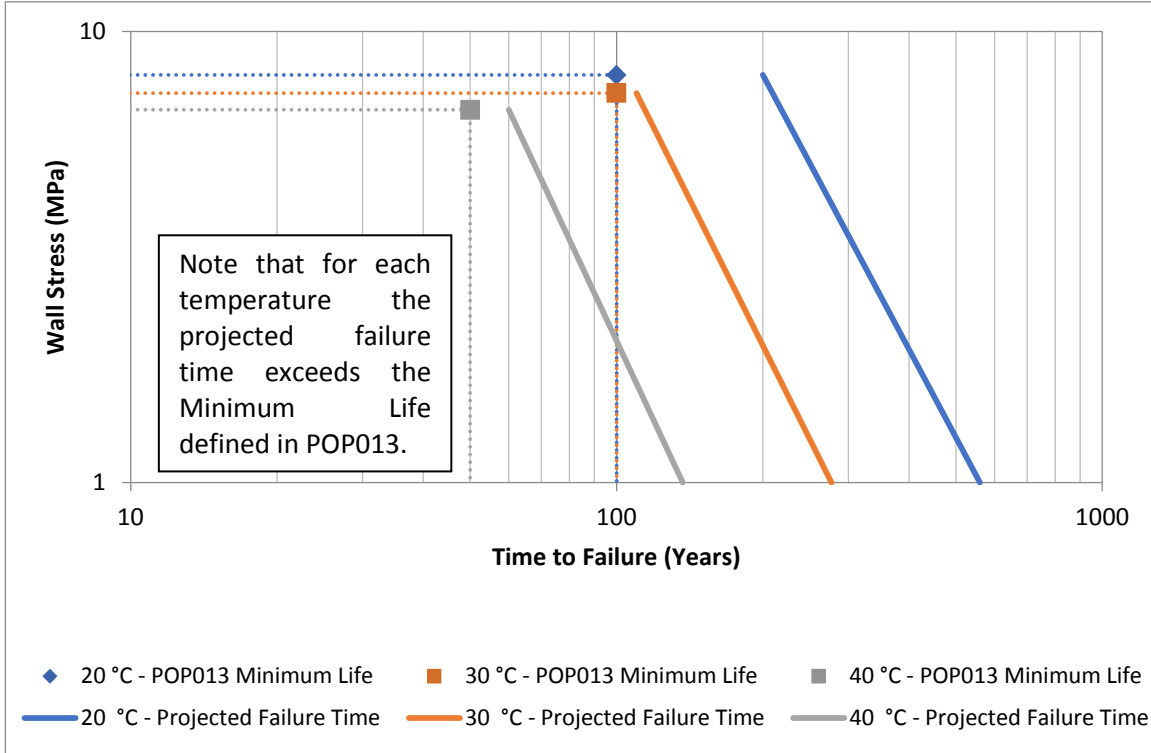
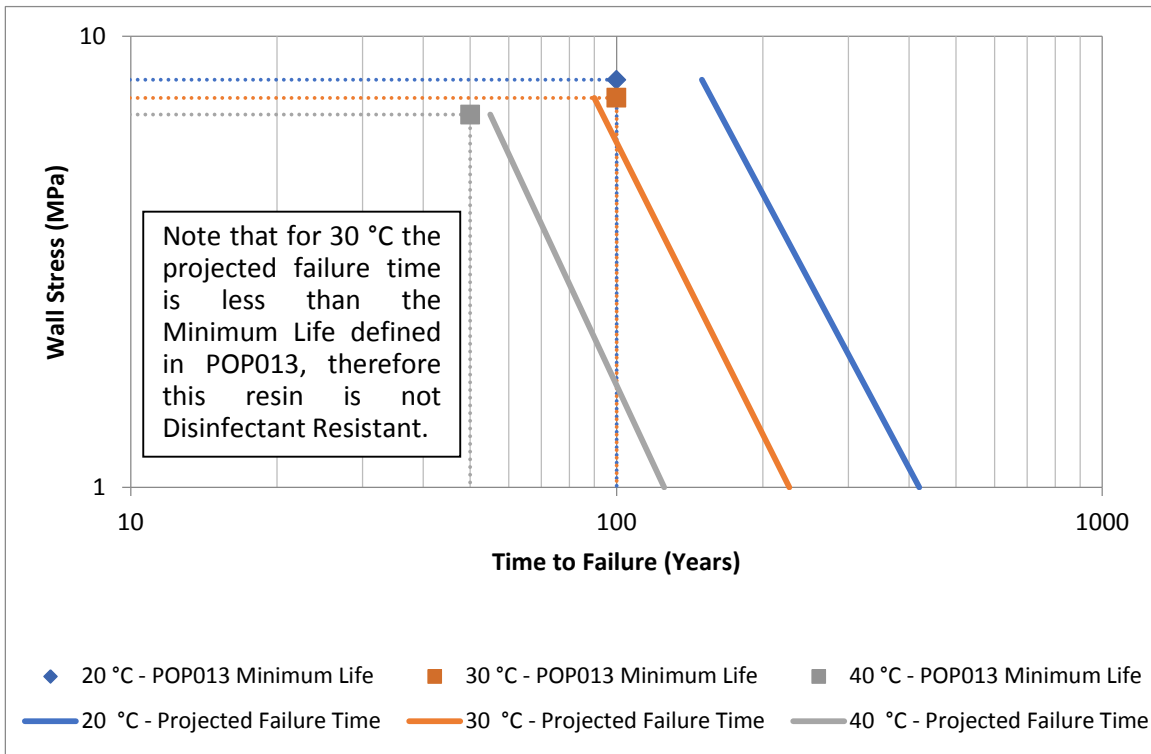


Figure 2: Example of a hypothetical resin test results for a resin considered to not be Disinfection Resistant



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