

Material Supply Standard

Ver.1.4

Date: 01 June 2018

Revision	Description	By	Date
1	First release	J de Villiers – Principal Engineer Standards	08/08/2016
1.1	Material updates	J de Villiers – Principal Engineer Standards	20/12/2016
1.2	Knife gate section added. Minor updates to sections. New accepted materials added	J de Villiers – Principal Engineer Standards	28/4/2017
1.3	New accepted materials. Minor corrections	J de Villiers – Principal Engineer Standards	31/08/2017
1.4	New accepted materials. New sections added for control cabinets, VSD's and air circuit breakers. Major update to double flanged butterfly valve section and design schedule added for paint coating systems. Standardised water meters and supplier.	J de Villiers	01/06/2018

The latest version of this standard takes effect on the date of release on all new work and supersedes all prior versions or formats of this document relating to the supply of materials for use with Watercare infrastructure.

Where design work has been completed or where construction work commenced, immediate adoption may be delayed unless the change is required within a timeframe provided by legislation, is an immediate health and safety concern or product failures have been known to occur.

Summary of changes

Version	Section	Description of revision
1.2		New materials accepted and added under: PE pipe and fittings, valves, DI fittings, Gate valves, Tapping bands and manhole invert connectors
	14.1.6	Note added on the free selection to use PE pipe – limited to 300mm. Over this size requires specific approval per project
	14.1.11	Clarification added to ductile iron grades for product types
	14.2.1; 14.2.2; 14.2.3; 14.2.4	Updated procurement schedules
	14.1.16	New section added for knife gate valves
	14.4	Clarification of flange range and application
	14.13.5	Clarified actuator input voltage. Updated procurement schedule
	14.12; 14.13	Standard for explosive environments. Reference to 'ATEX' removed. Selection in accordance with standard to the specific environment is required at time of design
	14.13.4	Clarification on access to wiring when front access only is specified - item f). Inclusion of consideration for ventilation/heat dissipation – item g)
1.3		New materials accepted for gate valves, s/s repair clamps, un-restrained couplings, pipe junctions, soft starters and power conditioning
	13	Updates to table. Added epoxy lined steel pipe and column for treatment plants
	14.1.1	Clarification to concrete pipe linings. Minor corrections
	14.3	Clarification added that bolts on couplings need to be stainless steel
	14.4	Minor rewording to clarify flange use
	14.8.4	Minor rewording to clarify concrete manhole linings. Added requirements for loading design confirmation to be checked between designer and supplier
	14.9.4	Updated dewatering pump requirements
	14.10.2	Deleted paint system selection. Designers are required to contact Altex and to identify macro and micro environment in order to correctly specify the painting system
1.4	14.1.12	Ductile iron. Min. PN35 changed to min. PN16.
	14.1.13	New section to include seamless steel pipe
	14.2.2	Double flanged butterfly valves. Updated testing and QA requirement and new procurement schedule added. Watercare is negotiating a supply contract.
	14.2.4	Gearboxes for valves. Minor updated to enclosure rating
	14.2.5	Spindle extension product added
	14.2.11	Corrected wording. Ball valves are not to be used for house lot connections
	14.2.17	New section added for globe valves (stopcocks)

Version	Section	Description of revision
	14.8.3	Update to available safety grille range following confirmation of compliance
	14.9.1	Requirement for generator connection added. Updated limitations of use to clarify pump selection
	14.9.2	Updated electrical requirements for small submersible pumps
	14.10.2	Paint system project selection schedule added. List of typical application added
	14.12.1	Major update to instrumentation general supply requirements
	14.12.3	Standardised domestic meters under supply contract.
	14.12.4	Added flow probe
	14.12.5	New section for DCS & PLC control panels
	14.13.2	Minor update to luminaries corrosion protection and protection against vandalism
	14.13.4	Minor wording update to switchboards, including requirements to compartmentalise main busbars
	14.13.7	Updates to motor protection
	14.13.11	New section added for variable speed drives (VSD's)
	14.13.12	New section added for air circuit breakers (ACB's)
	15	-Added Ebco 2,4 & 6 port manifolds for meter connections -Added flange dress sets

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Definitions

Accepted material	Materials that have been evaluated for general use, or for a specific function in an operational area. Acceptance does not imply exclusive use. Materials not on this list require evaluation against Watercare's materials standards prior to being used
Assets	Water and wastewater infrastructure owned and operated by Watercare, anything of financial value or provides service potential
Infrastructure	Facilities in an operational capacity that is managed by a controlling authority
Standardised material	Materials that shall be exclusively used for a specific operational area or function. In some instances materials under this list are provided under commercial agreements that ensure long term serviceability, component compatibility, availability of spare parts, etc.

1. Introduction

1.1 Purpose and Scope

This document must be used by designers and suppliers to ensure that the minimum quality and performance outcomes are achieved. Each material section includes a procurement template to assist the designer to identify the design specific requirement over and above the minimum material specification and for the supplier to demonstrate compliance or an alternative offer. Where the referenced standards are not met the designer must confirm the product is fit for purpose and complies with a recognised alternative standard or otherwise reject the proposal. Alternatives must be presented to Watercare for acceptance at its discretion.

Watercare acceptance of a product does not imply product certification. Certification of conformity must be completed by the product suppliers through a third party certification body. Third party certification does not automatically guarantee Watercare acceptance as products are examined for fit against Watercare's asset strategies.

Products listed in this standard does not provide a guarantee of product procurement and does not infer or express acceptance of any conditions of quotation, sales and delivery.

1.2 Applicability

This standard provides the minimum requirements for the supply of material (and products) that will be used or vested to Watercare as assets.

1.3 'Must' versus 'Shall' versus 'Will'

Where the verbs must, shall and will (or its past tense forms) are used they describe a requirement for compliance with the statement in which it is used.

'Shall' and 'must' expresses a mandatory condition or action. 'Will' is used to prescribe a performance outcome or intent.

2. Quality control and Quality assurance

2.1 General requirements

Quality must be demonstrated by presenting up to date certifications for the individual products as specified in each of the material sections.

Manufacturing processes must demonstrate current accreditation with ISO 9001 for quality management systems by an industry recognised certifier.

Accepted and standardised products must demonstrate ongoing compliance. Product manufacture and testing certifications shall be provided with every procurement process. Accepted and standardised products listed are typically re-evaluated every three years unless:

- The product design or material element is varied from the assessed product
- The product fails to perform in service to the stated performance and is terminated from the listing
- When the Watercare requirements are altered resulting in a potential non-compliance
- The accepted or standardised product is removed at Watercare's discretion

2.2 Change orders affecting quality

Any change orders for the works shall not compromise on quality, safety and regulatory requirements. Where a change is proposed the evaluation shall demonstrate that:

- The product is fit for purpose and meet the design requirements

- The product meets the minimum specified performance in the installation environment, or is of equivalent or better standard
- The product material is tested to comply and is manufactured under repeatable processes
- The product is safe

3. General document submittal requirements

All materials shall be provided with the following minimum documentation:

- Manufacturing quality assurance
- Test certifications / certificates of conformity
- Installation documentation
- Operation and maintenance manuals that includes parts lists
- Transfer of warranties and guarantees to Watercare when vested

4. Referenced standards

This standard makes reference to a number of national and international standards under each material section. It is the obligation of manufacturers and material suppliers to ensure they make use of the latest version of the applicable standard until such time that this standard can be amended.

Informative:

ISO 9001 Quality Assurance Certification

AS/NZS ISO/IEC 17067 Conformity assessment – Fundamentals of product certification and guidelines for product certification schemes

ISO/IEC TR 17026 Conformity Assessments – Examples of certification scheme for tangible products

AS 4738.1 Metal Castings – Part 1: Ferrous Sand Moulded

AS 3507.1 Part 1: Non-Destructive Testing – Part – Guide to Radiography for ferrous castings

AS 3507.2 Part 2: Non-Destructive Testing – Radiography Determination of quality of ferrous castings

AS 4314 Founding – Pattern, pattern equipment and core boxes for the production of sand moulds and sand cores

AS 3978 Non-Destructive Testing – Visual inspection of metal products and components

AS 1816 Metallic Materials – Brinell hardness Tests

AS 1816.1 Part 1: Test Method (Adapted ISO 6506.1-1997 MOD)

ASTM A941 Standard terminology relating to steel, stainless steel, related alloys and ferroalloys

ASTM A644 Terminology used in common reference to iron castings

ASTM A834 Common requirements for Iron Casting for general industrial use

5. Recycled and reused materials

Recycled material and material reuse shall not be accepted unless specifically required by instruction from Watercare.

6. Health and Safety

Any product or component intended for use in contact with the water supply system must demonstrate to comply with the requirements of AS/NZS 4020, Testing of Product for use in Contact with Drinking Water.

Where materials are used of similar design for that does not comply with the AS/NZS4020 standard and is not intended for use with drinking water its purpose must be clearly marked to exclude its use with drinking water.

All products and their components shall be free of asbestos fibres. Products must be specified and used for its intended purpose only.

7. Asset data capture

Asset information shall be progressively captured and supplied in accordance with the requirements of Watercare’s asset information standards. The minimum data to be supplied for materials shall be collected as part of the product procurement process.

8. Product life expectancy

Product type	Effective operational life
Pipe and pipe fittings	100 years
Valves	50 years
Couplings and connections	50 years
Flanges	100 years
Bolts, nuts and washers	100 years
Gaskets	100 years
Manholes and storage tanks	100 years
Valve and meter boxes	50 years
Lids on manholes and valve boxes	50 years
Pumps	10 years
Motors	15 years
Instrumentation	15 years
Electrical componentry	25 years
Cabinetry for instrumentation and electrical equipment	50 years

9. Product markings, traceability and parts

9.1 General requirements

All products shall be marked in accordance with the conformity assessment body’s requirements. This may include a standards marking on the product or an alternative means of identifying the product’s conformance against the testing standard.

Materials and componentry shall be traceable via a numbering system to the individual product, or batch, as applicable that will allow manufacturing records to be verified against the standards. The manufacturing

records shall include the manufacturing process records, process tolerances, material properties and testing results.

9.2 Replacement parts

Replacement parts shall be readily available. Any special tools required for routine maintenance or repair shall be provided in two sets.

10. Guarantee and warranty transfer

Materials shall be guaranteed for a minimum period of 12 months commencing from the date of installation covering performance, manufacturer workmanship and components.

During the guarantee period the supplier shall be responsible for rectification of all defects and faults in the equipment supplied due to faulty materials and/or workmanship and for all costs of consequential work to repair damage due to such faults.

Material purchased by contractors, developers or their agents shall have the product guarantees and warranties transferred to Watercare at time of transfer of ownership to Watercare. Materials shall not be accepted otherwise.

11. Material handling

Materials shall be supplied with the manufacturer's handling and storage instructions. Damage caused in the absence of instructions shall be carried by the supplier.

Materials shall be handled and stored in accordance with the manufacturer's recommendation. Any damage or product failure as a result of poor handling shall be replaced or repaired to the satisfaction of Watercare by the party responsible for handling the material.

12. Galvanic and corrosion compatibility of dissimilar metals

Harsh environments: such as outdoors, buried, high humidity or salt environment the Anodic index difference between materials must be $\leq 0.15V$.

Normal environments: such as in above ground buildings and where humidity is controlled, but not temperature the Anodic index difference between materials must be $\leq 0.25V$.

Controlled environments: such as enclosed structures where temperature and humidity is controlled up an Anodic index of up to 0.5V may be tolerated. Controls must be strict and risk based.

Metallurgic category	Anodic index (V)
Gold, solid and plated, Gold-platinum alloy	0.00
Rhodium plated on silver-plated copper	0.05
Silver, Solid or plated, Monel metal. High nickel-copper alloys	0.15
Nickel, solid or plated, titanium alloys, Monel	0.30
Copper, solid or plated; low brasses or bronzes, silver solder, German silvery high copper-nickel alloys, nickel-chromium alloys	0.35
Brass and bronzes	0.40
High brasses and bronzes	0.45
18% chromium type corrosion-resistant steels	0.50

Metallurgic category	Anodic index (V)
Chromium plated, tin plated; 12% chromium type corrosion-resistant steels	0.60
Tin-plate; tin-lead solder	0.65
Lead, solid or plated; high lead alloys	0.70
Aluminium, wrought alloys of the 2000 series	0.75
Iron, wrought, grey or malleable, plain carbon and low alloy steels	0.85
Aluminium, wrought alloys other than 2000 series aluminium, cast alloys of the silicon type	0.90
Aluminium, cast alloys other than silicon type, cadmium, plated and chromate	0.95
Hot-dip zinc plate, galvanised steel	1.20
Zinc, wrought, zinc-base die-casting alloys; zinc plated	1.25
Magnesium and magnesium-base alloys, cast or wrought	1.75
Beryllium	1.8

13. Material application guideline

Pipe materials	Normative standard	Pressure Wastewater	Gravity Wastewater	Water supply	Plants and processes	Selection notes
PVC-U	AS/NZS 1260	✘	✓ (Networks only)	✘	✓	Gravity applications only. Suitable for aggressive groundwater, anaerobic and tidal zones. Can be used for trenchless installations with suitable load resistant joints
PVC-U	AS/NZS 1477	✓ (Networks only)	✘	✓ (Networks only)	✓	Alternative installation techniques possible e.g. slip lining. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Can be used for trenchless installation with suitable end load resisting joints. Specific design for dynamic stresses (fatigue) required for pressure applications.
PVC-M	AS/NZS 4765	✓ (Networks only)	✘	✓ (Networks only)	✓	Improved fracture toughness and increased hydraulic capacity compared to PVC-U. Inferior fatigue resistance compared to PVC-U and PVC-O. Suitable for aggressive groundwater, anaerobic and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure applications.
PVC-O	AS/NZS 4441	✓	✘	✓	✓	Improved fracture toughness compared to PVC-U. Improved fatigue resistance compared to PVC-U and PVC-M. NOTE – Use only DI fittings in pumped mains to achieve full fatigue resistance. Has increased hydraulic capacity compared with PVC-U and PVC-M. Suitable for aggressive groundwater, anaerobic conditions and tidal zones. Specific design for dynamic stresses (fatigue) required for pressure applications.
PE	AS/NZS 4130 AS/NZS 4131 AS/NZS 4129	✓	✘	✓	✓	Generally for pressure applications but limitation placed on size and application in Transmission areas. Retrospective installation of fittings / repair is complicated. Can be curved to eliminate the need for bends. Alternative installation techniques, e.g. pipe cracking, directional drilling and slip lining. Can be welded to form an end load resistant system. Compression couplings and end load resistant fittings are available in smaller diameters. Pipe longitudinal flexibility accommodates large differential ground settlement.

Pipe materials	Normative standard	Pressure Wastewater	Gravity Wastewater	Water supply	Plants and processes	Selection notes
						<p>Fusion jointing requires qualified skilled installers and special equipment.</p> <p>Specific design for dynamic stresses (fatigue) required for pressure pumping applications.</p> <p>≤ DN 125 are available in long coiled lengths for fewer joints.</p> <p>Suitable for aggressive groundwater, anaerobic and tidal zones but not where some hydrocarbons are present. Suitable for ground with high subsidence potential.</p> <p>PE pressure fittings, including mechanical, compression, or electrofusion as approved by Watercare. Welding requires skilled and suitably qualified installers</p> <ul style="list-style-type: none"> • Butt fusion is preferred over electrofusion. Electrofusion should only be used where end connections or tie-ins are made. • Electrofusion fittings are preferred over mechanical couplings. Limitations are placed on the size of mechanical fittings that can be used.
PE	AS/NZS 5065	✘	✓	✘		<p>Only for gravity applications. Alternative installation techniques possible e.g. pipe cracking and slip lining. Can be welded to form an end load resistant system.</p> <p>Fusion jointing requires skilled installers and special equipment.</p> <p>Retrospective installation of fittings / repair complicated.</p> <p>Smaller diameters available in long coiled lengths for fewer joints.</p> <p>Suitable for aggressive groundwater, anaerobic and tidal zones.</p> <p>Not suitable for ground with high subsidence or weak support.</p>
GRP	AS 3571.1	✓	✓	✘		<p>Alternative installation techniques possible, e.g. slip lining.</p> <p>UV resistant (special product).</p> <p>Custom made fittings can be manufactured.</p> <p>Suitable for use without additional corrosion protection in areas where stray electrical currents occur.</p>

Pipe materials	Normative standard	Pressure Wastewater	Gravity Wastewater	Water supply	Plants and processes	Selection notes
						<p>Low impact resistance and ease of damage to thermosetting resin makes GRP susceptible to damage.</p> <p>Suitable for aggressive groundwater, anaerobic and tidal zones.</p>
GRP	AS 3571.2	✘	✘	✓		<p>Alternative installation techniques possible, e.g. slip lining.</p> <p>UV resistant (special product). Custom made fittings can be manufactured. Suitable for use without additional corrosion protection in areas where stray electrical currents occur.</p> <p>Low impact resistance and ease of damage to thermosetting resin makes GRP susceptible to damage.</p> <p>Suitable for aggressive groundwater, anaerobic and tidal zones.</p>
VC	BS EN 295-1	✘	✓ (Networks only)	✘		<p>Gravity applications only for particularly aggressive industrial wastes. Not for general use.</p> <p>Not recommended for active seismic (earthquake) zones or unstable ground. Limited diameter application.</p>
RRJRC (Rubber ring jointed reinforced concrete)	AS/NZS 4058	✘	✓	✘		<p>Requires protection from hydrogen sulphide attack in sewer applications by sacrificial layer, plastic lining or appropriate cement additives.</p>
CLS	NZS 4442 AS 1579	✓	✓	✓	✓	<p>Cement mortar lined, external coated according to installation environment.</p> <p>High mechanical strength and toughness. Easily customised, specially configured steel fittings can be made to order.</p> <p>Can be welded to form a system that will resist end load and joint permeation.</p> <p>Cathodic protection (CP) is required to electrically continuous pipelines to provide enhanced corrosion protection.</p>

Pipe materials	Normative standard	Pressure Wastewater	Gravity Wastewater	Water supply	Plants and processes	Selection notes
						<p>Standard Portland cement is not resistant to H₂S attack at any high points or discharge points in the main. High alumina cement has improved resistance.</p> <p>Welded joints require skilled installers and special equipment. Welded joints require reinstatement of protection system on site.</p> <p>Special design required for welded installations parallel and adjacent to high voltage transmission lines.</p> <p>Cathodic protection requires regular monitoring and maintenance.</p> <p>Suitable for high load applications, such as railway crossings and major roads. Suitable for aerial or suspended pipeline applications.</p> <p>Gravity application considered for structural crossings.</p>
ELS	NZS 4442 AS 1579	✓	✓	✓	✓	<p>Epoxy lined steel pipe, external coated according to installation environment. Limited use where pipeline can be removed such as process or plant environments.</p> <p>High mechanical strength and toughness. Easily customised, specially configured steel fittings can be made to order.</p> <p>Can be welded to form a system that will resist end load and joint permeation.</p> <p>Cathodic protection (CP) is required to electrically continuous pipelines to provide enhanced corrosion protection.</p> <p>Epoxy lining must be selected to suit specific environment – Note limited lifetime of linings and limitations of re-coating.</p> <p>Welded joints require skilled installers and special equipment. Welded joints require reinstatement of protection system on site.</p> <p>Special design required for welded installations parallel and adjacent to high voltage transmission lines.</p> <p>Cathodic protection requires regular monitoring and maintenance.</p> <p>Suitable for high load applications, such as railway crossings and major roads. Suitable</p>

Pipe materials	Normative standard	Pressure Wastewater	Gravity Wastewater	Water supply	Plants and processes	Selection notes
						for aerial or suspended pipeline applications.
DI	AS/NZS 1831 AS 3681	✓	✓	✓	✓	<p>Fatigue analysis not normally required. High mechanical strength and toughness. Ease of jointing.</p> <p>UV resistant / vandal proof / impact resistant. Well established methods of repair.</p> <p>Suitable for high pressure and above ground pipelines. Restrained joint systems available.</p> <p>Sufficient ring stiffness not to rely on side support for structural adequacy for the usual water supply installation depths. Elevated pH may occur when conveying soft water or in low flow extremities of reticulation mains.</p> <p>PE sleeving is required and must be repaired when damaged. Not suitable for aggressive ground water, anaerobic conditions or tidal zones.</p> <p>Gravity application – normally considered for structural crossings only.</p>
Stainless steel	AS5200.053	✓	✓	✓	✓	<p>Performs well in high corrosion prone areas. Impact resistant and does not require additional lining or coatings in most situations.</p> <p>Welded joints require skilled installers and special equipment.</p> <p>Special design required for welded installations parallel and adjacent to high voltage transmission lines.</p> <p>Gravity application – normally considered for structural crossings only.</p>

14. Material manufacture, testing and performance requirements

The general requirements, quality assurance and quality control listed for products are the minimum criteria. Watercare may accept a product at its discretion where a product complying with an alternative standard is proven to provide the same or higher quality and meet the specific design requirements.

The material sections include a register of accepted and standardised products that have been evaluated against the minimum standards.

Note: *The designer may require a product of higher performance over the pre-assessed accepted products listed. The accepted products may not always be suitable as a default option.*

Where a procurement schedule is provided for a material type, it is to be completed by the designer for the specific performance requirements identified at design, where the requirements are over and above the minimum standard. The designer shall not leave any spaces incomplete. Where the design does not require an additional or higher condition it shall be stated – i.e. “As per standard”. The supplier must confirm the product offered meets the minimum standard and state where the product does not comply or may comply with an alternative standard for consideration by the designer and Watercare.

All test certificates must be supplied for all products and component materials. Where test certificates to the applicable standard will be supplied at time of casting or manufacture, it must be stated and an example provided for evaluation purposes e.g. ductile iron castings.

14.1 Pipe and pipe fittings

14.1.1 Concrete pipe

General requirements

- a) Concrete pipe shall be reinforced manufactured to comply with AS/NZS 4058, and:
 - Accepted manufacturing processes are spun pipe with additional sacrificial layer of 25mm or special concrete mixes (CaC) to prevent corrosion for the specific application.
 - Vibrated pipe that must be PE or PVC lined (on specific approval of a particular application) or a special concrete mix (CaC) used to prevent corrosion for the specific application.
 - Where a separate reinforcing cage is used for the socket the cage shall overlap the barrel reinforcement by 50 diameters of the bar or wire
- b) Joint seals shall be natural rubber or EPDM complying with AS 1646 with a shore hardness of 40A to 60A.
- c) The minimum pipe class shall be load class 3.

Quality Control

The following minimum information shall be supplied with concrete pipes:

- a) Product shall be marked in accordance with the conformity assessment body's requirements.
- b) Type test – (ISO Type 5) to AS/NZS 4058, Table 5.1.
- c) Defects acceptability shall be to AS/NZS 4058, Section 3.4.2 and Table 3.6.
- d) Routine testing shall be provided as per the below table:

Routine testing:	Test	Frequency
	Concrete test and records	As per NZS 3104 – Batch records available on request As per NZS 3112.1 – Batch test records available on request
	Water tightness test (90 kPa)	AS/NZS 4058, Section A4.2, and a minimum of 1 pipe shall be sampled from pipe supplied
	Proof load test	AS/NZS 4058, Section A4.1, and minimum 2 pipes shall be sampled from pipe supplied
	Ultimate load	AS/NZS 4058, Section A4.2, and a minimum of 1 pipe shall be sampled from pipe supplied
	Water (Net) absorption <5.5%	As per AS/NZS 4058, Section A4.4
	Joint assembly test	AS/NZS 4058, Section A4.5, and a minimum of 1 joint test per batch supplied
	Reinforcement cover test	AS/NZS 4058, Section A4.6, and a minimum of 1 test per batch supplied
	Dimensional accuracy	As per AS/NZS 4058, Section A4.7
	Workmanship and finish	As per AS/NZS 4058 – Every pipe.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter (including additional lining)		
Manufacturing standards: AS/NZS 4058 as implemented by section 14.1.1		
Pipe class Reinforced class per design specification (min class 3). Additional 25mm sacrificial internal concrete cover, or CaC concrete or PVC/PE lined on approval		
Joints 1. Flexible rubber ring spigot and socket 2. In-wall spigot and socket joint for jacking pipe		
Joint seals Natural rubber or EPDM to AS1646, Shore hardness of 40A to 60A		
Product and Test certificates		

14.1.2 Vitrified clay (VC) pipe and fittings for non-pressure applications

VC pipe and fittings are limited to network sewer gravity applications of up to 300mm diameter and installation in low seismic or low ground settlement risk areas only.

General requirements

- a) Pipe, fittings and jointing assemblies shall comply with EN 295-1.
- b) Special fittings, adaptors and compatibility accessories shall comply with EN 295-4.
- c) Elastomeric joint seals shall comply with AS1646 and AS 681.1 (or EN 681-1).
- d) Minimum crushing strength for DN 150 shall be 34 kN/m (class number not applicable). For larger nominal diameter the crushing strength shall comply with EN 295-1 in accordance with the specified designed class number.
- e) 90° saddles are not acceptable.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Pipe, fittings and jointing assemblies shall have product certification (ISO type 5) to EN 295-1 (Sampling in accordance with EN 295-2).
- c) Elastomeric joint seals shall have product certification (ISO type 5) to AS1646 and AS 681.1 (or EN 681-1).
- d) Special fittings, adaptors and compatibility accessories shall have product certification (ISO type 5) to EN 295-4.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Pipe or fitting		
Nominal diameter		
Manufacturing standard: EN 295-1		
Minimum crushing strength for DN 150 shall be 34 kN/m		
Joint seals AS 681.1 performance specified		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
VC to uPVC coupler	Solo Plastics	150mm. wastewater networks
Drop saddles & VC to PVC connector	Hepworth	Wastewater networks
	Naylor	Wastewater networks

14.1.3 Polyvinylchloride, modified (PVC-M) pipe for pressure applications

Applies to pressure applications for water and wastewater in local network areas.

General requirements

- a) The minimum pressure rating shall be PN12.
- b) PVC-M pipes shall comply with AS/NZS 4765, Series 2 (for imperial compatibility when connecting to DI or existing AC), or Series 1 (metric).
- c) Elastomeric joint seals shall be EPDM complying with AS1646 and AS 681.1 (EN 681-1).
- d) Pipes for sewerage shall be legibly and durably marked with black lettering of at least 10mm high "SEWAGE – DO NOT DRINK" or equivalent repeated at intervals such that any length of unmarked pipe does not exceed 1m.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Pipes shall have product certification (ISO Type 5) to AS/NZS 4765.
- c) Elastomeric joint seals shall have product certification (ISO Type 5) to AS1646 and AS681.1.
- d) Certification of compliance with AS/NZS 4020 for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Internal diameter		
Networks minimum PN12		
Pipe series – specify series 1 or 2		
Manufacturing standards:		
AS/NZS 4765		
Pipe branding		
Pipe length		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
PVC-M	Marley	Local Networks
RHINO (PVC-M)	Iplex Pipelines	Local Networks

14.1.4 Polyvinylchloride, oriented (PVC-O) pipe for pressure

Applies to pressure applications for water and wastewater in local network areas.

General requirements

- a) The minimum pressure rating shall be PN12.5.
- b) PVC-O pipes shall comply with AS/NZS 4441, Series 2 (for imperial compatibility when connecting to DI or existing AC), or Series 1 (metric).
- c) Elastomeric joint seals shall be EPDM or SBR complying with AS 1646 and AS 681.18 (EN681-1).
- d) Pipes for sewerage shall be legibly and durably marked with black lettering of at least 10mm high "SEWAGE – DO NOT DRINK" or equivalent repeated at intervals such that any length of unmarked pipe does not exceed 1m.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Pipes shall have product certification (ISO Type 5) to AS/NZS 4441.
- c) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1.
- d) Certification of compliance with AS/NZS 4020 for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Internal diameter		
Networks minimum PN12.5		
Pipe series – specify series 1 or 2		
Manufacturing standards: AS/NZS 4441		
Pipe branding		
Pipe length		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Apollo	Iplex Pipelines	Local Networks
Tom-O	Pipemakers Australia	Local Networks

14.1.5 Polyvinylchloride, un-plasticised (PVC-U) pipe for pressure and non-pressure applications

Applies to pressure and non-pressure applications for water and wastewater in local network areas.

General requirements

- a) Applicable standards for manufacture are:
 - PVC-U pipes for pressure applications shall comply with AS/NZS 1477 Series 2 (for imperial compatibility when connecting to DI or existing AC), or Series 1 (metric), with minimum pressure rating of PN12
 - PVC-U pipes for non-pressure applications shall comply with AS/NZS 1260 with minimum stiffness class SN16
- b) Pipe joints:
 - Solvent cement joints are not accepted
 - Elastomeric joints shall be EPDM, or CR, or SBR complying with AS 1646 and AS 681.1 (EN 681-1)
 - Threaded spigot and socket joints with elastomeric sealing ring shall be to the manufacturer's specification
- c) Pipes for sewerage shall be legibly and durably marked with black lettering of at least 10mm high "SEWAGE – DO NOT DRINK" or equivalent repeated at intervals such that any length of unmarked pipe does not exceed 1m.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) As specified by the applicable Watercare material supply standard specification.
- c) Pressure pipes shall have product certification (ISO Type 5) to AS/NZS 1477.
- d) Non-pressure pipes shall have product certification (ISO Type 5) to AS/NZS 1260.
- e) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1.
- f) Certification of compliance with AS/NZS 4020 for potable water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Internal diameter		
Networks pressure minimum PN12 Networks gravity minimum SN16		
Pipe series – specify series 1 or 2		
Manufacturing standards: Pressure: AS/NZS 1477 Gravity: AS/NZS 1260		
Pipe branding		
Pipe length		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
	Marley	Within limitation of this standard. No solvent cement joints
Blue Brute, Novafuse, Novakey Novadrain & Restrain	Iplex Pipelines	Within limitation of this standard. No solvent cement joints
	Solo Plastics	Fittings. No solvent cement joints. Gritted manhole starters must be installed with hydrophilic seals and reinforced concrete collar cast insitu
PowerLock SewerLock	RX Plastics	Within limitation of this standard. No solvent cement joints
Lunden junction	Strata Plastics	Local networks gravity wastewater connections

14.1.6 Polyethylene (PE) pipe including fabricated bends and tees

Note: The use of PE pipe for sizes **over 300mm** requires **specific** approval from Watercare for the intended project on a case-by-case basis.

General requirements

- a) For local network systems: pressure applications the minimum pressure rating shall be PN12.5 (networks) and for gravity wastewater minimum SDR17, SN16 pipe shall be used.
- b) For transmission systems: For pressure pipe the minimum pressure rating shall be PN16 and for gravity wastewater minimum SDR17, SN16 pipe shall be used.
- c) Any horizontally directionally drilled pipe shall be minimum SDR11.
- d) All PE pipe > 63mm OD shall be PE100.
- e) Polyethylene pipe for pressure applications shall be manufactured to AS/NZS 4130.
- f) Polyethylene pipe for gravity sewer applications shall be manufactured to AS/NZS 5065
- g) Polyethylene compounds for the manufacturing of pressure pipe and fittings shall comply with AS/NZS 4131 and PIPA POP004.
- h) All PE pipe shall be manufactured from new material. Re-worked material shall not be used in the manufacture of the pipe.
- i) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- j) Pipe shall be supplied batched:
 - of the same diameter
 - of the same wall thickness
 - the same marking
 - manufactured on the same machine
 - manufactured from the same base resin
 - master batch shall not be added to base resin by the pipe manufacturer
- k) Flange requirements refer to section 14.4, and:
 - All PE stub flanges shall conform to the requirements of ISO 9624. The SDR and PN rating of PE stub flanges shall be the same as the PE pipeline
 - PE flange connection with fitting that has mismatched flange drilling patterns may also be achieved by the use of a PE reduced spigot flange adaptor (“slim flange”) conforming and tested to AS/NZS 4129. The flange on such a fitting must still comply with AS/ISO 9624
- l) PE Bends and Tees:
 - Where factory manufactured moulded bends or tees are not available short bends or tees shall be formed from mitred segments of the same material as the pipe, welded together in a quality controlled factory environment by manufacturers with a recognised independently certified system to AS/NZS 4129. Unless specifically designed otherwise the maximum deflection angle at any mitre shall not exceed 18 degrees
 - The SDR and PN rating of PE bends and Tees shall be the same as the PE pipeline. Where heavier wall pipe is required to fabricate the fitting (to maintain the pressure rating of the pipeline) the spigot end of the pipe shall be machined to match the wall thickness and OD of the pipeline
 - The ends of bends and fittings shall have straight sections of at least 1.5 pipe diameters to facilitate welding on site

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body’s requirements.
- b) Pipe for pressure applications shall have product certification (ISO Type 5) to AS/NZS 4130.
- c) Pipe for gravity applications shall have product certification (ISO Type 5) to AS/NZS 5065.
- d) Certification of compliance with AS/NZS 4020 for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Internal diameter		
SDR rating		
<u>Gravity:</u> Minimum SDR17		
<u>Pressure class:</u> Networks minimum PN12.5 Transmission minimum PN16		
Pipe >63mm diameter shall be PE100		
Manufacturing standards: AS/NZS 4130 and AS/NZS 4131 as or AS/NZS 5065 for gravity sewer as implemented by section 14.1.6		
AS/NZS 4020 compliance (if for water)		
Pipe branding		
Pipe length		
Pipe ovality minimum OD tolerance		
Pipe ovality maximum OD tolerance		
Minimum pipe wall thickness		
Product and Test certificates		
Delivery inspection		
Average pipe wall thickness of 6 points equally spread around the pipe circumference		
Reversion: strong / clearly visible /not noticeable		
Damage inspection < 10% of wall thickness		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Pipe	Asmuss	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Poliplex	lplex	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Pipe	Marley	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Pipe	Waters & Farr	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Pipe WM70021 & WM70026	RX plastics	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Pipe	Mill-pro	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. Only SDR17 and PE100, PN16 63mm to 160mm.
Pipe	Enviro PE	Within limits of this standard. Fittings and pipe to be matched – refer to the construction standard. General acceptance up to 300mm
Fabricated Spigot fittings		
Simona PE moulded range	Simona/Plasson	Injection moulded. General acceptance up to 300mm
Plastitalia PE stub flange	Plastitalia	General acceptance up to 300mm
Fusion PE moulded spigot range	Fusion	General acceptance up to 300mm
Hiflo Hydrant Tee	Strata Plastics	Fire hydrant installations on PE pipe 125mm and 180mm
Agru stub flanges	Agru	General acceptance up to 300mm

14.1.7 Polyethylene (PE) fittings other than fabricated bends and tees

Refer to [section 14.1.6](#) for spigot fittings

General requirements

- a) Minimum pressure rating shall be PN16.
- b) Fittings for pressure applications for use with polyethylene pipe shall be manufactured to AS/NZS 4129.
- c) Polyethylene fittings for gravity sewer applications shall be manufactured to AS/NZS 5065 or AS/NZS 4129.
- m) Fitting seals shall be EPDM complying with AS 1646 and AS 681.1 (EN 681-1).
- n) Polymeric coatings shall comply with AS/NZS 4158
- o) Electrofusion couplings and saddles:
 - Couplings and saddles must be the correct size for the pipe outside diameter
 - The fittings shall have a pressure rating no less than that of the pipe they are to be used to join
 - Couplings shall be bar coded for traceability and to provide information for preheat and fusion heating control and recording
 - Tapping saddle fittings used with PE pipe must comply with AS/NZS 4129. Tapping into PE mains is limited up to 315mm nominal diameter. A Tee shall be installed on pipe sizes over this diameter
- p) Mechanical couplings and saddles:
 - PE compression fittings may be used only on PE80 up to 63mm only
 - Metallic mechanical couplings shall be used for repair purposes only
 - Bronze tapping saddles shall not be used with PE pipes
- d) Flange requirements shall be to [section 14.4](#).

Quality Control

- a) Fittings shall have product certification (ISO Type 5) to AS/NZS 4129 and may be certified to AS/NZS 5065 for gravity sewer.
- b) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- c) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).
- d) Certification of compliance with AS/NZS 4020 for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Minimum product life of 100 years		
Nominal diameter		
Internal diameter range to fit pipe OD range		
To fit pipe SDR rating		
<u>Gravity:</u>		
Minimum SDR17		
Pressure class minimum PN16		
EPDM elastomeric seals to AS 1646 and AS 681.1 (EN 681-1).		
Manufacturing standards:		
AS/NZS 4129 as implemented by		

Minimum standard required	Design specific requirements	Supplier submission
section 14.1.7		
Flanged fittings Raised face B1 BSEN1092 or AS/NZS4087 as per section 14.4		
AS/NZS 4020 compliance (if for water)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Compression fittings		
Compression fittings	Philmac	MDPE (PE80) use up to 63mm. Networks only
Compression fittings	Plasson	Compression for MDPE (PE80) use up to 63mm in networks only.
Compression fittings	Georg Fischer	Compression for MDPE (PE80) use up to 63mm in networks only.
Compression fittings S16	Supreme	MDPE (PE80) use up to 63mm. Networks only
Compression fittings	Plassim (RX Plastics)	MDPE (PE80) use up to 63mm. Networks only
Electro-fusion fittings		
Electro-fusion (Frialen)	Friatec	Complete range
Electro-fusion	Monoline	Complete range
Electro-fusion	Agro	Complete range
Electro-fusion	Plasson	Complete range
Electro-fusion (Elgef+)	Georg Fischer	Complete range
Electro-fusion	Plastitalia	Complete range
Tapping saddles (PE mechanical)		
Tapping saddle	Philmac	PE mechanical, up to 110mm main, PN16. Compression off-take up to 63mm
Tapping saddle	Plasson	PE mechanical 110mm up to 180mm main, PN16. Compression off-take up to 63mm
Tapping saddle	Plassim (RX Plastics)	PE mechanical, up to 63mm main, PN16 Compression off-take up to 63mm -
Tapping saddle (Elgef+) 684C, 654	Georg Fischer	PE mechanical up to 160mm main,

Product model/name	Manufacturer/supplier	Specific limitation
		PN16 Compression off-take up to 63mm
4N – PE option (including tapper accessory)	Stockbrands	PE mechanical up to 300mm main, PN16
Tapping saddles (Electrofusion)		
Tapping saddle (Electro-fusion)	Plasson	PE electro-fusion up to 250mm main, PN16.
Tapping saddle (Electro-fusion)	Friatec	PE electro-fusion up to 315mm main, PN16. Depending on application.
Tapping saddle (Electro-fusion)	Monoline	PE electro-fusion up to 225mm main, PN16.
Tapping saddle (Electro-fusion)	Agro	PE electro-fusion up to 315mm main, PN16
Tapping saddle (Electro-fusion)	Georg Fischer	PE electro-fusion up to 315mm main, PN16
Tapping saddle (Electro-fusion)	Plastitalia	PE electro-fusion up to 300mm main, PN16
Tapping saddle (Electro-fusion)	Fusion group	PE electro-fusion up to 225mm main, PN16.
Metallic tapping saddles (Mechanical for repair only)		
WAGA Multi/Saddle	Georg Fischer	For pipe repairs only
Haku 5250	Hawle	40mm to 315mm
VariTap	Wang	100 DN and 150 DN PE PN12.5 or higher
Mechanical repair of PE (Repair only solution)		
System 2000	Hawle	For pipe repairs only
WAGA (end restraint model)	Georg Fischer	For pipe repairs only
Aquagrip; Aquafast; Ultragrip	Viking Johnson	For pipe repairs only
621,623,624 and Support Bush 05	AVK	For pipe repairs only

14.1.8 Glass reinforced plastic (GRP) pipe and fittings

General requirements

- a) GRP for pressure applications shall be manufactured by centrifugal casting process to AS 3571.2 (ISO 10639)
 - Network applications shall have a minimum pressure rating of PN12
 - Transmission application shall have a minimum pressure rating on PN16
- b) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- c) GRP pipe for gravity sewer applications shall be manufactured by centrifugal casting process to AS 3571.1 (ISO 10467) with a minimum ring stiffness of SN16.
- d) Tanks and manholes shall be manufactured by filament wound or centrifugal casting process AS 3571.
- e) Maximum long term deflection shall not exceed 5%.
- f) Pipe lengths shall be minimum 10m in length.
- g) Joint seals shall be EPDM complying with AS 1646 and AS 681.1 (EN 681-1).

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).
- c) Certification of compliance with AS/NZS 4020 for water applications.
- d) GRP for pressure applications shall have product certification (ISO Type 5) to AS 3571.2 (ISO 10639).
- e) Pipe for gravity applications shall have product certification (ISO Type 5) to AS 3571.1 (ISO 10467).

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Internal diameter		
External diameter		
Pipe lengths min 10m		
Pressure class: PN12 – for all Networks pressure, or PN16 – for all Transmission pressure, or SN16 – for all gravity		
Manufacturing standards: AS 3571.1 or .2 as implemented by this section		
Joints: Spigot and socket		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
various	Armatec	Within limits of this standard
Flowtite	Flowtite	Within limits of this standard
Superlit	Superlit Industries	Within limits of this standard
Hobas	Hobas	Within limits of this standard

14.1.9 Spiral welded steel pipe

General requirements

- a) The normative standard is NZS 4442 and compliance with AS 1579 for steel shell manufacture process and tolerances.
- b) Steel shall be manufactured to AS/NZS3678 or AS/NZS 1594 and demonstrate to meet the requirements of NZS 4442, clause 101.1.1.
- c) Pipe shall be manufactured with socket and spigot joints for fillet welding, unless otherwise specified.
- d) Any correction to formed steel shall be done by pressure and not by hammering.
- e) Manual welding shall be completed to AS/NZS 3992 and as required by the Watercare General Mechanical Construction Standard, Section M6.
- f) Missed welds shall be V-edge prepared a minimum of 2½ times the width of the weld on either side of the stop-start or further as determined by an ultrasound test result. The overlap shall be completed by manual welding across the prepared length. The end crater shall be filled by back-stepping 15mm at the end of the weld.
- g) Pipe tolerances shall conform to NZS 4442 clauses 104, 108, and 204 and as altered for the following items:

Item	Tolerance
Thickness of steel plate	+/-5%, with 0.5mm maximum
Plate seam alignment	Not more than 1.5mm for up to 12mm plate Not more than 3.0mm for plate thicker than 12mm
Height of weld at seams	≤3mm as per AS 1579

- h) A test hole shall be formed in the socket end of all pipes DN700mm and over for spigot and socket pipes. The test hole shall be drilled with its centre line 15mm from the end of the pipe and tapped Rc 1/8th (BS21) using the tapered form of the thread as set out in BS21 with the following provisions:
 - The gauge length shall be taken as the depth to gauge diameter measured from inside the pipe shell
 - The gauge length shall be 4 3/8 turns of thread (4.0mm) +/-1 thread (0.9mm)
 - The gauge diameter shall be 9.73mm

Threads shall be formed only after all operations likely to cause distortion, corrosion, or build-up of foreign material have been carried out. Once completed the test holes shall be filled with a rust inhibiting grease.

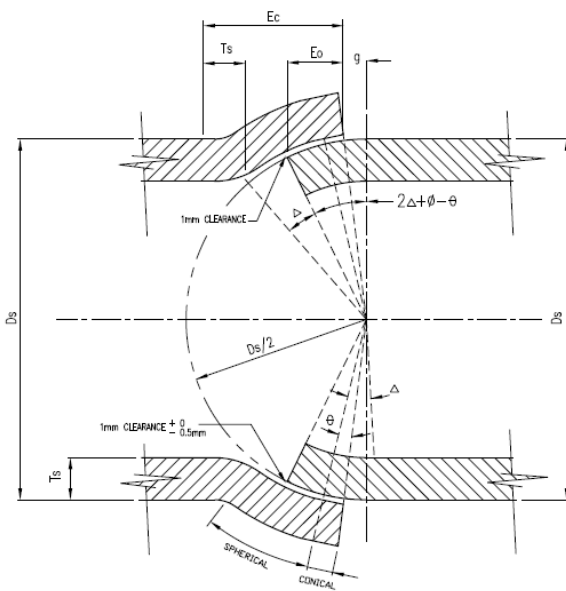
- i) A pipe identification number, to which plate details, manufacturing date quality control and source material can be related, shall be stencilled on the outside of the socket end of the pipe adjacent to the test hole with non-toxic permanent paint. If there is no test hole, the number shall be stencilled by the end of the spiral weld.
- j) Compliance with AS 1281 for cement mortar lining process. Testing of concrete to NZS 104 and NZS 3112.1
- k) Lining repair on pipe for the purpose of wastewater shall be done with a suitably resistant product such as Emaco Nanocrete R4 or similar accepted.
- l) Polymeric coatings (if specified) shall comply with AS/NZS 4158. The specific performance requirement shall be stated as part of the design for the pipe service.
- m) For water applications any surface in contact with the water shall comply with AS/NZS 4020.
- n) The exterior tape coating application of prefabricated polyolefin tapes shall comply with American Water Works Association Standards AWWA C225, AWWA C214 and AWWA C209 as applicable to the manufacturing method and tape type. Tape shall terminate at 150 mm for spigots and 100 mm for sockets from the pipe end.
- o) The outside diameters shall standard to ISO 559 or ISO 4200. Pipe wall thickness may be increased in accordance with the specific design. Suggested dimensions are provided in the following table:

Pipe shell					Ends			Pipe length		Concrete lining				Setbacks			2Min deflection angle for spigot (deg)
DN	Ds	Ts ¹	Tos ¹	tc	Eo	p	Ø	PE/LL	S & S	Di	Tc	Tol	Idt	Es	Ec & Ete		
(mm)	(mm) O.D	(mm) tw	(mm)	(mm)	(mm)	(degrees)	(degrees)	(m)	(m)	(mm) I.D	(mm)	(mm)	(mm)	(mm)	(mm)		
100	114	4.8	±0.24	±4	14	4.82	9.65	6	N/A	84	10	±2	±4	28	33	14	6
150	168	4.8	±0.25	±4	16	3.27	6.55	6	N/A	138	10	±2	±4	29	37	16	6
200	219	4.8	±0.25	±4	17	2.51	5.02	6	6	189	10	±2	±4	29	39	17	6
250	273	4.8	±0.25	±4	19	2.01	4.03	6	6	243	10	±2	±4	29	42	19	5
300	324	4.8	±0.25	±4	20	1.70	3.40	12	12	288	13	±3	±6	29	44	20	5
350	356	4.8	±0.25	±4	20	1.55	3.09	12	12	318	13	±3	±6	29	45	20	4
400	406	6.4	±0.29	±5	26	1.81	3.61	12	12	367	13	±3	±6	29	58	26	5
450	457	6.4	±0.29	±5	27	1.60	3.21	12	12	418	13	±3	±6	30	60	27	5
500	508	6.4	±0.29	±5	28	1.44	2.89	12	12	469	13	±3	±6	31	62	28	4
600	610	6.4	±0.29	±6	29	1.20	2.40	12	12	565	16	±4	±8	33	65	29	4
700	711	6.4	±0.29	±6	31	1.03	2.06	12	12	666	16	±4	±8	34	69	31	4
750	762	8	±0.30	±6	37	1.20	2.41	12	12	714	16	±4	±8	41	81	37	4
800	813	8	±0.32	±6	38	1.13	2.26	12	12	765	16	±4	±8	42	83	38	4
900	914	8	±0.32	±6	39	1.00	2.01	12	12	866	16	±4	±8	43	86	39	3
1000	1016	9.5	±0.32	±6	45	1.07	2.14	12	12	957	20	±5	±10	50	100	45	3
1200	1219	9.5	±0.32	±6	49	0.89	1.79	12	12	1160	20	±5	±10	53	107	49	3
1400	1422	9.5	±0.32	±6	51	0.77	1.53	12	12	1363	20	±5	±10	56	112	51	3
1600	1626	12.7	±0.36	±6	65	0.90	1.79	12	12	1561	20	±5	±10	71	142	65	3
1800	1829	12.7	±0.36	±6	68	0.80	1.59	12	12	1764	20	±5	±10	74	148	68	3
2000	2032	12.7	±0.36	±6	71	0.72	1.43	12	12	1967	20	±5	±10	77	154	71	3
2200	2235	12.7	±0.36	±6	73	0.65	1.30	12	12	2170	20	±5	±10	79	159	73	3

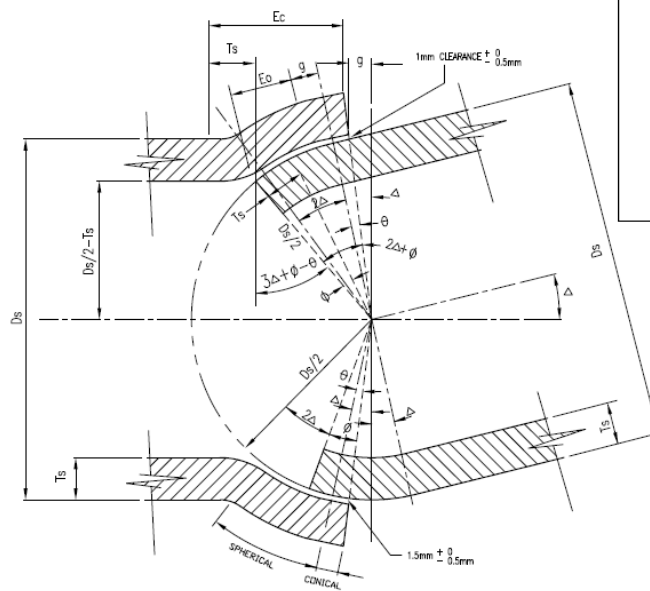
DN = nominal diameter	p = angle subtended by arc of Ts at radius D _s /2	ldt = internal diameter tolerance
D _s (O.D) = outside diameter (steel)	PE = plain ended	Es = set back of concrete or paint lining at spigot end
T _s = thickness of pipe steel	LL = laid length	Ec = set back of concrete or paint lining at socket end
T _{os} = tolerance on steel thickness	S & S = spigot and socket	Ete = minimum set back of external coating or for tape coating 150mm for spigots and 100mm for sockets
tc = tolerance for circumference	Di (I.D) = internal diameter (concrete lining)	
E _o = length of straight line entry	T _c = thickness of concrete lining	
Θ = angle subtended by the conical section of socket at the centre of the spherical joint	Tol = tolerance on concrete lining thickness	

¹ The nominated steel thickness is the minimum. Specific design may require a greater steel thickness (including thicknesses of up to 16mm with T_{os} ±0.55mm)

² For the purpose of manufacturing the deflection angle tolerance is set as a minimum.



SECTION THROUGH STRAIGHT LINE JOINT



SECTION THROUGH JOINT DEFLECTED TO MAXIMUM

KEY	
$E_o = \frac{\pi}{180} \times D_s/2 [(2\Delta + \phi - \theta) - (\Delta - \theta)]$	D _s = O.D. OF STEEL PIPE
$E_c = 2 \times E_o + T_s$	T _s = THICKNESS OF STEEL PIPE
$\Delta = \frac{1}{3} [\cos^{-1}(1 - 2T_s/D_s) - \phi + \theta]$	E _c = SET BACK OF CONCRETE LINING AND ENAMEL COATING
$\phi = \frac{180}{\pi} \times 2T_s/D_s$	E _o = LENGTH OF STRAIGHT LINE ENTRY
$\theta = 2 \times \phi$	Δ = MAXIMUM DEFLECTION ANGLE
$g = D_s/2 \sin(\Delta - \theta)$	φ = ANGLE SUBTENDED BY AN ARC OF T _s AT RADIUS D _s /2
	Θ = ANGLE SUBTENDED BY THE CONICAL SECTION OF SOCKET AT THE CENTRE OF THE SPHERICAL JOINT

Quality Control

- a) Product shall be marked in accordance with the conformity assessment body's requirements.
- b) Steel material test certification to AS/NZS 3678 or AS/NZS 1594.
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- d) Certification of compliance with AS/NZS 4020 for water pipe.
- e) Routine testing:

Routine testing:	Test	Frequency
	Batch number relating to pipe numbers	Per plate batch
	Materials testing report – metallurgical compliance.	Per plate batch
	Materials testing report – material properties compliance.	Per plate batch
	Destructive testing (optional to NDT) <ul style="list-style-type: none"> • Bend test: no crack or defect > 1.5mm • Nick break test: no cracks, slag, no lack of penetration or fusion, spherical defect up to max 2%, any defect not exceeding 1.5mm Ø • Tensile test: > Min. Tensile strength. no cracks, slag, no lack of penetration or fusion, spherical defect up to max 2%, any defect not exceeding 1.5mm Ø 	Weld Testing, at start then per 900m or every 100 pipes of 6m lengths
	Non-destructive testing (optional to destructive testing) Ultrasonic or x-ray testing certified by recognised organisation	Weld Testing, at start then per 900m or every 100 pipes of 6m lengths
	Hydrostatic pressure test to NZS 4442	Every pipe
	Pipe joint deflection	One pipe deflection test per pipe size as a minimum and then 1 per 100 pipes thereafter
	Concrete lining	NZS 3104 – Batch records available on request NZS 3112.1 – Batch test records available on request
	Concrete lining finish: cracks < 0.8mm, max 50% depth of lining, no pocket, lumps or voids	Every pipe
	Tape wrapping	As specified by AWWA and reported per pipe order batch

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Pipe nominal diameter		
Pipe outside diameter		
Pipe wall thickness (minimum as		

Minimum standard required	Design specific requirements	Supplier submission
set by this standard)		
Concrete lined (normative)		
External coated Polyken wrapping (normative). Refer to section 14.10.1		
Internal epoxy coated to AS/NZS 4158 - Design specific performance to be specified. Refer to section 14.10.2		
External epoxy coated to AS/NZS 4158 - Design specific performance to be specified Refer to section 14.10.2		
Manufacturing standards: NZS 4442 as implemented by section 14.1.9 with tolerances as set by AS 1579 as referenced in this section		
Joints Spigot and socket, or Butt weld prepared, or Flanged (Refer section 14.4)		
Length Minimum length 12m per pipe		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
-	Steelpipe NZ	-
Sintakote	SteelMains	Excludes SintaJoint (non-welded rubber ring joint). SintaJoint requires specific approval.

14.1.10 Stainless steel pipe

General requirements

- a) Pipe and fittings shall be manufactured to AS 5200.053.
- b) Pipe and fittings shall be stainless steel 316L grade.
- c) Minimum pressure rating shall be PN16.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO type 5) to AS 5200.053.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Manufacturing standards: AS 5200.053		
Minimum PN16 pressure rated		
Joints Refer flanges, section 14.4		
Length		
Product and Test certificates		

14.1.11 Ductile iron castings for pipe, fittings and valves

General requirements

- a) The carbon present in the ductile iron shall be spheroidal and not flake.
- b) Pipe and fittings sections shall be manufactured to AS1831 Grade 400-12 or Grade 450-10.
- c) Typical valves and couplings for transmission applications or sizes over 250mm shall be manufactured to AS 1831 Grade 450-10 or higher. **Note:** A **high risk local network** installation may require a material grade **higher than 400-12**

Quality Control

- a) All relevant physical, technical equipment and associated skill and knowledge will be audited, including actual manufacture of at least one heat following the associated testing and sampling process by an auditor with sufficient foundry and metallurgical knowledge on the following activities:

Laboratory equipment

- C.E. machine to control melt analysis
- O.E.S. or similar equipment to check melt chemistry and calibration
- Tensile testing equipment and calibration
- Hardness testing machines and calibration
- Metallographic microscopes, mounting and polishing equipment
- NDT Inspection tooling

Foundry melt production

- Melting and pouring equipment audit
 - Temperature control of metal in furnace and pouring stages
 - Process control of Spheroidizing treatment
 - Casting of test pieces and quarantine of product during testing
 - Actual mechanical testing and metallography on melts as routine procedures
 - Production of Test Certificates and conformance to standards and accreditation
 - Review past quality control records and non-conformance reports (if existing)
 - Availability of NDT technique for casting inspection
- a) Weld repair either artificially or structural are not accepted.
 - b) Plastic fillers to hide defects are not allowed.
 - c) Evidence of scabs, miss-runs, core or mould shift, metal penetration and swelling shall render the casting unfit.
 - d) Mechanical and chemical properties to AS1831 measured on machined test pieces shall be prepared from either:
 - Separately cast samples for fittings, pipe and valves \leq DN300mm
 - Cast-on samples for valves and fittings $>$ DN 300mm
 - Samples cut from a casting
 - e) The nodularity of the graphite shall be minimum 90% Form V and VI for valves.
 - f) The nodularity of the graphite shall be minimum 80% Form V and VI for pipe. Pipe and fittings expected to withstand high loading and fatigue conditions shall have nodularity above 85%.
 - g) Test certificates to AS1831 shall be provided together with the specific type test for the product.
 - h) Test certificates detailing the results of microstructure examination and mechanical results are required within 10 (ten) working days of the casting programme being completed and before shipping. This will include hydrostatic test result, hardness tests etc.
 - i) Frequency of test is per valve or fitting over 600mm (ISO Type 1a) and per batch for pipes and valves and fittings under 600mm (ISO Type 1b).

14.1.12 Ductile iron pipe and pipe fittings

General requirements

- a) Ductile iron casting shall comply with [section 14.1.11](#) of this standard.
- b) Ductile iron pipe and fittings shall be manufactured to AS/NZS 2280.
- c) Minimum pressure rating for pipe and pipe fitting shall be PN16.
- d) Capable of minimum flow velocity of 2m/s.
- a) Pipe shall be rubber ring jointed or flange cast. Refer to [section 14.4](#) for flanges (flange rated minimum PN16). Threaded flanges are not accepted.
- e) Polymeric coatings shall comply with AS/NZS 4158.
- f) Polyethylene sleeved coating (where not polymeric coated) shall comply with AS 3680.
- g) Pipe shall be concrete lined to NZS3122. Calcium aluminate cement (CaC) class concrete shall be used for wastewater applications.
- h) Any component or lubricant in contact with the water supply system shall comply with AS/NZS 4020.

Quality Control

- a) Product certification (ISO Type 5) to AS/NZS 2280.
- b) Elastomeric joint seals certification (ISO Type 5) to AS1646 and AS 681.1.
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- d) Certification of compliance with AS/NZS 4020 for water use.
- e) Tensile test certification to AS 1391.
- f) Casting certification to AS1831.
- g) Pipe or fitting markings shall include batch number or barcoded traceability to manufacturing verification.
- h) Routine testing:

Routine testing:	Test	Frequency
	Concrete lining test and records	NZS 3104 – Batch records available on request NZS 3112.1 – Batch test records available on request
	Material properties	Per batch and a minimum of 1 pipe shall be sampled from pipe supplied
	Dimensions	Each pipe / fitting
	Hydrostatic performance	Each pipe and fitting

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Pipe or fitting		
Nominal diameter		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 AS/NZS 2280 as implemented by section 14.1.12		
Concrete lined. Class CaC for wastewater applications		

Minimum standard required	Design specific requirements	Supplier submission
External coating Epoxy or PE sleeve		
Joint method spigot and socket or flanged (no threaded flanges)		
Flange spot facing		
Minimum pressure classification PN35 (flange PN16)		
Pipe / fitting length		
Mass of fitting or per pipe length		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Fittings		
RLEF; FAZ; BEND; THAF; TAF	Gillies	Wastewater consider specific lining
Sureflow	Viadux /Asmuss	Wastewater consider specific lining
Vario	Hawle	Wastewater consider specific lining
AVK DI fittings	AVK	Wastewater consider specific lining
Derwent range	Derwent	Wastewater consider specific lining
Asmuss DI	Asmuss	Wastewater consider specific lining
Pipe		
Hydrotite	Xingxing	
Saint Gobain PAM	Viadux /Asmuss/P&I	

14.1.13 Seamless steel pipe and fittings

General requirements

- a) Pipe and fittings shall be manufactured to ASTM-A-106/333/335 and BS EN 10204.
- b) Minimum pressure rating shall be minimum schedule 10 or higher as required by the specific design.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO type 5) to ASTM-A-106/333/335
- c) Manufacturing test certification to BS EN 10204.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Manufacturing standards: ASTM-A-106, ASTM-A-333 (low temp. app.), ASTM-A-335 (High temp. app.), and BS EN 10204		
Minimum Sch 10 pressure rated		
Joints Refer flanges, section 14.4		
Length		
Product and Test certificates		

14.2 Valves

14.2.1 Gate valves 50mm diameter and greater

General requirements

- a) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- b) Valves shall have a minimum pressure rating of PN16.
- c) Spindle shall be non-rising.
- d) Spindle seal shall be non-asbestos gland box or O-ring that is accessible for replacement under full operating pressure.
- e) Valve operating torque shall not exceed 125Nm at the fully unbalanced allowable operating pressure, otherwise a gearbox shall be equipped, see [section 14.2.4](#).
- f) The valve operating direction shall be permanently marked on the valve, gearbox, spindle cap or hand-wheel.
- g) Refer to [section 14.4](#) for flanges.
- h) Polymeric coatings shall comply with AS/NZS 4158.
- i) Applicable manufacturing standard is AS/NZS 2638.1 and .2

For gate valves used in **water**:

- Valves shall be resilient seated
- Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020
- The direction of rotation of input shaft shall be anti-clockwise to close the valve. For installation on rider mains valves shall be clockwise closing.
- Valves shall be supplied with a spindle cap or hand-wheel as required, which shall be coated fusion bonded polymer complying with AS/NZS 4158. Colour shall be blue or black.

For gate valves used in **wastewater**:

- Valves shall be metal seated
- The direction of rotation of input shaft shall be clockwise to close the valve
- Valves for local network pressure systems shall be supplied with a triangular spindle cap, or otherwise square spindle cap, or hand-wheel for other applications which shall be coated fusion bonded polymer complying with AS/NZS 4158. Colour shall be red
- Valves that do not comply with AS/NZS 4020 shall be marked in the casting “NOT SUITABLE FOR WATER SUPPLY” or equivalent

Quality Control

- a) Casting test certificates as per [section 14.1.11](#).
- b) Resilient seated gate valves shall have product certification (ISO Type 5) to AS/NZS 2638.2.
- c) Metal seated gate valves shall have product certification (ISO Type 5) to AS/NZS 2638.1
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- e) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).
- f) Certification of compliance with AS/NZS 4020 when used for water applications.
- g) All products shall be marked in accordance with the conformity assessment body’s requirements.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		

Minimum standard required	Design specific requirements	Supplier submission
Fluid type and nature		
Valve type: RSV – water Metal gate - wastewater		
Nominal diameter		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 AS/NZS 2638.2 as implemented by section 14.2.1		
AS/NZS 4020 compliance (if for water)		
Protective coating: AS/NZS 4158 or Altex specified		
Elastomeric seals to AS1646		
Flanges: Refer to section 14.4		
Flange spot facing required (y/n)		
Minimum pressure rated PN16		
Valve operability/input/output		
Installation orientation		
Maximum operating pressure of installation		
System test pressure		
Maximum flow velocity		
Closing direction		
Operation input (i.e. hand-wheel, actuator, etc.)		
Maximum handwheel diameter (if required – refer gearboxes for valves)		
Maximum operating torque for specified handwheel diameter is 356 N		
Actuation: <i>Gearboxes, Required for input over 125 Nm unbalanced operation – attach procurement schedule from section 14.2.4</i> <i>Electric actuators – attach procurement schedule from section 14.13.5</i>		
Valve specific information submittal		

Minimum standard required	Design specific requirements	Supplier submission
Valve manufacturer		
Country of valve manufacture		
Valve model		
Primary dimensions (or include drawings)		
Year of manufacture		
Serial number (supplied with each valve)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Resilient seated – Water application		
Series 57 / (40 or 48)	AVK	80mm to 250mm
E2	Hawle	50mm to 200mm
E2 Elypso	Hawle	250mm only
Gillies	Gillies	50mm to 250mm
Sureflow figure 500	Viadux / Asmuss Water Systems	80mm to 250mm
RSV gate	Daemco	80mm to 250mm
Derwent	Derwent	80mm to 250mm
Metal seated – Wastewater application		
Sureflow Figure 400	Viadux / Asmuss Water Systems	80mm to 200mm
Type 37/50	AVK	Drilling to be specified. Up to 300mm

14.2.2 Butterfly valves – Double flanged

General requirements

- Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- Butterfly valves shall comply with AS 4795.2 or an equivalent standard with specified testing to meet additional testing as set out in the table below:

Characteristic	Requirement	Test method described under AS4795.2	Standard (AS 4795.2) frequency of test	Additional Watercare requirements
Type verification				
Material properties	Materials	Review materials parts lists and compliance certificates against accepted materials	At any change in material	<i>See production verification on batch testing</i>
	Contamination of water	AS/NZS4020	At any change in material or 5 yearly	
	Elastomeric valve seal	AS 1646 Quality plan	At any change in elastomer. Available on request	<i>See production verification on batch testing</i>
	Seal suitability for service conditions	Review data sheets	At any change in elastomer	
	Elastomer hardness	AS1683	At any change in elastomer	
Design	Performance history	Review manufacturer's data, instructions, drawings, calculations and other relevant information such as material changes	Any change in design	<i>As defined in supply contract</i>
	Interchangeability of components			
	Installation			
	Head and flow operation			
	estimated operating life			
	Design calculations			
	End connections (flanges)	AS4087 or BS EN 1092-2	Any change in flange design	<i>As defined in supply contract</i>
	Welding	Category SP welding (AS/NZS 1554.1 or equivalent)	Any change in design	<i>Not applicable to valves with pressed or bolt-in seats</i>
	Castings	Visual examination and third party verification	Any change in design or foundry	<i>See production verification on batch testing</i>
	External drainage holes	Design drawings	Any change in casting design	
Face-to face dimensions	BS EN 588 or ISO 5752	Any change in design		
Supports	Design drawings		Any change in design	

Characteristic	Requirement	Test method described under AS4795.2	Standard (AS 4795.2) frequency of test	Additional Watercare requirements	
	Seal Shaft	Design drawings		Any change in design	
	Shaft sealing and ingress	Design drawings		Any change in design	
	Shaft bearings	Design drawings and bearing data sheet	Any change in bearing type or supplier	<i>See production verification on batch testing</i>	
	End thrust	Design drawings	Any change in design		
	Input stops and torque limiting devices	Design drawings and visual examination	Any change in design		
	Position indicator	Design drawings and visual examination	Any change in design		
	Lockout devices	Design drawings and visual examination	Any change in design		
	Operation	Design drawings and visual examination	Any change in design		
	Spindle cap, spindle extension and key	Design drawings and visual examination and dimensional checks	Any change in design	<i>See production verification on batch testing</i>	
	external spindle tube	Design drawings and visual examination and dimensional checks	Any change in design		
	Gearboxes	Refer section 14.13.5			
	Lifting devices	Design drawings	Any change in supplier	Any change in lifting design	
	Fasteners	AS1111.1,.2,.3	Any change in supplier	<i>See production verification on batch testing</i>	
Protective coatings	Coating effective for all internally wetted surfaces and non-corrosion resistant materials	AS/NZS4158	Any change in design, coating material, coating process or coating applicator	<i>See production verification on batch testing</i>	
	Coatings on actuators and gearboxes	Refer section 14.13.5			
	Continuous immersion	AS/NZS4158	Any change in design, coating material, coating process or coating applicator	<i>See production verification on batch testing</i>	
Type tests	Body strength	Test A	Each valve size, after any change in design, materials, suppliers, or place of	<i>See production verification on batch testing</i>	
	Free end	Test B			
	Disc strength	Test C			
	Shaft strength	Test D			

Characteristic	Requirement	Test method described under AS4795.2	Standard (AS 4795.2) frequency of test	Additional Watercare requirements
	Valve operation	Test E	manufacture	
	Sealing	Test F		
	Weld deposit seal	Test G		
Production verification				
Design	Standard critical dimensions	Design drawings	One valve per production batch	Batch testing for valves ≤600mm, every valve over 600mm
Freedom from casting defects	Structural and surface defects	Visual	Each valve	Valves ≤ 600mm one valve ultrasonic tested per production batch. All valves over 600mm to be ultrasonic tested for 0 casting voids
	<i>Body castings- (Watercare additional requirement)</i>	<i>Material analysis from cast-on sample bar Water care amendments to AS1831 that includes material composition, nodularity above 90%, Tensile and hardness testing (Watercare additional requirement)</i>		Valves ≤ 600mm one per production batch. All valves over 600mm test each valve
<i>Flange truing</i>	<i>Flange back end spot-facing within 2 degree tolerance</i>	<i>>2 degrees</i>		Each valve
Travel stops	Correct positioning of disc in open and closed position	Adjustments and visual examination	Each valve	
Protective coatings	Continuous immersion	AS/NZS4158	Each valve	Holiday testing accepted
Production test	Coating	Test 1	Each valve	
	Body strength	Test 2	Each valve	
	Sealing	Test 3	Each valve	
	Reverse sealing	Test 4	Each valve	
	Disc strength		As required	Batch testing for valves ≤600mm, every valve over 600mm

Characteristic	Requirement	Test method described under AS4795.2	Standard (AS 4795.2) frequency of test	Additional Watercare requirements
	free end		As required	One valve per production batch
	Weld deposit seal	Test 5	Each valve	<i>Not applicable to valves with pressed or bolt-in seats</i>
	<i>Valve componentry material test - (Watercare additional requirement)</i>	<i>Material analysis from batch per each component</i>		One sample per batch representative of valve order supplied
Marking	Markings	Visual examination	One valve per production batch	
	Direction of closure of handwheels and caps			
Packaging	Suitable packaging	Manufacturer's specification	Each package	

- c) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- d) Polymeric coatings shall comply with AS/NZS 4158 or recognised equivalent standard demonstrating suitable coating thickness and test methodology.
- e) Minimum pressure rating shall be PN16.
- f) Must accommodate under normal operation a nominal flow velocity of 4m/s.
- g) Valve operating torque shall not exceed 125Nm at the fully unbalanced allowable operating pressure for a handwheel diameter not exceeding 600mm; otherwise a gearbox shall be equipped, see [section 14.2.4](#).
- h) Operation by hand wheel with gearbox, or actuator may be specified from additional section 14.2.4 and section 14.13.5.
- i) Refer [section 14.4](#) for flanges. Flange drilling may be to AS/NZS4087 or BS EN1092 with suitable joint detail and specified bolting torques.
- j) Valves shall be suitable for bi-directional flow and end of line use.
- k) Seat sealing arrangement shall be Seal-on-disc and single or double eccentric disc offset from the shaft. Concentric valves or rubber lined valves are not acceptable.
- l) The body seat surface shall be stainless steel grade 316 or approved equivalent.
- m) Shaft connection shall be keyed using a taper pin on a partially milled flat groove on the edge of the shaft/ Straight pins through the centre of the shaft.
- n) Valves shall be provided with a suitable spindle lockout device independent from the handwheel and gearbox.
- o) Component specific requirements:

Component	Material	Grade	Standard
Body	Ductile iron	65-45-12; 500-7	AS1831; ASTM A536; EN1563 and as amended by section 14.1.11
Shaft & shaft extension	Stainless steel	316 or suitable alternatives such as Grade 431 or 630	ASTM A276; ASTM A564 / BS EN 10088-5 or recognised equivalent

Component	Material	Grade	Standard
Shaft collar & bearing	Bronze, PTFE, Nylatron or better polymer	DZR Bronze, Self-lubricating PTFE and Nylon	ASTM763 or required by AS 4795.2 and equivalents
Shaft seal	Elastomer	EPDM O-ring, V-type packing	AS 1646 or recognised equivalent
Disc	Ductile cast iron	65-45-12; 500-7	AS1831; ASTM A536; EN1563 and as amended by section 14.1.11
Body seat	Stainless steel or Nickel-copper alloy	316	ASTM A276; BS EN 10088-5 or recognised equivalent
Disc to shaft fixing	Stainless steel	A4/316	ASTM A276 , ASTM F594; BS EN 10088-5 or recognised equivalent
Seals & O-ring	Elastomer	EPDM, NR, NBR	AS 1646 or recognised equivalent
Fasteners	Stainless steel	A4/316	ASTM A276 / BS EN 10088-5 or recognised equivalent
Seal retaining rings	Stainless steel	316	ASTM A276 / BS EN 10088-5 or recognised equivalent
Lifting eyebolts	Hot dip galvanised steel or cast into body		AS 1214/ISO 1459 or recognised equivalent
Handwheel	Polymeric coated ductile iron	400-15; 65-45-12; 500-7	AS 1831 / ASTM A536 or recognised equivalent

Quality Control

- Casting test certificates as per [section 14.1.11](#).
- Butterfly valves shall have product certification (ISO Type 5) to AS 4795.2 or equivalent with additional testing
- Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158 or equivalent.
- Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1 or equivalent).
- Certification of compliance with AS/NZS 4020 (required for water applications) or equivalent.
- Component material batch test demonstrating compliance with the applicable standard.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Valve service environment		
Application use description		

Minimum standard required	Design specific requirements		Supplier submission
Fluid type and nature			
Minimum pressure rated PN16			
Maximum operating pressure			
System test pressure			
Nominal flow velocity			
Maximum flow velocity under emergency			
Installation orientation (<i>May require shaft key-way to be cut</i>)			
Valve configuration/features			
Nominal diameter (mm)			
Flange drilling configuration <i>Typical up to 1200mm AS/NZS4087. Over 1200mm BSEN1092</i>	AS/NZS4087		
	BS EN 1092		
Special protective coating(Altex specification)			
Exterior paint colour			
Flange face coated/uncoated			
Shaft lock-out device			
Valve operability/input/output			
Maximum handwheel diameter 600mm (if required – refer gearboxes for valves)			
Actuation: Gearboxes, required for input over 125 Nm unbalanced operation – attach procurement schedule from section 14.2.4			
Electric actuators – attach procurement schedule from section 14.13.5			
Valve specific information submittal			
Valve model			
Shaft maximum input torque			
Unseating torque at rated pressure			
Total assembled mass			
Testing and quality assurance			
Product and Test certificates as specified by supply contract			
Shipping requirements			

Minimum standard required	Design specific requirements	Supplier submission
Shipping details		

Standardised products

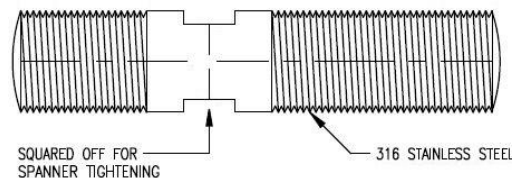
Product model/name*	Supplier	Specific limitation
AVK	Humes	Up to and including 1200mm
Valmatic	Asmuss	1200mm and over

*** Note:** Watercare is currently going through supplier negotiations to standardise on particular valve(s) and model. Please contact Watercare procurement team in the interim.

14.2.3 Butterfly valves – Lugged or tapped flange

General requirements

- a) May be used up to 250mm only.
- b) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- c) Butterfly valves shall comply with AS 4795.1.
- d) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- e) Polymeric coatings shall comply with AS/NZS 4158.
- f) Minimum pressure rating shall be PN16.
- g) Lugged butterfly valves shall be supplied with indexed studs.



- h) The lugged or tapped spacing shall conform to the flange requirements.
- i) Must accommodate under normal operation a nominal flow velocity of 4m/s.
- j) Valve operating torque shall not exceed 125Nm at fully unbalanced allowable operating pressure, otherwise a gearbox shall be equipped, see [section 14.2.4](#).
- k) Operating handle, hand wheel or gearbox may be specified.
- l) Valves shall be suitable for bi-directional flow.
- m) Disc sealing arrangement shall be fully lined vulcanised rubber. Replaceable or loose liners are not accepted.
- n) Shaft connection shall be keyed using a taper pin on a partially milled flat groove on the edge of the shaft/ Straight pins through the centre of the shaft.
- o) Valves shall be fitted with a lockout device to the spindle
- p) Component specific requirements:

Component	Material	Grade	Standard
Shaft & shaft extension	Stainless steel	316	ASTM A276 / BS EN 10088-5 or recognised equivalent
Shaft collar & bearing (on both ends)	Bronze, PTFE or better polymer	DZR Bronze	As required by AS 4795.2
Shaft seal	Elastomer	EPDM O-ring, V-type packing	AS 1646 or recognised equivalent
Valve lining	Vulcanised rubber		
Disc	Stainless steel	316	ASTM A276 / BS EN 10088-5 or recognised equivalent
Disc to shaft fixing	Stainless steel	316	ASTM A276 / BS EN 10088-5 or recognised equivalent
Seals & O-ring	Elastomer	EPDM, NR, NBR	AS 1646 or recognised equivalent
Fasteners	Stainless steel	316	ASTM A276 / BS EN 10088-5
Shaft operating lever	Stainless steel	316	ASTM A276 / BS EN

Component	Material	Grade	Standard
			10088-5 or recognised equivalent
Handwheel	Polymeric coated ductile iron	65-45-12/400-15, 500-7	AS 1831 / ASTM A536 or recognised equivalent

Quality Control

- a) Casting test certificates as per [section 14.1.11](#).
- b) Butterfly valves shall have product certification (ISO Type 5) to AS 4795.1.
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- d) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).
- e) Certification of compliance with AS/NZS 4020.
- f) Component material batch test demonstrating compliance with the applicable standard.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Valve service environment		
Application use description		
Minimum service life 50 years		
Fluid type and nature		
AS/NZS 4020 compliance (if for water)		
Minimum pressure rated PN16		
Maximum operating pressure		
System test pressure		
Nominal flow velocity 4m/s		
Maximum flow velocity under emergency		
Bi-directional flow. End of line		
Installation orientation		
Valve configuration/features		
Nominal diameter (mm)		
Flanges to section 14.4		
Protective coating to AS/NZS 4158 or Altex specified		
Exterior paint colour		
Fully vulcanised rubber seal in body		

Minimum standard required		Design specific requirements	Supplier submission
<i>Shaft connection:</i> Keyed with taper pin, or Straight pins through the shaft centre			
Spindle lockout device			
Supplied with indexed studs – refer material grades in section 14.5			
Valve operability/input/output			
Closing direction clockwise			
Maximum handwheel diameter 600mm (if required – refer gearboxes for valves)			
Maximum operating force on the handwheel is less than 356 N			
Actuation:			
<i>Gearboxes, Required for input over 125 Nm unbalanced operation – attach procurement schedule from section 14.2.4</i>			
<i>Electric actuators – attach procurement schedule from section 14.13.5</i>			
Manufacturing standards and component materials:			
<i>Valve body to AS 1831 as implemented by section 14.1.11</i>			
Ductile iron grade 450-10 or 500-7			
Testing frequency type 1a or 1b			
Valve body casting material sample bar, or batch test			
Min. required graphite nodularity			
<i>AS 4795.2 as implemented by section 14.2.3</i>			
Shaft & shaft extension	Stainless steel		
Shaft collar & bearing (on both ends)	Bronze, PTFE or better polymer		
Shaft seal	Elastomer		
Valve lining	Vulcanised rubber		
Disc	Stainless steel		
Disc to shaft fixing	Stainless steel		
Seals & O-ring	Elastomer		

Minimum standard required		Design specific requirements	Supplier submission
Fasteners	Stainless steel		
Shaft operating lever	Stainless steel		
Handwheel	Polymeric coated ductile iron		
Valve specific information submittal			
Valve manufacturer			
Country of valve manufacture			
Valve model			
Primary dimensions (or include drawings)			
Year of manufacture			
Serial number (supplied with each valve)			
Shaft maximum input torque			
Unseating torque at rated pressure			
Total assembled mass			
Recommended installation support/mounting			
Testing and quality assurance			
Product and Test certificates			
<i>Additional QA evidence (identified where required):</i>			
Manufacturers Inspection and Test Plan (ITP) – Manufacturer to provide access for third party inspection		<input type="checkbox"/>	
Inspection & Test Factory/Foundry Results		<input type="checkbox"/>	
Factory body hydrostatic pressure test		<input type="checkbox"/>	
Valve fully assembled closed drop tight pressure test		<input type="checkbox"/>	
Valve to be fully assembled in factory prior to shipping		<input type="checkbox"/>	
Assembled valve/actuator settings test		<input type="checkbox"/>	
Shipping requirements			
Shipping details			
Packing/Protection			
Identification			
Inspection on delivery			

14.2.4 Gearboxes for valves

General requirements

- a) The gearbox mounting flange shall conform to ISO 5211.
- b) The gearbox type shall be slotted lever or indirect lever with a travelling nut operating the disc shaft via a crank lever and worm gear. The complete operating mechanism shall be housed in a leak proof enclosure.
- c) The method of attachment of gears, worms and wheels to shafts shall be by key and keyway. Roll or split/taper pins are not acceptable.
- d) Mechanical operation shall be self-locking in all positions of the valve disc.
- e) Handwheel shall be 600mm maximum in diameter and marked to indicate direction of closing.
- f) Closing of the valve shall be by clockwise operation for water and anti-clockwise for wastewater operation of the handwheel when viewed from the top of the handwheel. Note: All butterfly valves are to close in clockwise direction.
- g) The manual gearbox shall be designed to produce the required operating torque with a maximum rim pull of 356N on the handwheel. The position stops and all other components must be designed to withstand a rim pull of at least 890N for a handwheel.
- h) Direction arrows shall be clearly visible and permanently on the handwheel.
- i) Adjustable stops shall be provided to prevent over travel of the valve disc in either direction.
- j) The gearbox shall be IP65 or better for valves installed above ground surface and minimum IP67 rated for valves installed below ground or in chambers; capable of operation without detriment to its mechanical function when it is immersed in water.
- k) Gears shall have a hardness of 58-62 Rc.

Quality Control

- a) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- b) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).

Procurement schedule

Minimum standard required	Design specific requirements		Supplier submission
Application use description/valve to be matched with			
Gearbox type: Slotted lever or indirect lever with travelling nut – operating geared lever or worm gear			
IP rating	IP65		
	IP67 or better		
Protective coating: AS/NZS 4158 or Altex specified			
Input flange – ISO 5211			
Flange spot facing			
Closing direction			
Maximum handwheel diameter 600mm			

Minimum standard required	Design specific requirements	Supplier submission
Maximum input force 356 N		
Attachment of gears, worms and wheels to shafts shall be by key and keyway. Roll or split/taper pins are not acceptable		
Installation orientation		
Gearbox manufacturer		
Country of manufacture		
Gearbox model		
Primary dimensions (or include drawings)		
Year of manufacture		
Serial number (supplied with each gearbox)		
Maximum output torque		
Maximum input torque		
Gearbox ratio		
Number of turns – (fully open to fully close)		
Total assembled mass		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Rotork IW, MTW	Rotork	Specified per application

14.2.5 Valve extension spindles

General requirements

- a) Applicable torque testing shall be certified to AS/NZS 2638 part 1 Test J and part 2 Test M or equivalent.
- b) Welding of spindles or components shall be in accordance with AS/NZS 1554.1.
- c) Cast iron or ductile iron extensions shall not be welded.
- d) Spindles shall be coated with a bonded polymeric coating or be supplied in stainless grade 316 in aggressive soils.
- e) Length supplied appropriate to the installation specification.

Quality Control

- a) Certification of maximum strength test torques to AS/NZS 2638.1 Test J and AS/NZS 2638.2 Test M or equivalent.
- b) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Maximum input torque – design specified. (Minimum 356 Nm)		
Length of spindle		
Soil type (aggressive/non-aggressive)		
Spindle material		
Coating		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Sureflow spindle extension	Asmuss	To product specified limitations

14.2.6 Control valves – Solenoid and piloted hydraulic actuated valves.

General requirements

- a) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- b) Control valves shall comply with AS 5081 or AWWA C-530:12.
- c) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- d) Polymeric coatings shall comply with AS/NZS 4158.
- e) Minimum pressure rating shall be PN16.
- f) Refer to [section 14.4](#) for flanges.

Quality Control

- a) Casting test certificates as per [section 14.1.11](#).
- b) Control valves shall have product certification (ISO Type 5) to AS 5081 or AWWA C-530:12.
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- d) Certification of compliance with AS/NZS 4020.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Control type		
Manufacturing standards: AS 5081 or AWWA C-530:12		
Fluid type and nature		
Nominal diameter		
Protective coating: AS/NZS 4158 or Altex specified		
Flanges: Refer to section 14.4		
Flange spot facing		
Minimum pressure rated PN16		
Maximum inlet pressure		
Minimum inlet pressure		
Minimum operating outlet pressure required		
Outlet pressure at max flow		
Minimum continuous flow (l/s)		
Maximum continuous flow (l/s)		
Accuracy at minimum flow		
Installation orientation		
Pilot Control		
Control (system)		
Limit switch assembly		

Minimum standard required	Design specific requirements	Supplier submission
Power supply		
Failure mode of pilot – control indication		
Failure mode of main valve – control indication		
Position Indicator – manual, output or both		
Reverse flow inhibitor		
Pilot Setting - Supplier to advise based on Operating and Process Conditions		
Pilot Adjustment Range - Supplier to advise based on Operating and Process Conditions		
Country of manufacture		
Control valve model		
Pilot valve model		
Year of manufacture		
Serial number (on supply with each valve)		
Total assembled mass		
Recommended installation support		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Model 700	Bermad	Must be design specified
Model 100	Cla Val	Must be design specified

14.2.7 Air release/vacuum valves for sewer applications

General requirements

- a) Applicable manufacturing standard is AS 4883.
- b) Refer to [section 14.4](#) for flanges.
- c) Valves shall be double acting (combination).
- d) Typical pressure rating shall be PN16 or as otherwise suitable to the specific design location but at least 1.25x the system test pressure.
- e) Connections may be threaded for 80mm but shall be flanged for all larger valves.
- f) O-Rings and seals shall be EPDM.
- g) The float shall be from High Density Polyethylene, Polypropylene or stainless steel.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Valves shall have product certification (ISO Type 5) to AS4883.
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Double acting (Release/Vacuum)		
PN16 rated, or Minimum 1.25x system test pressure		
Size (mm diameter)		
Connection type: Flanged (over 80mm) – specify flange drilling section 14.4 BS21 threaded		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
ARV-3N	AVFI	Up to PN16
701/70	AVK	Transmission use (flange drilling). Up to PN16
SCF-RFP	Bermad (CSA)	Up to PN 16
RGX	Vent-o-mat	Transmission use Up to PN16
VM-803a (and) VM-304	Val Matic / Asmuss	Min. PN10. Choose specific to venting requirement
ARI AD020; AD025L; AD026	ARI	Networks

14.2.8 Air release/vacuum valves for water supply

General requirements

- a) Applicable manufacturing standard is AS 4956.
- b) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- c) Valves shall be double acting (combination).
- d) Minimum pressure rating shall be PN16; connections may be threaded for 80mm but shall be flanged for all larger valves.
- e) Refer to [section 14.4](#) for flanges.
- f) O-Rings and seals shall be EPDM. The float shall be from High Density Polyethylene, Polypropylene or Stainless steel. All other wetted areas shall be stainless steel grade 316 or Ductile Iron.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Valves shall have product certification to AS 4956.
- c) Certification of compliance with AS/NZS 4020 for water use application.
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Double acting (Release/Vacuum)		
PN16 rated		
Size (mm diameter)		
Connection type: Flanged (over 80mm) – specify flange drilling. Refer section 13.4 BS21 threaded		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
RBX 1601 & 1631	Vent-o-mat	80mm to 150mm
02-ARC	Bermad	50mm only, on specific application approval on pipework smaller than network mains
Series 851/10	AVK	80mm to 150mm
DAV-MH	AVFI	80mm to 150mm
Gillies	Hynds	Transmission water pipeline use
ARI AD043 and AD046	ARI	Networks

14.2.9 Hydrant valves

General requirements

- a) Hydrant valves shall be 80mm NB.
- b) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- c) Hydrants shall be manufactured to NZS 4522.
- d) Valve flanges for network application shall be flanged to AS/NZS 4087.
- e) Flange facing shall be raised face B1.
- f) 4158 (coating), AS 4087 (flange).
- g) All hydrants shall be supplied as screw down type, tall pattern with allowable working pressure to 1,600kPa, with polyurethane cup washer, PTFE gland packing or O-ring sealing system.
- h) Hydrants shall be clockwise closing fitted with a standard removable spindle cap with dimensions as per NZS4522. Colour shall be blue.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Casting test certificates as per [section 14.1.11](#).
- c) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- d) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- e) Certification of testing performed as per NZS4522.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Series 29	AVK	80mm diameter only
-	Gillies	80mm diameter only
80BFH41	Promains	80mm diameter only

14.2.10 Gate valves smaller than 50mm – Water use only

Valves in this section **shall not be used** for water mains isolation, but **only for lot service connections or processes**. For network isolation purposes using gate valves, refer to [section 14.2.1](#).

General requirements

- Valves shall be manufactured to AS1628 or BS 5154.
- All brass components shall be dezincification resistant (DR/DZR).
- Minimum pressure rating of PN16 with threaded end connections.
- Valves shall be clockwise closing and fitted with ductile or grey cast iron hand-wheel with polymeric coating. The hand-wheel shall have open spokes.
- The stem seal shall be replaceable under pressure and be either braided PTFE yarn or EPDM O-ring.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Certification of compliance with AS/NZS 4020.
- Product certification to AS1628 or BS 5154.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Applicable valve manufacturing standard		
DZR brass or better		
Minimum PN16 rated		
Size (mm diameter)		
Threaded end connections, BS21		
PTFE or EPDM stem seal		
Polymeric coated handwheel or better		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
PN16 FH	Kitz	Hand-wheel nut changed to DR type. Up to 50mm
1070 (or) 30-30LS	Pegler / Pegler Hattersley	Up to 50mm
Cimberio DZR	Hydroflow	Up to 50mm
A59M JY	Maxiflo	Up to 50mm
AGVFF (or) PGV	Asmuss	Up to 50mm

14.2.11 Ball valves for water and wastewater

Valves in this section are for use on processes and plant services.

General requirements

- a) Ball valves may be used by application up to 50mm only.
- b) Steel ball valves shall be manufactured to BS EN 1983.
- c) Copper alloy ball valves shall be manufactured to BS EN 13547.
- d) Threaded end connection shall be to BS21.
- e) Valves shall be clock-wise closing, full port, and 2-piece.
- f) Minimum pressure rating shall be PN16.
- g) Handle shall be either a stainless steel lever or grey cast iron tee with polymeric coating.
- h) Seat ring and packing ring from PTFE.
- i) Valves to be used for water shall comply with AS/NZS 4020.
- j) For wastewater applications all wetted parts shall be stainless steel 316. Water applications may either be stainless steel 316 or dezincification resistant (DR/DZR) brass.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Certification of compliance with AS/NZS 4020 when used for water applications.
- c) Product certification to BS EN 1983 or BS EN 13547 as applicable.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Applicable valve manufacturing standard		
DZR brass or better		
Minimum PN16 rated		
Size (mm diameter)		
Threaded end connections, BS21		
PTFE seat and packing ring		
Full-port flow, 2 piece		
Polymeric coated or stainless steel 316 handle		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Art.245; Art. 222C; Art.602	Bugatti Valvosanitaria	Water use
SBV	Hydroflow	Wastewater & water use
BG 412	Hydroflow	Water use
MVBBD	Maxiflo	Water use

Product model/name	Manufacturer/supplier	Specific limitation
VM BVSS2	VM (Asmuss)	Wastewater & water use

14.2.12 Non-return valves >50mm for pressure applications

General requirements

- a) Minimum pressure rating shall be PN16.
- b) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- c) Valves shall be manufactured to AS4794.
- d) Valves shall be swing check type with rubberised (vulcanised) steel disc.
- e) Downstream tapped ports shall be provided.
- f) Design shall allow for vertical installation.
- g) Refer to [section 14.4](#) for flange requirements.
- h) Non-return valves for water supply shall comply with AS/NZS 4020 for products in contact with drinking water.
- i) Non-return valves that do not comply with AS/NZS 4020 shall be marked in the casting “NOT SUITABLE FOR WATER SUPPLY” or equivalent.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body’s requirements.
- b) Product certification to AS 4794.
- c) Casting test certificates as per [section 14.1.11](#).
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- e) Certification of compliance with AS/NZS 4020 for water products.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Minimum PN16 rated		
Nominal diameter		
Flow velocity – design consideration		
Installation orientation – design consideration		
Pressure surge mitigation – design consideration		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 AS 4794 as implemented by section 14.2.12		
Flanges: Refer to section 14.4		
Protective coating: AS/NZS 4158 or Altex specified		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Swing Flex (and) Surgebuster	Val Matic	Up to 300mm
Series 41	AVK	Up to 300mm
Keystone Fig 87L	Asmuss	Up to 300mm

14.2.13 Check valves <50mm for water and wastewater

General requirements

- a) This section excludes backflow prevention (refer [section 14.2.14](#)) or boundary kits for PWC systems (refer [section 14.2.15](#)).
- b) Valves used for water shall comply with AS/NZS 4020.
- c) Check valves shall be manufactured to AS1628 or BS5154.
- d) Threaded end connections shall be to BS21.
- e) Minimum pressure rating shall be PN16.
- f) For wastewater applications all wetted parts shall be stainless steel 316. Water applications may either be stainless steel 316 or dezincification resistant (DR/DZR) brass.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Certification of compliance with AS/NZS 4020.
- c) Product certification to AS/NZS1628 or BS5154 as applicable.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Applicable valve manufacturing standard		
DZR brass or better 316 stainless steel for Wastewater		
Minimum PN16 rated		
Size (mm diameter)		
Threaded end connections, BS21		
PTFE seat and packing ring		
Full-port flow, 2 piece		
Polymeric coated or stainless steel 316 handle		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
CP20 and CP 25	Petronelli valves	20mm and 25mm
Europa BVEC	Asmuss	Water only

14.2.14 Backflow preventers

General requirements

- a) Boundary backflow prevention devices shall have a minimum working pressure rating of up to 1,200kPa and hydrostatic testing up to 2,400kPa.
- b) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- c) Valve body to be either ductile iron with polymeric coating to AS/NZS 4158, or stainless steel 316, or cast bronze (unleaded), or DR brass.
- d) Backflow preventers shall be manufactured to AS/NZS 2845.
- e) All internal parts shall be accessible to allow inline maintenance.
- f) Testable valve to be fitted with BSPT threaded test points.
- g) Threaded end connections shall be to BS21 and is limited up to 50mm valves.
- h) Flanged devices flanges shall comply with AS/NZS 4087.
- i) Flange facing shall be raised face B1.
- j) Valve design will allow for both horizontal and vertical installation.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification to (ISO Type 5) AS/NZS 2845.
- c) Polymeric coatings shall have product certification to AS/NZS 4158.
- d) Certification of compliance with AS/NZS 4020.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
007; 009; 709; 909	Watts	Specific to application and legislative requirement
350; 375; 950; 975	Wilkins	Specific to application and legislative requirement
805Y; 850; 860 880 905Y	Febco	Specific to application and legislative requirement
40204A2; RPZ	Conbraco	Specific to application and legislative requirement
RPO3; DCO3	Pentair (PWS)	Specific to application and legislative requirement
4A-100; 4A-200; 4AE-100; 4AE-200	Aqualine	Specific to application and legislative requirement
DCV; DCVE; RPZ; RPZE	Flowmatic	Specific to application and legislative requirement
Colt C400; C500	Ames	Specific to application and legislative requirement
DN50	Caleffi	Specific to application and legislative requirement

14.2.15 Boundary kits for pressure wastewater collection (PWC) system

General requirements

- a) All components shall have a minimum pressure rating of PN16.
- b) The boundary kit shall consist of a ball valve isolation valve, non-return and flushing point. The kit shall have a maximum of six threaded joints between the components; including the end connections. All threaded jointing using hemp and graphite.
- c) All fittings shall be stainless steel 316. The flushing point (Tee) shall be fitted with a polymer threaded plug. Tail end or transition fittings shall be stainless steel 316 or a direct electrofusion transition to PE pipe.
- d) The ball valve shall comply with the requirements in [section 14.2.11](#) for wastewater. The valve shaft shall be fitted with a stainless steel square top.
- e) PWC boundary kits shall comply with AS/NZS 1546.1.
- f) The access box shall comply with the requirements in [section 14.8.2](#) for boxes for valves.

Quality Control

- a) All components shall be marked in accordance with the conformity assessment body's requirements.
- b) Individual components as specified by the referenced sections in the general requirements.
- c) Valve kits shall be pre-assembled and hydrostatically tested to 1600kPa with certification provided.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
-	E/One	-
-	Aquatec	-
PSS-BK4	Mono	-
PWC boundary kit	Aquate	-

14.2.16 Knife gate valves 50mm diameter and greater

General requirements

- j) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- k) Valves shall have a minimum pressure rating of PN10 for gravity systems and PN16 for pressure systems. **Note:** The designer must demonstrate the maximum upstream and downstream static pressure.
- l) Spindle shall be non-rising.
- m) Spindle seal shall be non-asbestos gland box or O-ring that is accessible for replacement under full operating pressure.
- n) Valve operating torque shall not exceed 125Nm at the fully unbalanced allowable operating pressure, otherwise a gearbox shall be equipped, see [section 14.2.4](#).
- o) The direction of rotation of input shaft shall be clockwise to close the valve for wastewater and anti-clockwise for water.
- p) The valve handwheel operating direction shall be permanently marked on the valve, gearbox, spindle cap or hand-wheel.
- q) Valves shall allow for bi-directional flow and bi-directional sealing. Flow shall be full bore.
- r) Refer to [section 14.4](#) for flanges.
- s) Polymeric coatings shall comply with AS/NZS 4158.
- t) Acceptable manufacturing standards are AS6401 and AWWA C520.

Quality Control

- h) Casting test certificates as per [section 14.1.11](#).
- i) Knife gate valves shall have product certification (ISO Type 5) to AS6401 or AWWA C520.
- j) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- k) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646 and AS 681.1 (EN 681-1).
- l) All products shall be marked in accordance with the conformity assessment body's requirements.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Nominal diameter		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 , and AS6401 or AWWA C520 with specific requirements stated by section 14.2.16		
Protective coating: AS/NZS 4158 or Altex specified		
Elastomeric seals to AS1646		
Flanges: Refer to section 14.4		
Valve operability/input/output		
Installation orientation		

Minimum standard required	Design specific requirements	Supplier submission
<i>Minimum pressure rating:</i> PN10 for gravity PN16 for pressure		
Maximum operating pressure of installation		
System test pressure		
Maximum flow velocity		
Upstream maximum static pressure		
Downstream maximum static pressure		
Valve closing direction		
Operation input (i.e. hand-wheel, actuator, etc.)		
Maximum handwheel diameter (if required – refer gearboxes for valves)		
Maximum operating torque for specified handwheel diameter is 356 N		
<p>Actuation:</p> <p><i>Gearboxes, Required for input over 125 Nm unbalanced operation – attach procurement schedule from section 14.2.4</i></p> <p><i>Electric actuators – attach procurement schedule from section 14.13.5</i></p>		
Valve specific information submittal		
Valve manufacturer		
Country of valve manufacture		
Valve model		
Primary dimensions (or include drawings)		
Year of manufacture		
Serial number (supplied with each valve)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation

14.2.17 Globe valves (stopcock) 50mm diameter and smaller

Valves in this section **shall not be used** for water mains isolation, but **only for lot water service connections**. For network isolation purposes using gate valves, refer to [section 14.2.1](#).

General requirements

- f) Valves shall be manufactured to BS 5433 or BS 5154.
- g) All brass components shall be dezincification resistant (DR/DZR).
- h) Minimum pressure rating of PN16 with threaded end connections.
- i) Valves shall be clockwise closing and fitted with a brass T-handle.
- j) The stem seal shall be replaceable under pressure and be either braided PTFE yarn or EPDM O-ring.
- k) The valve seal shall be replaceable and the seat be of adequate thickness to allow re-cutting for maintenance.

Quality Control

- d) All products shall be marked in accordance with the conformity assessment body's requirements.
- e) Certification of compliance with AS/NZS 4020.
- f) Product certification to BS5433 or BS 5154.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Applicable valve manufacturing standard		
DZR brass or better		
Minimum PN16 rated		
Size (mm diameter)		
Threaded end connections, BS21		
PTFE or EPDM stem seal		
Polymeric coated handwheel or better		
AS/NZS 4020 compliant for water use		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
EBCO SV5402FCR to SV5408FCR	Ebco	
EBCO SV5402MCR	Ebco	
EBCO SV5420BCR to SV5463BCR	Ebco	

14.3 Couplings and connections

14.3.1 Mechanical couplings, un-restrained, for water supply and sewer

This section **excludes** couplings for use on **polyethylene pipelines**. Refer [section 14.1.7](#). The purposes of un-restraint mechanical couplings shall be for leak repair, damaged pipe section replacement or designated dismantling locations only. Applications are where no movement restraint is required but **shall not be used for ordinary pipe jointing of new pipelines or as a deflection/articulation joint, refer [section 14.3.3](#)**.

General requirements

- a) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- b) Couplings shall comply with AS/NZS 4998.
- c) Minimum pressure rating is PN16.
- d) Joint seals shall be EPDM, NBR or NR as suitable for the specific application and complying with AS 1646 and AS 681.1 (EN 681-1).
- e) Fasteners shall be stainless steel 316, refer to section [14.5](#) and [14.6](#).
- f) Refer to [section 14.4](#) for flanges.
- g) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Couplings shall have product certification (ISO Type 5) to AS/NZS 4998.
- c) Casting test certificates as per [section 14.1.11](#).
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- e) Certification of compliance with AS/NZS 4020 where used for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Application diameter/range		
Minimum PN16 rated		
Stainless steel 316 fasteners		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 AS/NZS4998 as implemented by this section		
Protective coating: AS/NZS 4158 or Altex specified		
AS/NZS 4020 compliance (if for water)		
Product and Test certificates		

Accepted products

Listed product are for general acceptance up to 300mm diameter. Project specific suitability must be confirmed over this size.

Product model/name	Manufacturer/supplier	Specific limitation
Maxifit – Couplers and Flange adaptors	Viking Johnson	Not for PE or articulation joint
Varigib	Wang	Not for PE or articulation joint
Series 601;602;603	AVK	Not for PE or articulation joint
Multi-gib	Deks	Not for PE or articulation joint
Unrestrained S/S barrel coupling	Daemco	Not for PE or articulation joint

14.3.2 Mechanical couplings, restrained, for water supply and sewer

This section **excludes** couplings for use on **polyethylene pipelines**. Refer [section 14.1.7](#). These couplings are used for designated dismantling locations or damaged pipe section replacement but **shall not be used for ordinary pipe jointing or as a deflection/articulation joint**, refer [section 14.3.3](#).

General requirements

- Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- Couplings shall comply with EN14525.
- Minimum pressure rating shall be PN16.
- Fasteners shall be stainless steel 316, refer to section [14.5](#) and [14.6](#).
- Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- Joint seals shall be EPDM complying with AS 1646 and AS 681.1 (EN 681-1).
- Refer to [section 14.4](#) for flanges.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Couplings shall have product certification (ISO Type 5) to EN14525.
- Casting test certificates as per [section 14.1.11](#).
- Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- Certification of compliance with AS/NZS 4020 where used for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Application diameter/range		
Minimum PN16 rated		
Stainless steel 316 fasteners		
Manufacturing standards: AS 1831 as implemented by section 14.1.11 EN14525 as implemented by this section		
Protective coating: AS/NZS 4158 or Altex specified		
AS/NZS 4020 compliance (if for water)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Aquagrip; Aquafast; Ultragrip	Viking Johnson	Not for PE or articulation joint
Sytem 2000; Synoflex; Vario	Hawle	Not for PE or articulation joint
Multi/Joint 3000	Georg Fischer	Not for PE or articulation joint

Product model/name	Manufacturer/supplier	Specific limitation
VAG Dismantling joint	VAG Armaturen	Flanged dismantling joint. Not for PE or d articulation joint
Type 265	AVK	Flanged dismantling joint. Not for PE or articulation joint
PAS30; PAS20	Erhard	Flanged dismantling joint. Not for PE or articulation joint

14.3.3 Mechanical couplings, flexible restrained joints for articulation and expansion

General requirements

- Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- Steel bellows shall be manufactured to BS ISO 15348 and BS EN 14917 or ASTM F1120-87.
- Stainless steel fittings shall be grade 316.
- Fasteners shall be stainless steel 316, refer to [section 14.5](#) and [14.6](#).
- Minimum pressure rating shall be PN16 for pressure pipe.
- Minimum crush load rating for gravity application shall be SN16.
- Refer to [section 14.4](#) for flanges.
- Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Casting test certificates as per [section 14.1.11](#).
- Steel bellows shall have product certification to (ISO Type 5) BS ISO 15348 or ASTM F1120-87.
- Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- Certification of compliance with AS/NZS 4020 where used for water applications.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description / drawing		
Installation environment: external, marine, etc.		
Fluid type		
Nominal diameter		
Minimum operating pressure PN16		
Test pressure minimum 1.25 x PN16		
Maximum flow rate		
Manufacturing standard: BS ISO 15348 BS EN 14917 ASTM F1120-87 As implemented by this section		
Joint seals to AS 1646		
Stainless steel 316 fasteners		
AS/NZS 4020 compliance (if for water)		
Protective coating: AS/NZS 4158 or Altex specified		
Type of movement (may be combination of):		

Minimum standard required	Design specific requirements	Supplier submission
Lateral thrust or expansion Horizontal/Vertical Angular Bi-planar Hinged Double-hinged Universal (restrained) Double end		
Flanges: Refer to section 14.4		
Overall length		
Design temperature range: minimum to maximum °C		
Axial shortening mm		
Axial extension mm		
Design horizontal offset		
Design vertical offset		
Design angular deflection		
Axial force (kN)		
Lateral force (kN) compression and contraction		
Fatigue (cycles): 5% of design movements (maintenance) 25% of design movements (events, seismic, subsidence) 80% of design movements (daily temperature and pressure variations, vibration)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Flex-Tend	Hynds	Design input required
FJ restraint	Romac	Design input required
EJ400	Romac	Design input required
Jolly joint	Nova Siria	Design input required
SEB, UEB, TEB, HEB, DHEB, GEB, DGEB	Axial Dynamics	Design input required

Product model/name	Manufacturer/supplier	Specific limitation
Geoflex	Saint Gobain	Design input required

14.3.4 Repair and off-take repair clamps for water supply

This section **excludes** clamps for use on **polyethylene pipelines**. Refer [section 14.1.7](#)

General requirements

- a) Minimum pressure rating shall be PN16.
- b) Ductile iron body casting shall comply with [section 14.1.11](#) of this standard.
- c) Stainless steel fittings shall be grade 316.
- d) Fasteners shall be stainless steel 316, refer to section [14.5](#) and [14.6](#).
- e) Clamps shall comply with AS 4181 and be specified Type R for rigid pipe or type F for flexible pipe applications.
- f) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Couplings shall have product certification (ISO Type 5) to AS 4181.
- c) Casting test certificates as per [section 14.1.11](#).
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.
- e) Certification of compliance with AS/NZS 4020.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Application diameter/range		
Minimum PN16 rated		
Stainless steel 316 fasteners		
Manufacturing standards: AS4181 as implemented by this section		
Protective coating: AS/NZS 4158 or Altex specified		
AS/NZS 4020 compliance (if for water)		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Open-Flex1; Straub-flex; Straub clamp SCE	Straub	Un-restrained. 50mm to 250mm only
Straub –metal-grip; Straub-eco-grip	Straub	Self-restrained. 50mm to 250mm only
K2	Kawandah	Un-restrained. 50mm to 250mm only
Repair; Tapped Offtake Repair	Wang	Un-restrained. 50mm to 250mm

Product model/name	Manufacturer/supplier	Specific limitation
		only
CR,CTR; CF; CFW	Rapid	Un-restrained. 50mm to 250mm only
EasiClamp, EasiTap	Viking Johnson	80mm to 150mm only
Norma connect	Norma / P&I	Un-restrained. 50mm to 250mm. Excludes min-clamp

14.3.5 Couplings (banded) for sewer gravity applications

General requirements

- a) Shear ring and band fasteners shall be stainless steel grade 316.
- b) Couplings shall be manufactured to AS/NZS 4327 with coupling elastomer type B.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Couplings shall have product certification (ISO Type 5) to AS/NZS 4327.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Application diameter/range		
Stainless steel 316 shear ring and band fasteners		
Minimum SN16 rated		
Manufacturing standards: AS4327, Type B as implemented by this section		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Type B	Aqualine	Gravity sewer only
Type B	Synapco	Gravity sewer only
Type B	Keramo	Gravity sewer only
Type B	Flexseal	Gravity sewer only
Flex connect	Rehau	Gravity sewer only

14.3.6 Tapping bands for water connections

This section **excludes** tapping for use on **polyethylene pipelines**. Refer [section 14.1.7](#)

General requirements

- Tapping bands shall comply with AS/NZS 4793 as the normative.
- Tapping bands for use on PVC shall dimensionally comply with AS/NZS 1477.
- Minimum pressure rating shall be PN16.
- Fasteners shall be stainless steel 316, refer to section [14.5](#) and [14.6](#).
- Gunmetal tapping bands shall be LG2 only.
- Minimum nominal tapping ID of 20mm.
- Tapping bands may be used on pipe up to a maximum diameter of 300NB. A Tee shall be installed for pipe of larger diameter.
- Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Tapping bands shall have product certification (ISO Type 5) to AS/NZS 4793.
- Certification of compliance with AS/NZS 4020.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Tapping diameter		
Pipe diameter/range (maximum pipe diameter use 300 NB)		
Minimum PN16 rated		
Manufacturing standards: AS/NZS4793 PVC couplings to AS/NZS1477 As implemented		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
AC/DI Tapping strap (Model with Stainless steel bolts)	Giltech Precision	Application specific for PVC, DI and AC pipe
Series 1, Series 2	Plasson	PVC pipe only
4N for PVC and DI	Stockbrands	PVC series 1 and 2; DI pipe, AC pipe – refer to section 14.1.7 for PE option
Promains LG2	Promains	Application specific for PVC, DI and AC pipe

Product model/name	Manufacturer/supplier	Specific limitation
P&I LG2	Pipe and Infrastructure	Application specific for PVC, DI and AC pipe

14.4 Flanges

This section relates to waterworks flanges for linear system

General requirements

- a) Flanges shall be metal as specified and manufactured to AS/NZS 4087 (standard covers sizes up to 1200mm).
- b) Weld neck flanges to AS/NZS 4087 (neck manufactured to AS 2129) may be specified where the design requires high fatigue or stress resistance as typically required for Transmission installations.
- c) For special installations where the component is larger than 1200mm or cannot be supplied to AS/NZS 4087, then BS EN 1092-1 (-2 for Ductile iron flanges), type 11 is used.
- d) Flange face finish shall be machine faced serrated concentric or serrated spiral grooves:

Radius of round nosed tool mm	R _a (EN ISO 4287) μM		R _z (EN ISO 4287) μM	
	Min.	Max.	Min.	Max.
min. 1.0mm	3.2	12.5	12.5	50

- e) Flange materials shall have a minimum yield stress of no less than 250 MPa.
- f) Stainless steel grade shall be 316L grade.
- g) Ductile iron flanges shall be minimum 450-10 grade (unless part of accepted cast fitting at lower grade), refer [section 14.1.11](#).
- h) Grey cast iron or copper alloy flanges are not accepted for pipework.
- i) Flanges shall be raised face (steel Figure B7 or ductile iron Figure B5) and minimum PN16 rated.
- j) Flat face flanges may only be used on flat pump facings or specific design where a raised face may cause the connecting flange to break e.g. Cast iron or GRP.
- k) Weld-neck flanges shall be required as specified.
- l) Uncoated flanges shall be coated with a heavy duty anti-corrosive product suitable for storage purposes. The corrosion protection product used shall be easily removable for installation. All ductile iron flanges shall be fully factory coated to AS/NZS 4158 with the raised-face area uncoated when specified.
- m) Spot facing is required on the back face of all cast flanges to allow correct seating of the washers. Refer to Watercare General Mechanical Construction standard.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Flanges shall have product certification (ISO Type 5) to AS/NZS 4087 or BS EN1092.
- c) Material testing of ductile iron flanges shall be certified as per [section 14.1.11](#).
- d) Material testing of stainless steel flanges shall be certified to ASTM A240.
- e) Material testing of mild steel flanges shall be certified to AS 2074.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Fluid type		
Connecting pipe material type and rating		
Flange material		
Pipe outside diameter		
Pipe internal diameter (without lining)		

Minimum standard required	Design specific requirements	Supplier submission
Flange nominal diameter		
Flange standard AS/NZS 4087, or BS EN 1092-1/2 by specific design		
Raised face Figure B5 or B7		
Weld-neck required y/n (to be specified)		
Minimum operating pressure PN16		
Minimum test pressure (to be specified)		
Product and Test certificates		

14.5 Bolts and nuts

Refer to the General Mechanical Construction standard for specific bolt and nut applications. Others may be specified based on specific design.

General requirements

- a) Bolts for general purpose and small flange connections shall be ISO metric manufactured to AS 1111.1 grade 4.6 or stainless steel 316 class 50.
- b) Nuts for general purpose and small flange connections shall be ISO metric manufactured to AS 1112.3 grade 4.6 or stainless steel 316 class 50.
- c) Bolts and nuts for high strength structural engineering or large flanges shall be manufactured to AS/NZS 1251 grade 8.8 or stainless steel 316 class 80.
- d) Hot dip galvanising on fasteners shall be completed to AS 1214 with the following oversize tapping allowance:

Size	Microns
M22	400
M24	450
M27	500
M30	550
M33	600
M36	600
M36 to M48	800
M48 to M64	1000

Quality Control

As applicable to the application:

- a) Bolts shall have product certification (ISO Type 5) to AS 1111.1.
- b) Nuts shall have product certification (ISO Type 5) to AS 1112.3.
- c) Structural bolts shall have product certification (ISO Type 5) to AS/NZS 1251.
- d) Hot dipped galvanised bolts and nuts shall be certified to AS 1214.

14.6 Washers

General requirements

- a) Washers shall be manufactured from mild steel to AS/NZS 3679.1 or stainless steel 316.
- b) Hot dip galvanising shall be completed to AS/NZS 4680.
- c) Refer to [section 14.11.6](#) for isolation washers used for cathodic protection.

Quality Control

- a) Mild steel washers shall have product certification to AS/NZS 3679.1.

14.7 Gaskets for flanges

General requirements

- Flange gaskets shall be manufactured to comply with BS 7531, BS EN 12560-2 and BS EN 1514-1 applicable to the gasket type.
- Gaskets shall not contain any asbestos fibre.
- Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- Gasket materials shall generally be suitable for 16bar pipeline operating pressure and minimum 20bar test pressure unless a lower pressure is specified for gravity wastewater.
- Natural and nitrile insertion rubber shall have hardness in the range between 60 and 75 IRHD units, and shall have a cotton reinforcing fabric layer.
- The gasket inside diameter may be varied to accurately match the flange inside diameter.
- Gaskets for insulating flange joints shall be cut with an inside diameter 2mm less than the flange's internal diameter and an outside diameter 2mm larger than the flange's external diameter.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Gaskets shall be tested to BS EN 14772.
- Certification of compliance with AS/NZS 4020 for products in contact with water.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Nominal diameter		
Fluid type		
Temperature range: minimum to maximum °C		
Flange standard Refer to section 14.4		
Flange clamping force (tensile load (kN))		
Insulation flange purpose: ID 2mm smaller than flange and OD 2mm larger than flange		
Minimum operating pressure PN16		
Minimum test pressure 20bar		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Klingsil C-4430	Klinger	General joints as per mechanical construction standard

Product model/name	Manufacturer/supplier	Specific limitation
Inca	James Walker	General joints as per mechanical construction standard
Style 2500	Garlock	General joints as per mechanical construction standard
Flexitallic SF 2400 and SF 2800	Industrial Specialities	Wastewater networks up to 300mm only
Neoprene, EPDM, Nitrile rubber	N&P Industries – James Walker	Water networks up to 250mm, magnetic meter joints, all buried Wastewater. Per design, see mechanical construction standard
EPDM, Insertion Rubber	Hynds	Networks water and wastewater flange joints
EPDM, Insertion Rubber	SHUK	Networks water and wastewater flange joints

14.8 Manholes and street-ware

14.8.1 Covers for manholes and chambers

Applicable to covers for man access to chambers, maintenance access holes and inspection openings.

General requirements

- a) Covers and frames shall conform to EN 124 or AS3996 with the following application:
 - **EN 124** - The minimum class for any cover and frame shall be Class D 400 (Carriageways of major road speed limit > 100km/h). For areas with high wheel loads Class E 600 shall apply. Where there is any doubt the stronger class shall be specified.
 - **AS3996** - The minimum class for any cover and frame shall be Class D (Carriageways imposing high nominal wheel loads). For areas with high wheel loads Class E or Class F shall apply. Where there is any doubt the stronger class shall be specified.
- b) The frame depth of covers shall be at least 100mm.
- c) Covers and frames of ductile iron shall have a bituminous coating in accordance with AS3996 or AS/NZS 3750.4 or EN 124.
- d) All fabricated steel covers and frames (not cast) shall be hot-dip galvanised after fabrication in accordance with AS/NZS 4680.
- e) Man access hole cover sets shall have a minimum clear opening of 600mm diameter.
- f) The cover surface slip resistance shall comply with AS/NZS 4586, class V and ramp classification R10.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Manhole access covers shall have ISO Type 5 product certification to EN 124 or AS3996.
- c) For galvanised covers certification to AS/NZS 4680.
- d) All covers shall be certified AS/NZS 4586 for slip resistance.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
D400 600mm	Maestro - Hygrade	Networks only – air sealed application
D400 800mm	Maximo - Hygrade	Networks only – air sealed application
Hinged Class D (Item 78255)	Humes	Networks only - vented application
Korum D400	Saint Gobain	Transmission water (see standard drawings) and Wastewater – vented application
Pamtight D400; Pamrex D400	Saint Gobain	Transmission Wastewater only – air sealed application
Twino D400	Norfond	Networks only – vented application
Water reservoir hatches	Peltech Engineering Morgan Engineering and Sheetmetals	Watercare standard design for reservoir hatches
Watercare chamber lids	Peltech Engineering Morgan Engineering and Sheetmetals	Watercare standard design for chamber access such as PRV chambers and air valve chambers

Product model/name	Manufacturer/supplier	Specific limitation
610 round cover and frame	Surecast Metals	Local network wastewater – air sealed applications

14.8.2 Surface boxes for housing meters and valves

Applicable to housing meter boxes and for gaining access to isolation valves and valve spindles

General requirements

- Box sizes shall allow adequate free space to maintenance and insert any tools required to complete operations intended to be contained within the box enclosure.
- Boxes where installed in driveways or footpaths shall comply with AS3996 Class B rating and for heavy load driveways such as industrial areas shall comply with AS3996 Class D rating.
- Box lid surface slip resistance shall comply with AS/NZS 4586, minimum class V and ramp classification R10.
- Box lids shall be clearly marked in the casting in accordance with the intended content for 'METER', 'VALVE', 'SEWER' etc. as appropriate.
- Colour requirements of box lids are listed below:

Application	Colour of lid
Fire hydrants	Yellow
Valves in water network areas (Isolation, air release, scour)	White
Valves in water transmission areas (Isolation, scour)	Blue
Special controlled zone – Normally shut	Red
Wastewater valves and boundary kits	Red
Water meter boxes	Black
Grey water – all	Purple

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Boxes shall have ISO Type 5 product certification to AS3996.
- Box lids shall have ISO Type 5 product certification to AS/NZS 4586.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Metallic Surface Boxes (made in India)	Humes	Heavy duty lids only. Check rating and location of use with supplier
Metallic Surface Boxes (made in India)	Hygrade/Hynds	Heavy duty lids only. Check rating and location of use with supplier
Metallic Surface Boxes	SureCast Metals	Heavy duty lids. Check rating and location of use with supplier
DRA30/1 or /5	Draper Enterprises	Meter box and base, lid selection per location
AMBJ	Acuflo	Meter box and base, lid selection

Product model/name	Manufacturer/supplier	Specific limitation
		per location
Channel pits class C	Humes	Multiple meters. Bulk meters. Various sizes as required. Must be fitted with coloured puck to indicate water or sewer service. Fitted with lifting bolt.

14.8.3 Manhole safety grilles

Manhole safety grilles for the purpose of fitting into manhole access lid frames where there are:

- Water system unsecured service chamber entries and scour chambers; and
- Sewerage maintenance holes/chambers and man access holes (manholes).

General requirements

- Manhole safety grilles shall comply with AS3996 Class A.
- Grilles shall be constructed from stainless steel 316L grade or an approved equivalent material with adequate strength and corrosion properties.
- The maximum opening size of any section of the grille fit and surface shall not pass more than 150mm diameter.

Quality Control

- All products shall be marked in accordance with the conformity assessment body's requirements.
- Manhole safety grilles product certification (ISO Type 5) to AS3996 Class A. This certification shall include the fit to the access lid frame design meeting the specified load requirements.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Impact – Korum-Twino	Impact Engineering	Fits Korum and Twino
Impact Maestro	Impact Engineering	Fits Maestro
Hygrade HD	Impact Engineering	Fits hygrade HD 485mm (<i>not for new lids, retrofit only</i>)
Hygrade LD	Impact Engineering	Fits hygrade LD 510mm (<i>not for new lids, retrofit only</i>)
48514	Humes	Fit to Humes lids
48503	Humes	Fit to Humes lids 460mm opening (<i>not for new lids, retrofit only</i>)
CSG600SSH	Caliber	Fit to Humes lids
CSG600SSM	Caliber	Fits Maestro lids
CSG600SSTK	Caliber	Fits Twino and Korum lids
CSG600SSC	Caliber	Fits Surecast hinged lids

14.8.4 Prefabricated manholes in Concrete, PP, PE, or GRP

Applies to prefabricated man access chambers constructed from concrete or plastics for use in gravity sewers of $\leq 300\text{mm}$ NB connecting pipework

General requirements

- a) Elastomeric joints shall be EPDM, SBR, NR or CR complying with AS 1646 and AS 681.1 (EN 681-1). Joints shall be fully watertight to the installation depth
- b) Products shall be manufactured to:
 - Polypropylene to AS/NZS 5065
 - Polyethylene to AS/NZS 5065
 - Glass reinforced thermoplastic to ASTM D3262-11
 - Concrete to AS/NZS 4058
- c) The design shall prevent buoyancy to full chamber height.
- d) The nominal access throat diameter shall be minimum DN 600 with a maximum depth of 450mm.
- e) The depth of the lowest side of the throat to the first step rung shall be maximum 500mm.
- f) Load rating on the lid shall be HN-HO-72 in accordance with the NZTA Bridge Manual under installed conditions.
- g) The installed manhole shall be able to withstand lateral forces through soil loading, anticipated ground movements and top loading to the designed depth.
- h) Concrete chambers shall have an additional 25mm sacrificial layer or a special concrete mix to prevent corrosion (CaC) or, on specific approval a PVC or PE lining.
- i) For ladders and step rungs refer to [section 14.8.5](#).
- j) For manhole pipe invert connectors refer to [section 14.8.6](#).

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Manholes shall have ISO Type 5 product certification to the applicable standard for the product material.
- c) Load rating certification compliant with HN-HO-72.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Connecting pipe material type and rating		
Nominal diameter Min 1000mm for manholes Min 675mm for terminating manholes		
Manhole riser depth		
Joint seal: Type Sealing (mH ₂ O) > manhole riser depth		
Detail expected ground movement that the structure must be able to withstand		
Configuration – inlets and outlet		

Minimum standard required	Design specific requirements	Supplier submission
detail / drawing		
Fall / grade through base per design code		
Energy dissipation		
Anti-floatation		
Manufacturing standard – applicable to parent material type		
Cover detail / drawing		
HN-HO-72 load rated when installed		
Ladder AS/NZS 1657		
Special treatment, coating or lining		
Concrete min 25mm additional cover over reinforcement (concrete chambers), or CaC, specific lining approval		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Done manhole – prefabricated manhole base	Sherriff drainage	Grades < 7%. Connectors pre-fitted. SN16 PVC drains
Romold manhole system	Australasia moulding	Grades < 7%. Specific design
Manhole/chambers	Maskell	Specific design
Concrete manholes: Manhole system (excl. Hyseal connectors)	Hynds	Specify to meet design
Concrete manholes: VT, Humes seal	Humes	Specify to meet design
KBL manhole plug	KBL / Hynds	Plug to seal unused manhole penetrations

14.8.5 Ladders and step rungs for chambers

General requirements

- a) Step rungs and ladders shall be manufactured to comply with AS/NZS 1657.
- b) Hot dip galvanising on fasteners shall be completed to AS 1214.
- c) Step rungs can be used where chambers are less than 1500mm in diameter/square and less than 3m deep.
 - Step rungs shall be galvanised mild steel or an approved polymer. Encapsulated step rungs are not accepted.
- d) Ladders shall be used where chambers are more than 1500mm diameter/square or more than 3m deep.
 - Ladders shall be galvanised mild steel or aluminium to Watercare standard design. Other materials are not permitted.
- e) Ladders or step rungs in contact with potable water shall comply with AS/NZS 4020.

Quality Control

- a) Step rungs shall have ISO Type 5 product certification to AS/NZS 1657.
- b) Hot dip galvanising to AS 1214.
- c) Compliance with AS/NZS 4020 for products in contact with water.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Aluminium step ladders	Ulrich Aluminium	Dry chamber or other facilities with non-aggressive atmosphere.
KBL polymer step rung	KBL Ltd.	Manholes less than 3m deep and <1500mm diameter. Testing in accordance with EN13101 accepted.
Hynds Galvanised step rungs	Hynds	Manholes less than 3m deep and <1500mm diameter.
Humes Galvanised step rung	Humes	Manholes less than 3m deep and <1500mm diameter.

14.8.6 Manhole invert connectors

General requirements

- a) Pipe material or fittings used in manufacturing the invert connector shall comply with the applicable standard listed under [section 14.1](#).
- b) Transmission wastewater invert connectors shall be typical concrete pipe or Watercare's standard cast in concrete collar detail for PE pipe.
- c) Heat shrunk transition pieces shall be factory applied.
- d) Glued fittings are not accepted.

Quality Control

- a) Pipe material shall be ISO Type 5 tested to the relevant pipe standard under [section 14.1](#).

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
PVC manhole connectors (PVC/MCM), 1580 Manhole connector, DWV drop junctions (ID, EDJ, DJ), Z1500HF	Solo Plastics	Local networks – wastewater
C-tech	Humes	Local networks - wastewater
Manhole Invert Connector	Mico	Local networks - wastewater
VC with PVC short	Hynds/Hygrade	Local networks – wastewater
Strata PVC short	Strata plastics	Local networks up to 500 OD for PE pipe adaptor and 630mm for PVC pipe adaptor
Sliding Manhole joint	Asmuss	Local networks – wastewater

14.9 Pumps

14.9.1 Grinder pumps for private sewer application

Applies to pumps for use in PWC systems

General requirements

- a) Pumps shall be selected for the specific application where a minimum of 0.4 l/s is achieved at the pressure wastewater system average operating head. The pump maximum operating head for short periods shall exceed the pressure system maximum head by minimum 10%.
- b) Pumps shall be fitted with a 240v, 50 Hz single phase motor meeting AS/NZS 3000 requirements and rated IP68. Refer to [section 14.13.7](#) for motors.
- c) The grinder low pressure pumping system shall comply with ASF/ANSI 45 and fittings with the respective section in this standard.
- d) Fittings shall be minimum PN16 rated and selected to prevent environmental and galvanic corrosion
- e) The minimum pipework size shall be 32mm internal diameter.
- f) Overload/over-pressure protection at maximum shut-off head.
- g) The grinder cutter shall be a single piece stainless steel hardened to 55-60Rc.
- h) Tanks shall comply with AS/NZS1546.1 with minimum 24 hours storage capacity for the unit it is serving. (min. 660 litres for a standard domestic dwelling).
- i) Tanks in trafficable areas shall comply with the level of traffic expected as per AS3996 or EN124.
- j) Tank covers shall comply with [section 14.8.1](#). Non-trafficable areas shall be rated for minimum 500kg. Access cover shall be child proof.
- k) The control panel shall be minimum IP65 rated and provided with lockable access security.
- l) Control panels shall be fitted with a suitable emergency generator connection.
- m) Alarms shall be audible and visual with minimum:
 - High level alarm
 - Pump fault or conditions preventing pumping operation
 - Alarms reset automatically after issue resolution
 - Button on the panel to silence audible alarms
- m) Maintenance manuals, control diagrams and wiring detail, installation and commissioning manuals, drawings and home owner's manual shall be stored in a purpose compartment in the control panel.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) The product shall have a minimum 2 year manufacturer's warranty, completed with each installation.
- c) Product certification (ISO Type 3 or 5) to NSF/ANSI 46.
- d) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
E/One	E/One	System head 55m at 0.4l/s. Note design limitations for new systems in CoP
InviziQ	Mono	System head 45m. Note design limitations for new systems in CoP
SGPC	Barnes Aquatec	System head 54m at 0.4l/s. Note design limitations for new systems in CoP
GP2	Sabre	System head 60m at 0.4l/s. Use Rational Method or Dynamic

Product model/name	Manufacturer/supplier	Specific limitation
		Hydraulic modelling when sizing pump. Not Probability Method. Distribution board circuit breaker to be rated for pump motor size. Note design limitations for new systems in CoP
Zoeller 7021	Aquatec	System head 58m at 0.4l/s. Note design limitations for new systems in CoP
OGT	Aquatec	System head 50m at 0.4l/s. Note design limitations for new systems in CoP

14.9.2 Submersible pumps for sewer pumping stations

General requirements

- a) Refer to [section 14.13.7](#) for motors.
- b) The impeller type shall be selected specifically for the design or operational application, taking into consideration the best efficiency requirements as specified by the design.
- c) For all Submersible pumps up to 7.5kW:
 - i. Motors shall be supplied with an integral vendor cable(s) which will be connected to a junction box located as close as possible to the motor (i.e. at the top of the pump guide bars). The junction box shall house fixed terminals for the connection of field wiring. Floating connections are unacceptable.
 - ii. All submersible pumps shall be provided with monitoring of winding temperature and moisture ingress as a minimum. Moisture ingress via cable or cable gland and also moisture ingress via mechanical seals must be monitored and alarmed prior to moisture making it to the stator windings.
 - iii. Each pump unit shall be provided with suitable relay devices, fully compatible with the detection probes supplied and with fully detailed wiring and connection details. All such relays and associated components shall be readily available in New Zealand. Relay devices shall be housed in field control enclosure.
- d) Conformance with WSA101:2008 industry standard for submersible pumps for sewage pumping stations amended as follows:

Clause	Amendment
2.1	Paragraph 1, delete: "See Appendix B for alternative materials"
	Replace Note with "Material equivalence will be considered by Watercare standards governance group or as may be nominated by the Standards Engineer"
2.4	Paragraph 4, delete: "hot-dip galvanized to AS/NZS 4680"
	Delete "Note: Other protective... may be acceptable"
Table 2.1	Delivery hose minimum grade "Class C rated to 10 bar" replace with "16 bar"
3.7.1	Notes, replace "a ruling committee of asset owners and operators selected by the Water Services Association of Australia (WSAA)" with "Watercare Services Ltd"
3.7.2	Note, replace "a ruling committee of asset owners and operators selected by the Water Services Association of Australia (WSAA)" with "Watercare Services Ltd"
3.7.3	Delete clause (b)
3.7.7.1	Delete clause 3.7.7.1 Insert: "Electrical Motors shall comply with the requirements as specified by Watercare electrical standards"
3.7.7.6	Last paragraph "of 15 m" , replace with "up to the maximum depth of the manhole wet well plus 5 m"

Clause	Amendment
3.8.1	Delete “Note:...”
3.9.1	Delete clause 3.9.1
3.9.5	Replace “Flange gaskets... WSA 109.” with “Flange gaskets shall comply with Watercare’s general mechanical construction standard. O-rings shall comply with AS1646.”

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body’s requirements.
- b) As specified by the Watercare standard for Local Network Wastewater Pumping Station Design and Construction, and WSA101:2008.
- c) Certificate of compliance (ISO Type 5) to AS2417.

Procurement schedule

- a) Complete schedule: WSA101:2008, Appendix C.
<https://www.wsaa.asn.au/shop/product/6061>

Accepted products

Manufacturer/supplier	Specific limitation
Grundfos	Design specific
Flygt	Design specific
KSB	Design specific

14.9.3 Pumps for water supply and wastewater dry mounted.

General requirements

- a) Minimum working pressure shall be PN16.
- b) Pumps shall comply with:
 - WSA 130:2010 for pumps
 - WSA 131:2010 for motor pumps

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO type 3 or 5) to WSA 131:2010 or WSA 130:2010 as respectively applicable.

Procurement schedule

- a) For pumps complete schedule: WSA130:2010, Table C.1.
<https://www.wsaa.asn.au/shop/product/6031>
- b) For motor pumps complete schedule: WSA131:2010, Table D.1.
<https://www.wsaa.asn.au/shop/product/6041>

Accepted products

Manufacturer/supplier	Specific limitation
Grundfos	Design specific
Flygt	Design specific
KSB	Design specific

14.9.4 Dewatering pumps for chambers

Chamber dewatering pumps shall not be used for wastewater pumping.

General requirements

- a) Motor casing shall be stainless steel 304 (or better), or Stainless Steel 304 or cast iron
- b) The pump motor shall be single phase 50Hz
- c) The pump impeller shall be stainless steel 304 (or better), or hard cast iron
- d) Pump shaft shall be stainless steel 304 or better
- e) All surfaces not made of stainless steel and susceptible to corrosion shall be epoxy coated to AS/NZS4158
- f) All fasteners shall be stainless steel A2 or A4
- g) Inlet strainer shall be stainless steel 304 or better
- h) Pump discharge size shall be 50mm
- i) Pump must be able to deliver 200 litres per minute and a minimum 10 metre pumping head
- j) Pump start and stop shall be with a paddle float
- k) The pump motor shall have built in thermal overload protection
- l) Motor seals shall be double mechanical seals in separate oil filled chamber

Quality Control

- a) The product shall have a minimum 2 year manufacturer's warranty, completed with each installation.
- b) Polymeric coatings shall have product certification (ISO Type 5) to AS/NZS 4158.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Elepon AD450 S	Elepon	Single phase
Elepon AD250 2S	Elepon	Single phase - for standard use in BSP chambers
SFA-0512N	Showfou	Single phase

14.10 Corrosion protection

14.10.1 Corrosion protection tapes – cold applied and prefabricated

- Steel or ductile iron pipe and fittings may use bituminous or petroleum based tapes and mastic products.
- Petroleum based products shall not be used on plastic type pipes, fittings or mechanical couplers with any rubber seals that are not first bituminous coated, or any polyethylene based coating i.e. Sintakote on steel pipe.
- Where possible the application of bituminous and petrolatum products on stainless steel bolts will be avoided.

General requirements

- Applicable standards are: ANSI/AWWA C209; ANSI/AWWA C214; ANSI/AWWA C217.
- The coatings shall be applied in accordance with the manufacturer's requirements or as otherwise specified.

Quality Control

- Product certification to: ANSI/AWWA C209; or ANSI/AWWA C214; or ANSI/AWWA C217 as applicable to the application method.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Primer - 1027	Polyken	Steel or DI pipe only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.
Mastic - 939	Polyken	Steel or DI pipe only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.
Joint wrap 930	Polyken	Steel or DI pipe only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.
High UV tape 936	Polyken	Transitioning sections and field joints – all pipe types. (butyl)
Rockshield 5000	Polyken	Over full system for mechanical protection. (petrolatum). Not on PE coated steel pipe.
Steelcoat 400 & Acrylic topcoat	Denso	For UV (above ground) applications used with acrylic topcoat tape. Steel or DI pipe only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.
Densyl mastic & tape	Denso	Steel or DI valves and components only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.

Product model/name	Manufacturer/supplier	Specific limitation
Densolen AS50	Denso	Any fitting or valve. (butyl)
Densolen mastic W/WP	Denso	Any fitting or valve. (butyl)
Primer HT	Denso	On steel or DI only. Not to be applied into joints or onto plastic pipe when used with AS50. (petrolatum). Not on PE coated steel pipe.
UCC petrolatum wrapping system	Universal Corrosion Coatings	Steel or DI valves and components only – not plastic or rubber in joint application. (petrolatum). Not on PE coated steel pipe.

14.10.2 Painting systems for pipe and equipment protection

General requirements

- a) Watercare has standardised on Altex coating systems (by Carboline) for the majority of its infrastructure coatings.
- b) For heavily abrasive applications such wastewater pump header manifolds Belzona 5311 may be specified.
- c) Special applications not attainable with Carboline systems shall be considered by the design on a case-by-case.
- d) Coating environments are as classified by AS/NZS 2312.
- e) MSDS sheets are available from the suppliers at www.carboline.co.nz
- f) Specific or specialist applications must be determined in consultation with Altex. Contact Altex at technz@carboline.co.nz

Project schedule

Table 1: Project engagement schedule

Project Schedule	
1 Project Description	
<u>Scope:</u> Each project is assigned a unique reference number. The project description includes details on project name, area location, size, process conditions, environmental classification, new or repair work, and a cross-reference that tracks revisions and modifications.	
1.1 Project	
Project Number	
Project Name	
Equipment Numbers	
Documentation No	

Area Location		
Description		
Size		Area (m ²)/Vessel diameter x height/ length
Substrate		Steel/ Galvanised/ Stainless steel Concrete (poured, spun, block)
Drawings (list numbers)		
Environment		Interior/ Exterior/ Insulated/ Buried/ Damp Immersed
Process stream		Potable water/ Raw sewage/ Treated sewage
Temperature		°C
Pressure		bar
Type		New/ Repair/ Repaint/ Removal
Durability		Years
1.2 Tanks		
Diameter		m
Height/ Length		m
1.3 Pipework / equipment		
Diameter		m
Length		m
Connection		Flanged/welded

2 Personnel		
<u>Scope:</u> Contact names of project managers, supervisors and suppliers		
Project manager		
Consultant		
Supervisor		
Coating supplier		
NCI Coating inspector		
Contractor 1		
Contractor 2		
3 Revision/ Project modifications		
<u>Scope:</u> Track updates and plant modifications		
Date/ Revision		
Date/ Modification		
4 Environment		
<u>Scope:</u> Environmental data is classified into six groups. 4.1 Exterior macro climatic conditions 4.2 Corrosivity data evaluation (BRANZ and NIWA data) 4.3 Under insulation 4.4 Buried 4.5 Damp/ condensing 4.6 Immersed/ Semi-immersed		
4.1 Exterior climatic data		
Air temperature range		°C
Substrate temperature		°C
Dew point		°C
Humidity range		%RH

Prevailing wind		Direction
Wind Speed		km/h
Height (above sea level)		m
Coastal proximity		km (distance to coast)/ Inland/ Splash zone/
Geothermal proximity		Nil activity/ km (distance to site)
Background H ₂ S level		ppm
4.2 Environmental corrosivity classification evaluation		
Refer Table 2 below		
Macro evaluation		μm _{Fe} / year
Macro Category		ISO 9223, C1-C5
Micro evaluation		μm _{Fe} / year
Micro Category		ISO 9223, C1-C5
4.3 Under insulation environmental data		
Temperature range		°C
Corrosivity evaluation		μm _{Fe} / year
4.4 Buried environmental data		
Temperature range		°C
Aggregate type		
Depth		m
Soil Resistivity		Ohm-m
Corrosivity evaluation		μm _{Fe} / year

4.5 Damp/ condensing		
Process stream temp		°C
Substrate Temperature		°C
Dew point		°C
Corrosivity evaluation		µm _{Fe} / year
4.6 Immersed or semi-immersed environmental data		
Process stream		Potable water/Raw sewage/Treated sewage
Temperature range		°C
pH		
H ₂ S		ppm
CH ₄		ppm
Corrosivity evaluation		µm _{Fe} / year

Table 2: Atmospheric evaluation

Table 2 Atmospheric Macro/ Micro Corrosivity Evaluation						
Macro Climate						
Region		BRANZ Data			HERA Data	
Site Location		Location	g/m ² / year	µm/ year	Minimum (µm/ year)	Maximum (µm/ year)
Coastal proximity						
Wind speed						
Wind direction						
Humidity		Average				

Estimated Macro Climate	Corrosivity		Category	
Micro Climate				
Item	+ Factor	X Factor	Accumulated Corrosivity	
Damp/ shade				
Semi enclosed				
Unwashed saline				
Bird lime/ lichen				
Geothermal				
Transport fumes				
Estimated Micro Climate	Corrosivity		Category	

Existing coating systems

Note: The listed coating systems are a general coating system index. Selection must be supported with completion of the above project schedule and confirmed with Altex.

Coating System Index			
Coating System			Altex Specification No
Ref No	Designated Area	Environment (ISO 9223)	2017 New/ Repair
Mild Steel and Cast Iron Steelwork			
01	Interior and Exterior Steel and Pipework. Moderate non-immersed environment	Interior/ Exterior to 80 °C C2 Low – C3 Medium	TG-2017-135201
02	Interior and Exterior Steel and Pipework. Severe non-immersed environment	Interior/ Exterior to 80 °C C3 Medium – C4 High	TG-2017-135202
03	Conveyors and walkways. Severe abrasive	Interior/ Exterior to 50 °C C2 Low – C4 High	TG-2017-135203
Mild Steel High Temperature Non-insulated Pipework and Steelwork			
04	High Temperature Non-insulated Pipework. Non condensing dry heat environment	Interior/ Exterior to 538 °C C2 Low – C3 Medium	TG-2017-135204
Mild Steel Insulated Steelwork			
05	Steelwork and Pipework (exterior surfaces). Under	Under insulation	TG-2017-135205

Coating System Index			
Coating System			Altex Specification No
Ref No	Designated Area	Environment (ISO 9223)	2017 New/ Repair
	insulation	Ambient to 85 °C	
Duplex Galvanised and Metal Spray Steelwork			
06	Galvanised Steelwork. Interior and exterior	Interior/ Exterior to 80 °C C2 Low – C3 Medium	TG-2017-135206
Buried/ Wet Condensing Steelwork			
07	Buried Steelwork and Pipework. Suitable for impressed current CP	Buried in aggregate, soil, concrete Amb temp	TG-2017-135207
08	Buried Steelwork and Pipework. Extended durability	Buried in aggregate, soil, concrete	TG-2017-135208
09	Wetwell and Valve Chamber Steelwork. Condensing wet environment	Very severe, wet C5: Very High	TG-2017-135209
Zincalume, Aluminium, Colorsteel and GRP Cladding			
10	Zincalume Cladding. Interior and exterior	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135210
11	Aluminium Cladding. Interior and exterior	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135211
12	Colorsteel. Interior and exterior	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135212
13	GRP. Interior and exterior	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135213
Electrical, Mechanical and Hydraulic Drives			
14	Pumps, Valves, Motors and Gearboxes. Upgrade of existing coating	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135214
Safety Equipment			
15	Mild Steel - Machinery Guards and Safety Equipment	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135215
16	Galvanised Fire Sprinkler Pipework	Interior/ Exterior C2 Low – C3 Medium	TG-2017-135216

14.11 Cathodic protection

14.11.1 Cathodic protection anodes

Impressed current anodes

Shall be ordered as per the design and shall be mixed metal oxide coated titanium or silicon cast iron cathodic protection anodes, rated for 50+ years operation.

Sacrificial anodes

- a) Meet AS2239 Galvanic (sacrificial) anodes for cathodic protection.
- b) Be pre-packaged in gypsum-bentonite in accordance with the standard.
- c) Be as specified in the design.
- d) Sized for the application to allow a minimum design life of 25 years.

Shunts for current measurement

- a) Issued with a certificate of calibration.
- b) Clearly marked with calibrated resistance.
- c) 0.01ohm for impressed current anode cables.
- d) 0.1ohm for sacrificial anode cables.

Switches for manual interruption of bond current

- a) Rated for minimum twice the design current.
- b) Normally closed.
- c) Momentary action.
- d) IP68 rated.
- e) Rated for 1,000,000 cycles.

14.11.2 Cathodic protection Zinc reference

Shall be Anode Engineering AEZR-1, or equivalent, and shall be:

- a) Pre-packaged zinc electrode.
- b) Designed for use as a permanent buried reference electrode.
- c) Supplied with calibration certificate.
- d) Rated for operation for longer than 30 years.

14.11.3 Cathodic protection – Electrical probes and corrosion coupons

Corrosion coupons shall be Rohrbak Cosasco Systems; Smart Test Station ER Probes. Ordered as 'foot only,' to be installed with the specified test station.

- a) Normal installation is without an in-built reference. Ordering code is:
 - STF-1-LL, where LL is the length of cable in feet, 1 metre = 3.3 feet
- b) Where the design specifies supply with an in-built reference the ordering code is:
 - STF-0-LL, where LL is the length of cable in feet, 1 metre = 3.3 feet

14.11.4 Cathodic protection flange insulation kits

- a) Whether a flange gasket is required and whether it is to be potable or wastewater rated.
- b) Number of sleeves and washers.
- c) Mylar, or better, sleeve, and inner and/or outer diameter.
- d) Sleeve length, sufficient to overlap midway into both steel washers.

14.11.5 Cathodic protection monolithic insulation joints

- a) Be suitable for the application.
- b) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.
- c) Internal lining shall be dielectric, and extend for a length equivalent to at least one diameter on both sides of the insulation.
- d) A proposal for the joint to be ordered shall be presented to Watercare for approval prior to placing order.

14.11.6 Cathodic Protection test stations

Pillar mount test stations are preferred over flush mount. Flush mount shall only be ordered for sites where a pillar would block access or traffic and where wall mounting is not suitable.

Preferred types for urban, suburban and semi-rural use, in order of preference are:

- Watercare Standard Transnet Ecopillar
- Wall mounted
- Watercare Standard Transnet TUD pit
- Flush Fink

For Rural use Big Fink pillar test points may be used in place of Transnet Ecopillars.

Wall mounted enclosures may be used where it is practical to mount the test station on a Watercare building. The enclosure ordered shall be as specified in the design or if not specified shall suit the site conditions, be sufficiently vandal proof, include non-conductive or insulated mounting plates and be of a suitable size to accommodate the required fittings.

Ordering information:

Test Station Type	Order Code / Detail	Supplier
Ecopillar	EPOWSLSTD	Ideal Electrical
TUD pit	Watercare Std TUD pit	Ideal Electrical
Flush Fink	Black	Cathodic Protection New Zealand Ltd
Big Fink	Dark green	Cathodic Protection New Zealand Ltd

14.11.7 Cathodic protection power supplies

- a) Meet New Zealand electrical regulations for extra low voltage dc power sources – including technician access to terminals for installation of a portable interrupter.
- b) Be robust and rated for 50 years operation.
- c) Include a RS485 MODBUS RTU port.
- d) Include a GPS synchronised interrupter, operable via the RS485 port.
- e) Have a minimum of the following output control options:
 - Constant current, and
 - Constant pipe potential (Auto-Control)
- a) Be continuously adjustable down to $\leq 1\%$ of maximum current.
- b) Output smoothed dc - ripple to be $\leq 5\%$ of output voltage.
- c) Include facilities for installing a portable interrupter.

14.11.8 Cathodic protection services

The companies listed in this section may be engaged for the service categories listed. Suppliers not listed may be used on Watercare specific approval.

Electrical hazard analysis

Consultants with resources to carry out electrical hazard analysis include:

- Mitton Consulting
- GHD Ltd
- Aecom Ltd
- Linetech Ltd
- Phoenix Solutions

Contractors and consultants

Provider	Category	CP Services
GHD	CP consultant	Design Project Management Commissioning
Aurecon	CP consultant	Design Project Management Commissioning
Aecom	CP consultant	Design Project Management
Opus	CP consultant	Project Management
Plant and Platform	CP consultant	Design Project Management Commissioning
Phoenix Solutions	CP consultant	Design Project Management Installation Testing
Savcor ART NZ Ltd	CP contractor & Supplier	Design Installation Testing Commissioning Equipment supply
Pacific Cathodic Protection	CP contractor	Design Testing Commissioning
Anode Engineering	CP Contractor	Design Installation Testing Commissioning
Transfield Services	Instrumentation	Installation Testing Basic design Basic commissioning
Clarkson Electrical	Instrumentation	Installation Testing
Marine and Civil	CP contractor	Basic design Installation Basic testing Basic commissioning
Cathodic Protection NZ Ltd	Supplier	Design Equipment supply
Deepwater Corrosion Services	Supplier	Design Equipment supply

Equipment suppliers

Supplier	Agents for	Equipment supplied
Anode Engineering	Various	All
Sulco NZ Ltd	Various	All
Savcor ART NZ Ltd	Various	All
Cathodic Protection NZ Ltd	Various	Anodes, references, TR's, FIK's and other
Lordco	Various	ER Probes, MIJ's, FIK's and other equipment
Deepwater Corrosion Services	Dairyland Electrical, and other	PCR, surge diverters, and other equipment
M Broddribb Ltd	Supplier	TR's
Metal Image Ltd	Supplier	Labels
Shuk Engineering	Various	FIK's

14.12 Instrumentation and control

14.12.1 General requirements for all instrumentation

- a) Measurement instrumentation for:
- water meters,
 - gas meters,
 - active electrical energy meters,
 - heat meters,
 - measuring systems for continuous and dynamic measurements of quantities of liquids other than water,
 - automatic weighing instruments,
 - material measures, and
 - dimensional measuring instruments

shall comply with Measuring Instruments Directive (MID), directive 2004/22/EC.

- b) Pneumatic receiver instruments shall accept 20kPa to 100 kPa pneumatic signals
- c) Communication protocols:
- 4 to 20mA/ (HART where available)
 - Serial: RS485/422/423/232
 - Digital Bus (Foundation Fieldbus when expanding existing process areas)
- d) Transmitter type instruments shall have a linear 4-20mA isolated transmitted signal
- e) All loop instruments shall be suitable for 600 Ohm loops.
- f) Digital instrument signals shall be 24vdc unless otherwise stated.
- g) Proximity switches shall be two-wire with encapsulated flying leads. Three-wire type devices requires specific approval.
- h) Relay outputs shall be dry SPDT contact; 2A signal; rated to 240 VAC.
- i) Instrumentation in potentially explosive atmospheres shall generally comply with BS EN 60079 (NZ equivalent is AS/NZS 60079). The protection method must be selected in accordance with the hazardous area classification.
- j) All field instruments with local indication shall have an LED or LCD indicator with engineering unit related to the variable being measured.
- k) For hazardous areas an LCD indicator shall be used and must be a certified hazardous rated instrument for the designated area.
- l) Displays shall have enough number of digits so that it covers the specified measured range and accuracy. Instrumentation for measurement, control and laboratory use shall comply with BS EN 61326.
- m) Functional safety of instrumentation shall comply with IEC 61511 (AS 61511).
- n) Instrumentation shall be tested for electromagnetic compatibility (EMC) to AS/NZS61000.4.7.
- o) All instruments shall be have electrical RF and electromagnetic noise immunity.
- p) Instrument housing shall be suitable for the operating environment.
- q) Electronic components and circuit boards shall coated to IEC 61086-3-1 class 3.
- r) Instruments shall be minimum IP65 rated unless otherwise specified.
- s) Programmable instruments shall provide security of programs from unauthorised modification and a means for configuring operating parameters. Only English words and the English language shall be used.
- t) The instrument data sheets shall include ass accessories. Fail-safe switched contact must be indicated on the data sheets.
- u) Manufacturer and product information must be engraved on a 316 stainless steel nameplate fixed to the instrument.
- v) All instrument specifications, installation instructions and operation and maintenance manuals shall use the English language.

Standardised products (general) - Instrumentation

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Actuators – Air		
Joucomatic	ASCO	
Keystone	Keystone Tyco	
Fisher	Custom Controls	
Actuators - Electrical		
Rotork, 24 VDC, 3-phase	Rotork NZ	Site specific requirements for voltage configuration
Chlorine Analyser		
HACH CL17	Biolab Scientific	
Wallace & Tiernan Depolox 3 Plus	Filtec	
Endress & Hauser CM444 Liquidline Transmitter, CCS142D CL2 Probe, CPS11D pH Probe, CCA250 Flow Cell	EMC Industrial Group	
Chlorine leak detection		
Wallace and Tiernan	Filtec	
Differential Pressure		
Rosemount 3051 series	Emerson Process Management	
Endress & Hauser DeltaBar	EMC Industrial Group	
Distributed Control System		
Fisher Rosemount, Delta V with AMS installed	Emerson Process Management	
Dissolved Oxygen		
Endress & Hauser OxyMax COS61D with CM442 transmitter	EMC Industrial Group	
Dosing Pumps		
Milton Roy	Foster & Associates	
Wallace and Tiernan	Filtec	
Bran & Leubbe	Pump Systems	
Prominent	Pump Engineers	
Flow Switches – Instrument Sample Lines		
VGfVASK510 - 15mm Variable Area Flowmeter with magnet	Plastic Systems	5-50 l/hr
VGfVASK620 - 15mm Variable Area Flowmeter with magnet	Plastic Systems	20-200 l/hr
VGfVAGK11 – Max Limit Contact (Fail		

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
safe for FSL)		
Flow Switches Pumps		
Flow Captor	EMC	
Fluoride analyser		
ABB Aztec AFM631	ABB Ltd	
Inductive proximity switches		
IFM	IFM Effector Pty Ltd	
Pepperl + Fuchs	Customs Controls Ltd	
Turck BI15-CP40-AP6X	CSE-W. Arthur Fisher Ltd	
Instrument valves		
Woscester/Norbro/Norgren	Delta	
Level control relays		
Multitrode (24 VDC powered)		
Omron 61FGPN (24 VDC Powered)		
Level radar sensor		
Vega Vegapuls Series 60	Instrumatics	Selection based on range, liquid type and process conditions
Endress & Hauser Micropilot FMR51	EMC Industrial Group	
Endress & Hauser LevelFlex	EMC Industrial Group	
Level switches		
Vega	Instrumatics	
ATMI	Instrumatics	
Endress & Hauser Liquiphant	EMC Industrial Group	
Endress & Hauser Liquipoint	EMC Industrial Group	
Level transmitters		
'The Probe' LU	Siemens Ltd	
LUT400	Siemens Ltd	
Endress & Hauser - Prosonic FMU 40	EMC Industrial Group	
Endress & Hauser FMU90	EMC Industrial Group	
Endress & Hauser FMX 21	EMC Industrial Group	
Endress & Hauser CUS71D with CM442 transmitter	EMC Industrial Group	Sludge interface level
PH/ORP meters		

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
ABB AP100 with AX460 transmitter	ABB Ltd	
Great Lakes	Biolab	
Hach	Filtec	
Rosemount	Fisher-Rosemount	
Endress & Hauser CPS11D with CM442 transmitter	EMC Industrial Group	
Pressure Switches		
Danfoss	Danfoss	
IMT		
Endress & Hauser Ceraphant	EMC Industrial Group	
Pressure Transmitters		
Rosemount 3051 series or 2088 series	Emerson Process Management	Series selected on accuracy requirements
Endress & Hauser Cerabar Series	EMC Industrial Group	
Process Indicators		
Endress & Hauser RIA series	EMC Industrial Group	
Sludge Thickness in line meter		
Zullig	Applied Instruments	
Endress & Hauser TurbiMax CU51D with CM442 transmitter	EMC Industrial Group	
Solenoid valves		
Joucomatic	ASCO	
Burkert	Burkert fluid control	
SMC	SMC Corporation	
Streaming Current		
Chemtrac		
Milton Roy	Foster & Associates	
Temperature Transmitters		
Endress & Hauser iTemp	EMC Industrial Group	
UV Transmissivity		
Endress & Hauser ViaMax CAS51D with CM442 transmitter	EMC Industrial Group	
Weighing Systems		
Wedderburn, GEC, Avery		
EMC Modweigh - Chlorine Drum	EMC Industrial Group	

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Weighers		

Standardised product – Control systems

Product type	Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
RTU Kingfisher Series III (CP-30) RTU Hardware	Kingfisher Series III (CP-30) RTU modules	CSE-W Arthur Fisher	
PROCESSOR MODULE	CP-30-00	CSE-W Arthur Fisher	By specific design
MULTI COMMS MODULE	MC-31-00		
BACKPLANE 6 SLOT	BA-6 PLUS		
BACKPLANE 12 Slot	BA-12 PLUS		
ETHERNET BOARD for MC-31 or CP-30	OPTION T3		
SERIAL RJ45 COPPER for MC-31 or CP-30	OPTION I		
POWER SUPPLY 100 - 240VAC INPUT	PS-12-0		
POWER SUPPLIES 10-30 VDC INPUT	PS-22-0		
DIGITAL INPUT MODULE	DI-5-1		
DIGITAL OUTPUT MODULE	DO-2-1		
Multi I/O 8 x DI + 2 x DO + 2 x AI	IO-4-1		
ANALOG MODULE	AI-10-1		
ANALOG OUTPUT MODULE	AO-3-1		

14.12.2 Turbidity meters

General requirements

- a) Comply with [section 14.12.1](#).
- b) Comply with measuring principle and performance output for BS EN ISO 7027.
- c) Measurement range shall be minimum 0.0001 to 1000 NTU.

Quality Control

- a) Calibration by an IANZ certified testing facility meeting ISO/IEC 17025.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Great Lakes	Biolab	
Hach 1720E	Filtec	Filtered water
Hach FT660	Filtec	Alternative to 1720E
Hach Ultraturb	Filtec	Raw, Clarified water
Endress & Hauser Turbimax W CUS31	EMC Industrial Group	For use with SCADA II

14.12.3 Meters for water supply – Volumetric and turbine type

Applies to domestic and commercial water metering

General requirements

- a) Comply with [section 14.12.1](#).
- b) Comply with AS 3565.1 for volumetric and turbine meters and BS EN ISO 4064.
- c) Maximum working pressure shall be PN16.
- d) Refer to [section 14.4](#) for flange requirements.
- e) Threaded end connections shall be to BS21.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Meter tests shall be performed by an IANZ certified testing facility meeting ISO 17025.
- c) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Standardised products

Product model/name	Description	Supplier	Specific limitation
WTMPSMT15	15mm Kent Elster V100 (PSM-T)	Arthur D Riley	
WTMPSMT20	20mm Kent Elster Elster V100 (PSM-T)	Arthur D Riley	
WTMPSMT25	25mm Kent Elster Elster V100 (PSM-T)	Arthur D Riley	
WTMPSMT25	25mm Kent Elster Elster V100 (PSM-T)	Arthur D Riley	
WTMPSMT30	30mm Kent Elster Elster V100 (PSM-T)	Arthur D Riley	
WTMPSMT40	40mm Kent Elster Elster V100 (PSM-T)	Arthur D Riley	
WTMC400050	50mm Kent Elster C4000 Combination mtr	Arthur D Riley	
WTMC400080	80mm Kent Elster C4000 Combination	Arthur D Riley	
WTMC4000100	100mm Kent Elster C4000	Arthur D Riley	
WTMC4200150	150mm Kent Elster C4200	Arthur D Riley	
WTMH500040	40mm Helix 5000 BS10 Table E 4	Arthur D Riley	
WTMH500050	50mm Helix 5000 BS10 Table E 4	Arthur D Riley	
WTMH500065	65mm Helix 5000 BS10 Table E 4	Arthur D Riley	
WTMH500080	80mm Helix 5000 BS10 Table E 4	Arthur D Riley	
WTMH5000100	100mm Helix 5000 BS10 Table D 4	Arthur D Riley	
WTMH5000150	150mm Helix 5000 BS10 Table E 8	Arthur D Riley	
WTMV210B2.5	2.5 V210 (MSM-T) OIML Brass Manifold Meter	Arthur D Riley	20mm. For replacements only. Not new installations

Product model/name	Description	Supplier	Specific limitation
Readers and loggers			
AMR Data cell Loggers (ADL2CH)	Aegis Pty Ltd.	Arthur D Riley	
AMR Emeris remote reader (HHTREMETR600A)	Honeywell/Elster	Arthur D Riley	

14.12.4 Meters – electromagnetic flow type

Applies to commercial and Watercare facility water and wastewater metering.

General requirements

- a) Comply with [section 14.12.1](#).
- b) Comply with OIML R 49-1 or Measuring Instruments Directive (MID).
- c) Meters for closed conduits shall be in accordance with BS EN 29104.
- d) Meters for open channels shall be in accordance with BS EN 15768.
- e) Polymeric coatings shall comply with AS/NZS 4158.
- f) Minimum working pressure shall be PN16.
- g) Refer to [section 14.4](#) for flange requirements.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Meter tests shall be performed by an IANZ certified testing facility meeting ISO/IEC 17025.
- c) Polymeric coatings shall comply with AS/NZS 4158
- d) Any component or lubricant in contact with the water supply shall comply with AS/NZS 4020.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
Endress & Hauser Promag W400, Model 5W4C	EMC Industrial Group	
Endress & Hauser Promag 50	EMC Industrial Group	
FPI Mag <i>(not subject to general requirements b), c), or d))</i>	McCrometer	Specific applications for hot-tap metering and bulk balancing – requires specific approval by Service Delivery

14.12.5 Control (DCS and PLC) panel manufacture and supply

General requirements

- a) The DCS/PLC panels may be integrated with the associated MCC panels or stand-alone panels as specified.
- b) The manufacturer shall supply a complete panel folder for the specification of all individual parts, operation and maintenance manuals and a list of recommended spare parts.
- c) All earthing shall be in compliance with the relevant Electrical Codes of Practice, Australian and New Zealand Standards. DCS panels shall have two types of Earth as follows:
 - Protective Earth for panel body and 240 vac equipment protection.
 - Instrument Earth for field instrument and 24 vdc protection.
- d) The Instrument Earth shall be completely isolated from the panel body and the Protective Earth.
- e) The Instrument Earth shall be connected to the DCS/PLC panel independently from the Protective Earth and shall have its own main terminal and distribution terminals rail as shown on the associated drawings.
- f) Factory testing shall include but not be limited to:
 - Check completion of work, including metalwork, finishing and electrical, including check for any missing equipment.
 - Check all electrical work for correct tagging and continuity.
 - Check all miscellaneous electrical equipment for conformance to specifications and perform a functional test of each, including relays, timers, switches, pushbuttons and solenoids.
 - Check that all lamps have been installed and are operable.
 - Check for satisfactory operation and freedom from defects for all mechanical features such as doors, latches and hinges.
 - Check finish for freedom from defects, including miscellaneous filler plates and panels.
 - Check the proper size, specification, installation and operation of the 24 vdc power supply unit.
- g) Certified test reports shall be submitted to Watercare for approval prior to shipment to site.

Construction

- h) The control panels shall be the standard vertical type, general purpose IP42 rated enclosure and free standing for floor mounting.
- i) Panels shall have hinged doors, full height rear gear plates, gland plates, terminations and trunking as shown on the design drawings.
- j) The panels shall be supplied with complete corrosion protection coating system. Paint colour shall be RAL7035.
- k) Panels shall be supplied complete with 75mm high base mounting channel and all fixing bolts, anchors, nuts washers, gaskets, vibration mountings and any other fastenings necessary for the complete installation of the panel.
- l) Panels shall be front access unless otherwise specified.

Heat Dissipation

- m) Heat dissipation shall be installed for full load without high rise in temperatures in accordance with AS/NZS 61439 and component manufacturer specifications.
- n) Heat dissipation analysis shall be made available.
- o) All panels may have Purafil filters to scrub the air inside the panel when the panel door is closed. The Purafil filter unit shall clear the panel of possible plant gases like methane and hydrogen sulphide.

Cable Entry and supports

- p) Top entry is preferred. The supplier shall provide gland plate fitted into a cutout for cable entry.
- q) Field Instrument cable cores and MCC conduit wires shall terminate at the DCS/PLC marshalling section terminal blocks.
- r) Non-magnetic, undrilled gland plates shall be provided for the glanding of incoming and outgoing cables.
- s) Gland plates shall be bolted in position and shall be readily removable for drilling onsite.
- t) Adequate trunking systems shall be provided for the support of incoming and outgoing cables within the control panel enclosure trunking shall be sized with sufficient capacity to allow for un-terminated spare incoming cores. The supports shall be so located that they do not obstruct terminations.

DCS power supplies and I/O

- u) Panel equipment shall have two DC power supply units for system requirements and redundancy.
- v) DC power supply units for the instrument loops bulk power supply shall be supplied in pairs for redundancy. Units are not identical for all panels and vary in size as per the DCS panel requirements.
- w) There are different simplex I/O terminal blocks available to meet the wiring needs of field signals. The control panel simplex I/O terminal blocks shall be designed for use with DeltaV AI 8-channel terminal block (2 wire / 4 wire) – Part number SE4003S2B1 (as of May 2017).

Wiring and terminations

- x) Terminal blocks for power distribution shall be compression type and shall be labelled as per the drawings.
- y) Terminal blocks shall be sectional TS35 Din Rail mounted screw type of suitable size for direct connections.
- z) Spare terminals and spare DIN rail shall be installed as per the drawings.
- aa) All panel wiring, as far as practical, shall be run in trunking. Segregation of 24 vdc / 4-20mA circuits from 240/110 vac circuits shall be provided to prevent signal interference arising from continuous or transient coupling.
- bb) Control circuit wiring shall be 0.75 mm² generally.
- cc) Power circuit wiring shall be sized for the require load.
- dd) Wire shall be tinned stranded copper PVC insulated.

Identification

- ee) Individual equipment such as power supplies and isolators shall be identified by means of laminated plastic nameplates engraved with black letters on a white background.
- ff) Ferrules shall be arranged to read left to right irrespective of side of entry to the vertical terminal strip. For horizontal terminal strip the ferruling shall be rotated 90 degrees anti-clockwise.
- gg) Each end of each wire shall be tagged using a proprietary wire marking system. The wire numbers shall be allocated sequentially from 000 to 999 by the supplier as follows:
 - All wires shall have a unique number except that where “looping” between multiple terminals, (e.g. for power supplies and grounding) multiple wires shall carry the same number when they are effectively the same wire
 - In all cases the wire number shall be the same at both ends of a wire
 - All wires shall be fitted with crimp pins before terminating
- hh) Each device shall be identified with a white traffolyte (three layer laminated) nameplate engraved with 5mm high black text of uniform size and affixed below the respective device.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Overall dimensions		
Internal and external protection coatings		
Heat dissipation capacity within limits of AS/NZS 61439		
Internal layout drawing set		
Mounting and anchor details		
Total weight		
Air scrubber requirements		

14.13 Electrical

14.13.1 General requirements for all electrical components

- a) Electrical components in potentially explosive atmospheres shall generally comply with BS EN 60079 (NZ equivalent is AS/NZS 60079). The protection method must be selected in accordance with the hazardous area classification.
- b) All electronic printed circuit boards (PCB) and components shall be provided to IEC 61721 class 3C3. Class 3C2 may be applied where approved by Watercare

Standardised products (general) – Electrical

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Ammeter & Voltmeter		
72x72mm Analogue panel mount with appropriate range	Electrical Wholesalers (refer: Procurement)	
Antenna lightning protection units		
RF Industries model IS-50NX-C1	RF Industries	
CRITEC CSP Series	Enertec Services Ltd	
Automatic transfer switch - Mains		
Schneider APC/UA Source Changeover equipment	Schneider Electric	
ASCO Source Changeover Equipment	IT Power Services Ltd	
Socomech ATS		
Batteries		
Yuasa (5 yr warranty) 12 volt 7ah, 24ah, 38ah or 100ah sealed lead acid	Century Yuasa	
Circuit Breakers - MCB		
Schneider Merlin Gerin Multi 9 series	Schneider Electric	
NHP Terasaki Din-T6 series	NHP Electrical Products (NZ) Ltd.	
ABB S200 series	ABB	
Circuit Breakers - MCCB		
Schneider Merlin Gerin Compact NS/NSX series	Schneider Electric	
NHP Terasaki TemBreak 2 series	NHP Electrical Products (NZ) Ltd.	
ABB Tmax/XT series	ABB	
Circuit Breakers - Motor (<30kW)		
Schneider Merlin Gerin GV series	Schneider Electric	
NHP Sprecher + Schuh KT-7 series	NHP Electrical Products (NZ) Ltd.	
ABB MS series	ABB	

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Contactors		
Telemecanique Model D, rated for AC 3 duty	Schneider Electric	
Sprecher + Schuh CA7 series, rated for AC 3 duty	NHP Electrical Products (NZ) Ltd.	
ABB A/AF series, rated for AC 3 duty	ABB	
Current Transformers		
BS 7626:1993 Compliant	Electrical Wholesalers (refer: Procurement)	<ul style="list-style-type: none"> - Class 1 for check meter and revenue metering applications. - Class 3 for general purpose metering applications. - Class 10P for protection applications. CTs shall have a 5VA minimum burden
Enclosures		
Himel	Schneider Electric	
MacArthurs	MacArthurs	
Thompson Hutton	Thompson Hutton	
Eldon	NHP Electrical Products (NZ) Ltd.	
Rittal	Rittal	
Equipment Labels – Metal		
Aluminium Black Print	Metal Image Ltd	
Equipment Labels – Traffolyte		
Traffolyte	Electrical Wholesalers	
Fan/Light Switch Isolators		
PDL 56 series	Schneider Electric	
ISO series	NHP Electrical Products (NZ) Ltd.	
Industrial computers		
VECOW –SPC 200 Series Panel Mount Monitor PM 156 S VECOW SPC-2145 Industrial PC	ECS Engineering Computer Services Limited	
Winsonic PM1565-WH25L0 15” 1920x1080 resolution Touch Screen	ECS Engineering Computer Services Limited	
Intrinsic Safety Barriers/Isolators		
Endress & Hauser	EMC	

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
MTL5500 series	Carrel Electrade	
Lamp Colours		
White = Running	Schneider Electric / NHP / ABB	
Non = Stopped	Schneider Electric / NHP / ABB	
Amber = Alarms	Schneider Electric / NHP / ABB	
White = Auto Available / General indication	Schneider Electric / NHP / ABB	
Lamp indicators		
Telemecanique Harmony Style 4, 22mm, LED, 24 VDC	Schneider Electric	
Sprecher + Schuh D7 series, 22mm, LED, 24VDC	NHP Electrical Products (NZ) Ltd.	
ABB Compact pilot light series, 22mm, LED, 24VDC	ABB	
Loop Isolators		
Carrel Electrade T-CDL series	Carrel Electrade	
Intech XI series	Intech	
Mains fail / Phase failure relay		
Carrel Electrade RP33-1-415	Carrel Electrade	
Schneider RM4TR32	Schneider Electric	
Carlo Gavazzi DUB-01-C-M48	NHP Electrical Products (NZ) Ltd.	
Network switches		
Hirschmann RS2 series (Emerson DCS Systems) only used at Waikato WTP Moxa EDS 508A, EDS 510A, \EDS516A	Hirschmann	Hirschmann RS2 series only used at Waikato Water Treatment Plant
Overload units "DOL start"		
Telemecanique TeSys D	Schneider Electric	
Sprecher + Schuh CEP7 series	NHP Electrical Products (NZ) Ltd.	
ABB STAR series	ABB	
Power factor correction		
Motorpol, Metalect with overpressure tear off fuses		
Sinexcel Static Var generator	Power electronics	
Sinexcel Active harmonic filter	Power electronics	
Power quality meters		

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Socomec DIRIS A40	Dataguard NZ	
Schneider PM700 series	Schneider Electric	
Power Supply - ELV DC Battery Backed		
Innovative Energies - SR series No Break – Series with Battery Condition Testing	Innovative Energies Ltd	
Phoenix Contact - QUINT-UPS-IQ Power Supply series	Phoenix Contact Ltd.	
Power Supply - ELV DC Non Battery Backed		
Innovative Energies - IED series	Innovative Energies Ltd	
Phoenix Contact - QUINT-PS series	Phoenix Contact Ltd	
Schneider Phaseo Series	Schneider Electric	
Power Supply - DC-DC converters		
RF Industries model UNITEK SDC08	RF Industries	
Innovative Energies - IEXT/IEHT series	Innovative Energies Ltd	
Phoenix Contact - QUINT DC/DC converter series	Phoenix Contact Ltd.	
Programmable logic controller (PLC)		
Area dependant, refer to Watercare for requirements		
Push Buttons		
Telemecanique Harmony Style 4, 22mm (230 VAC push buttons to be fitted with terminal, shrouds)	Schneider Electric	
Sprecher + Schuh D7 series, 22mm (230 VAC push buttons to be fitted with terminal, shrouds)	NHP Electrical Products (NZ) Ltd.	
ABB pushbutton series, 22mm (230 VAC push buttons to be fitted with terminal, shrouds)	ABB	
Radio's		
Area dependant, refer to Watercare for requirements	Tellit Ltd	
Trio QR Series	WAF Schneider Electrical	
Relays 230VAC Coil		
Omron MY series	Electrical Wholesalers (refer:	

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
	Procurement)	
Zelio RXM series	Schneider Electric	
ABB CR-M series	ABB	
NHP 56 series	NHP Electrical Products (NZ) Ltd.	
Relays 24VDC Coil		
Omron MK series	Electrical Wholesalers (refer: Procurement)	
Zelio RUM series	Schneider Electric	
ABB CR-U series	ABB	
NHP 60 series	NHP Electrical Products (NZ) Ltd.	
Rotary Switches		
Kraus & Naimer Blue Line	Electrical Wholesalers (refer: Procurement)	
Telemecanique Cam Switches series	Schneider Electric	
Sprecher + Schuh L2 series	NHP Electrical Products (NZ) Ltd	
Security Systems		
Tecom Challenger	Advance Security Ltd	
Soft starters		
Telemecanique – Altistart 48	Schneider Electric	
ABB – PSE	ABB	
V5 series	Power electronics	
Surge Protection		
ERICO TDS series (40kA minimum)	Enertec Services Ltd	
Schneider PRD series (40kA minimum)	Schneider Electric	
Cirprotec series (40kA minimum)	NHP Electrical Products (NZ) Ltd.	
ABB OVR PV series (40kA minimum)	ABB	
Switch – 3 Position (Auto/Off/Manual)		
Kraus & Naimer Blue Line	Electrical Wholesalers	
Telemecanique Harmony Style 4, 22mm	Schneider Electric	
Sprecher + Schuh D7 series, 22mm	NHP Electrical Products (NZ) Ltd	
ABB Compact pilot light series, 22mm	ABB	

Product model/name	Manufacturer/Supplier	Specific limitation / Area of use
Terminal Rail		
DIN Rail	Electrical Wholesalers	
Terminals – feed through		
Klippon SAK 2.5mm or as appropriate for larger cables.	Electrical Wholesalers	
Phoenix Contact 2.5mm or as appropriate for larger cables.	Electrical Wholesalers	
Terminals – Fused		
Klippon ASK1 fitted with appropriate 20 mm glass fuses for ELV/LV	Electrical Wholesalers	
Phoenix Contact fitted with appropriate 20 mm glass fuses for ELV/LV	Electrical Wholesalers	
Thermistor relays		
Telemecanique LT3 series	Schneider Electric	
Sprecher + Schuh RT7 series	NHP Electrical Products (NZ) Ltd.	
ABB CM series	ABB	
Timers		
Omron H3 series	Electrical Wholesalers	
Schneider Zelio series	Schneider Electric	
Carlo Gavazzi series	NHP Electrical Products (NZ) Ltd	
ABB ERP series	ABB	
Transducers – Voltage, Current, Temperature etc.		
Carrel Electrade	Electrical Wholesalers	
Trunking		
Standard electrical switchboard trunking	Electrical Wholesalers	
Water heater isolator		
PDL 56 series	Schneider Electric	
ISO series	NHP Electrical Products (NZ) Ltd.	

14.13.2 Luminaries

General requirements

- a) Comply with [section 14.13.1](#).
- b) [Luminaries and their fittings shall have minimum IP65 rating](#)
- c) Road lighting performance to AS/NZS 1158.
- d) Interior lighting for industrial tasks and processes performance to AS/NZS 1680.2.4. Where there is the likelihood of corrosive gasses present, the luminaire body shall be of die-cast aluminum with a copper content of less than 0.1%. Where corrosive gasses will not be present, polycarbonate plastic can be used with stainless steel fixing and HDG stirrups.
- e) Exterior fittings shall be vandal-resistant
- f) LED lighting to IEC/PAS 62717 or IEC/PAS 62722.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) to applicable product type in accordance with the referenced standard.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Description of application		
Lighting performance – lumens		
Luminary type		
Product and Test certificates		

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Fluorescent Lamps		
Non Hazardous areas: Pierlite SDW258 & Thorn Aquaforce II	Electrical Wholesalers (refer: Procurement)	
Hazardous areas: Class 1 Zone 2 Pierlite SXN Series and Samode class 1 zone 2 IP68 fittings	Electrical Wholesalers (refer: Procurement)	

14.13.3 Socket outlets

General requirements

- a) Comply with [section 14.13.1](#).
- b) Manufacturing standard to AS/NZS 3112.
- c) Sockets shall be standard 3-pin 10A white polycarbonate, flush mount
- d) IP56 rated.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) to AS/NZS 3112.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Description of application		
Outlet phases		
Product and Test certificates		

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Power outlets (Single phase)		
PDL 56 series	Schneider Electric	
ISO series	NHP Electrical Products (NZ) Ltd.	
Power outlets (Three phase)		
PDL 56 series	Schneider Electric	
ISO series	NHP Electrical Products (NZ) Ltd.	
Power outlets (Single phase-switchboard control cubicle)		
PDL 600 series (RCD protected)	Electrical Wholesalers	

14.13.4 Switchboards

General requirements

- a) Comply with [section 14.13.1](#).
- b) A complete set of drawings must be provided for mechanical and electrical construction in accordance with Watercare's CAD manual.
- c) Manufacturing standard to AS/NZS 3439 form 4a with no terminations in the wire way, except for neutral and earth connection bars.
- d) The cabinet shall permit for future addition of vertical sections.
- e) Removable end plates shall be provided to cover the horizontal power bus and horizontal wire way openings on each end of the switchboard.
- f) Wire way shall be provided to allow cable access into each cell.
- g) Front access only (wall mounting or close to wall) unless otherwise specified. All switchboard equipment, wiring and components, including nuts and bolts, shall be accessible from the front.
- h) Allow for design specified ventilation and heat dissipation.
- i) The switchboards shall be formed of corrosion resistant sheet metal to give a uniform appearance with no sharp corners, buckling or distortion.
- j) Framing, panels and sections screwed or bolted together using machine threaded fixings.
- k) Nuts and bolts shall be cadmium-plated, stainless steel or nylon as appropriate for the specified operating environment.
- l) The switchboard shall be supplied with a hot dipped galvanised plinth, which shall be manufactured from parallel flange mild steel channel 100 x 50, drilled front to back, with four 51mm diameter lifting holes. All fixing holes shall be pre-drilled prior to galvanising.
- m) Access to all cells and wire ways shall be via hinged vertically mounted lockable doors. Minimum door swing shall be 120°. Switchboard doors shall be individually earth bonded to the switchboard frame with insulated flexible copper braid. Earth bonding through the door hinges only is not acceptable.
- n) A minimum of two hinges shall be used for each panel or door. Where a panel or door is 1200 mm high or greater, a minimum of three hinges shall be used.
- o) All switchboard doors shall be lockable as follows:
 - Lock barrel -Type CLF85-144 (16 mm barrel length)
 - Key: No. 144 (the standard electrical industry key number)
 - The lock unit shall be fitted at mid-height
 - Outdoor switchboard key access requirement shall be confirmed with Watercare
- p) Additional latches or closers are to be operable without the use of a tool or key.
- q) In the case of double doors, 900 mm high or greater, a three point engagement mechanism shall be operated by the handle being turned through 90 degrees. The three engagement points are to be located at the top, the centre and the bottom of the panel or door.
- r) The switchboard colour shall be as follows unless otherwise approved:
 - External surfaces – RAL 7032, RAL 7035 or Oxyplast Almond
 - Interior gear plates – Gloss white
- s) Outdoor switchboards shall be housed in a pillar box arrangement constructed of powder coated marine grade aluminium or stainless steel 316 with ingress protection of minimum IP65.
- t) Refer to the electrical design standard for minimum seismic resilience requirements.

Switchboard electrical requirements:

- u) Busbars shall be of high-grade electrolytic tinned copper and carry a standards mark.
- v) Busbars will be treated against the corrosive effects of hydrogen sulphide and sulphur dioxide by means of tinning. The busbars shall be naturally cooled and have heat resistant appropriately coloured PVC sleeves (red, white, blue etc.).
- w) The neutral busbar shall be the same cross sectional area as the phase busbars.
- x) The busbars shall be of uniform cross section throughout their vertical or horizontal run. Tapered busbars are not acceptable.
- y) A tinned bare copper earth (BCE) bar rated for the short circuit duty of the switchboard shall run throughout the length of the board. All non-current carrying metal parts shall be earthed by connecting to this bar

- z) A BCE with a minimum size of 5x35mm shall be installed vertically in each wire way and pre-drilled with suitable holes.
- aa) Main horizontal busbars and vertical droppers shall be enclosed in a separate compartment with screwed covers or doors. The connection to droppers shall be through the insulating barriers.
- bb) Openings for future busbar extension and panel wiring shall be provided at both ends
- cc) The switchboard main earth and neutral connection points shall be easily accessible to allow for testing after installation.
- dd) All main switchboards shall be fitted with a suitably sized marked MEN link installed in an easily accessible position.
- ee) A 36 way 63A brass tunnel bar is to be fitted to allow easy connection of the instrument earth wires (mounted in the control cubicle section).
- ff) Exposed terminals for voltages above extra low voltage shall be fitted with clear shrouds (i.e. all 110/230/415 Vac connections). The switchboard shall be arranged so that no live conductors are exposed under conditions of maintenance. All phase conductor busbars that are accessible via a door shall be fitted with easily removable clear shrouding to protect against accidental contact by personnel. The intention of this clause is to provide accidental touch protection during fault finding.
- gg) Provision shall be made to adequately support all incoming and outgoing cables against mechanical stress.
- hh) Removable split aluminium gland plates (minimum thickness 3mm) shall be provided at each switchboard cable entry point. PVC gland plates are not acceptable.
- ii) The main incoming section and larger motor cable wire ways will require a 5mm aluminium gland plate. The mounting frame shall be rigid enough to prevent deflection of the gland plate. (Use non-ferrous gland plates when installing three phase single core cables).
- jj) A wire way shall be supplied to allow cable access into each cell. Only Earth and Neutral connections shall take place in the wire way.
- kk) A neutral connection point shall be fitted in each wire way (sized at 0.5 times the rated current of the main busbars). The connection point shall allow easy conversion to a full neutral bar if required by Watercare.
- ll) Switchboard cell main isolators shall be mechanically interlocked such that the switchboard cell door cannot normally be opened when the isolator is in the 'on' position. It shall be possible to defeat the interlock and open the door with the isolator on, only with the use of a special tool and only when the isolator is not padlocked off.
- mm) All switchboard cell main isolators / circuit breakers shall be of the rotary type and lockable in the off position with a padlock. They shall be capable of interrupting the full prospective short circuit current of the board at rated voltage and frequency. Circuit breaker co-ordination shall be Type 2.
- nn) Any isolator / switch rated above 63A shall not be mounted on the switchboard door. Any wiring looms connected to the cubicle doors shall have a gooseneck and sufficient slack to allow the doors to open easily and fully without placing any undue strain on the wiring.
- oo) A wire way shall be provided across the top of the switchboard to allow the interconnection of cables between cells.
- pp) Within cubicles, control and power wiring shall be enclosed in separate slotted PVC ducting. Cable ducting shall be sized for a minimum of 50% spare capacity.
- qq) Equipment in the switchboard other than door mounted control switches, indicators and meters shall be mounted on removable gear plates fixed to the frame of the switchboard. Wherever possible equipment shall be DIN rail mounted on the gear plate.
- rr) DC power supplies and batteries shall be mounted in the PLC control cubicle. Batteries shall be mounted with seismic restraints. The mounting shall also allow easy removal and checking of the batteries while still connected to the supply.
- ss) One 60Watt heater shall be fitted at the bottom of each wire way controlled via a thermostat situated as close as practical to the top of that wire way. The thermostat shall be located in a position that will not impede cable installation.
- tt) Main switchboards with an incoming isolator greater than 80A shall have a power meter installed with an RS485 Modbus or Ethernet IP adaptor module.
- uu) The main switchboard shall have 3 phase surge protection installed. This shall comprise a surge diverter which complies with ANSI/IEEE C62.41.2 Cat A, Cat B, Cat C standards.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) to AS/NZS 3439.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Manufacturers name		
Country and city of manufacture		
Source & country of source of principal switchboard components		
Fully compliant with referenced standards		
Main busbar rating (rated current) – Ampere		
Main busbar rating (short-time withstand current) - kA		
Distribution busbars (rated current) – Ampere		
Distribution busbar rating (short-time withstand current) – kA		
Design - Fully type tested or partially type tested assembly		
Form rating (to AS3439.1)		
Copies of Certificates of Compliance Included		
Maximum temperature rise of busbars above ambient		
Metalwork gauge (mm)		
Ventilation/heat dissipation requirements		
Paint Finish		
Colour (External)		
Colour (Internal)		

14.13.5 Electric actuators

General requirements

- a) Comply with [section 14.13.1](#).
- b) Electrical enclosures are to be double sealed and be IP68 rated.
- c) The terminations compartment is to be sealed from the internal electrical elements with IP68 rating.
- d) Power supplies are typically 24 V dc for the motor and the control circuits on remote sites such as line-valve chambers. Established facilities or where provision is made for back-up power generation 3-phase for the motor and 24 V dc for the control circuit shall be considered.
- e) Modbus-RTU communications protocol on RS485 or Foundation Fieldbus as required will be used for all control and monitoring functions.
- f) Rotary selector or push buttons to Open, Close and Stop when in Local Control.
- g) One three-position lockable selector for the following functions: Local, Off, and Remote.
- h) Local continuous indication of the valve position in percentage open, readily visible when the actuator is installed.
- i) Remote controls are to be at 24 V dc. These are to be activated when the local selector is in the Remote position.
- j) Remote Indications.
- k) Monitor relays (Normally-open voltage free contacts). The relays shall be configurable to provide indication of at least the following:
 - Loss of power
 - Actuator battery low
 - Selector switch in Local or Off
 - Motor thermostat tripped
- l) Four independently adjustable limit switches are to be fitted for additional position indication.
- m) End of travel limit switches, one open and one closed limit switch, may be fitted and used to control the limits of the valve travel.
- n) Valve running indication.
- o) Valve travel limitation may use 'torque off' against its own mechanical stops to provide end of travel limit.
- p) The configuration of travel limits, torque levels, and indication contacts shall be by means of a non-intrusive handheld device or an infrared serial link to a computer.
- q) Provision for software uploading and downloading of configuration parameters is desirable (via a serial communications link).

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application description		
Enclosure – Assess environment in accordance with BS EN 60079 / AS/NZS60079		
Specify corrosion protection to suit operating environment		
Input flange – ISO 5211		
Flange / shaft cathodic isolation		
Valve type: Part turn; Multi-turn		

Minimum standard required	Design specific requirements	Supplier submission
<i>Duty cycle:</i> Isolating; Regulating; Modulating		
Operating time/turns		
Seating torque (Nm)		
Running torque (Nm)		
Thrust (kN) – multi-turn only		
Power supply to motor 24 V dc o 3-phase		
Control circuit power supply 24 V dc		
Local indication		
Remote control Modbus RTU on RS485		
<i>Remote indication:</i> Position; Faults		
Product and Test certificates		

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
IQ range	Rotork	Specific to function

14.13.6 Uninterruptable power supply (UPS)

General requirements

- Comply with [section 14.13.1](#).
- Performance shall comply with IEEE 446.
- A guide is provided below to assist in the technical assessment of UPS equipment. The intent of this guide is to identify the UPS equipment most suitable for the application by identifying the main criteria in the technical selection of a UPS. Each criterion is given a weighting such that different UPS equipment suppliers and systems can be suitably compared.

1 = Average, 2 = Good, 3 = Very good, 4 = Excellent

Criteria	Weight 1 to 4	Score 1 to 4	Rating Score X Weight	Comments
Overall UPS Construction	4			The quality of the internal UPS unit construction. Includes internal equipment mounting, cooling/ventilation, 'ruggedness' for an industrial environment.
Suitability for use in Environment	4			The suitability of the UPS to operate in the Watercare environment. Features appropriate for industrial rather than server room use.
Mounting Arrangement	1			UPS mounting options and ability to fit earthquake restraints.
Components	2			Review of internal UPS components used. Single supplier preferred.
Cable Termination	2			Ease of power and control cable termination.
UPS Efficiency	3			UPS running efficiency.
Maintenance Bypass Arrangement	2			Proprietary maintenance bypass cabinet preferred rather than custom made.
Operator Display	2			Ease & clarity of local UPS controls and status indication. Features that provide operator local visual/audible fault indication.
Battery System	3			Dual independent battery systems preferred.
Battery Cabinets/racks	3			If applicable, quality of external battery cabinets/racks, etc.
Battery Mounting (internal)	2			If applicable, method of installing internal batteries, drip trays etc.
Battery Type	2			The type/manufacturer/quality of batteries offered. Include battery design life and local battery replacement support.
Conformal Coating	3			Preference is for factory conformal coating
Communication & Relay Cards	1			Ability to add additional interface cards and the range of interface cards available.
Supplier/Distributor Commitment	3			Perceived security of supplier and NZ distributor. Assessment of commitment to UPS equipment supply and into NZ market.
UPS Support	4			Assessment of the support offered from the UPS distributor. Review resources the distributor has available.
Additional items to be added as appropriate				
Total	-	-		

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product test certification to AS / IEC 62040.3.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Input rated voltage		
Input Voltage tolerance		
Input Rated frequency		
Power factor		
Output voltage		
Output voltage tolerance		
Output Rated frequency and tolerance		
Overload		
Crest factor		
Bypass rated voltage		
Bypass voltage tolerance		
Bypass rated frequency and tolerance		
Efficiency		
Operating ambient temperature		
Relative humidity range		
Operating altitude		
Product and Test certificates		

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Socomec Masterys (minimum 10kVA, 3ph in/1ph out)	Dataguard	

14.13.7 Motors

General requirements

- a) Comply with [section 14.13.1](#).
- b) Manufacturing standard to AS1359 or BS EN (IEC) 60034.
- c) Motors shall be total enclosed fan cooled (TEFC) and metric frame design.
- d) Cooling fans shall be bi-directional type. Plastic fans are not acceptable.
- e) Motor winding insulation shall comply with BS EN 60085 and be class F to this standard.
- f) Windings shall have terminations to BS4999-145. The termination box shall be 360° rotatable.
- g) The motor shall be capable of operating at full rating under reverse rotation (reversing two motor leads).
- h) Motors larger than 5.5kW or used in variable speed applications shall be protected against excessive temperature with protectors terminated in the terminal box.
- i) For motors over 11 kW, temperature sensing shall be positive temperature coefficient thermistor type, to BS EN 60034-11, Class I with Class B temperature rise tripping function. Motors over 150 kW shall have embedded in the stator windings per phase and per bearing, platinum RTD, type PT100.
- j) Motor bearings shall be packed with lithium based grease to the following requirements:
 - Bearings shall comply with ISO 281
 - Vertical shafts shall have thrust end guide bearings
 - Motors less than 11kW shall have sealed bearings and be re-greasable on larger motors
 - Bearing life shall be minimum 20,000 hours
 - VSD applications fitted with frame size IEC 315 (IEC 60072) and over shall have insulated bearings
 - Temperature detectors shall be spring loaded screw type and touching the outer race. The temperature detectors shall match the thermal limitations of the motor's electrical installation
- k) Motors selected for VSD applications shall be capable of operation when supplied from a thyristor, transistor or IGBT type VSD. The speed range shall be 10-100 Hz. The de-rating factors shall be supplied.
- l) Motors shall be rated for 1.15 continuous service factor.
- m) Motors over 10kW shall be fitted with an anti-condensation heater, single phase 230Vac, 50 Hz to raise the motor temperature 6°C over the ambient temperature. VSD anti-condensation heating (dc injection) shall not be used in place of heaters.
- n) Heaters shall be wired to a separate terminal block within the motor terminal box. Motor heaters shall be powered via a miniature circuit breaker or fuse connected to the load side of the motor isolator/breaker.
- o) Anti-condensation heaters shall operate continuously whenever the motor is at standstill.
- p) Motors shall have provision for earthing in accordance with BS EN 60034 and shall be provided with a machined boss, tapped for a bolt of suitable size, for earthing purposes.
- q) The maximum permitted noise emission level shall not exceed 80 dB.
- r) Motor connection shafts shall be keyed.

Motor performance ratings

- s) Motors shall be rated to a minimum of IP55. Submersible motors shall be IP68 rated.
- t) Motor duty shall be duty class S1 for continuous operation with up to short term overloads of 150% for 60 seconds unless otherwise specified.
- u) The driven loads power requirements shall not exceed 95% of the motor rating
- v) The electric motor shall be capable of operating continuously, at the rated torque, within the voltage limits $\pm 6\%$ of nominal supply value and within ± 2 Hz from nominal supply frequency value.
- w) Motors shall be rated for a minimum of 15 starts per hour.
- x) The efficiency rating of motors shall be "eff1".
- y) The starting characteristics shall be in accordance with AS1359.41 Design N (normal torque, three phase, cage induction motors, intended for direct on line starting, having 2, 4, 6 or 8 poles and rated from 0.4 kW to 630 kW at a frequency of 50 Hz).
- z) Motors shall be able to start under full-load and accelerate smoothly to full speed.

Submersible motor specific requirements

- aa) The motors shall be of the 3-phase, squirrel-cage induction type, suitable for a 400Vac, 3-phase, 50Hz. supply. Duty S1 and rated for Class MCR.
- bb) Provided with an integral cable(s) to specified length.
- cc) The variable speed drives for borehole pumps shall have a dV/dt rate less than $500V/\mu s$.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) to AS1359 or BS EN (IEC) 60034.

Accepted products

Product model/name	Manufacturer/supplier	Specific limitation
GEC Alstom	Alstom	Needs to meet requirements of the efficiency and usage
ABB	ABB	Needs to meet requirements of the efficiency and usage
Toshiba	Industry Uniserve	Needs to meet requirements of the efficiency and usage
TECO	TECO	Needs to meet requirements of the efficiency and usage
WEG	TR Industries	Needs to meet requirements of the efficiency and usage
Brooke Crompton	Brooke Crompton	Needs to meet requirements of the efficiency and usage

14.13.8 Cable and connectors

Excludes fibre optic cable. Refer to [section 14.13.10](#)

General requirements

- a) Comply with [section 14.13.1](#).
- b) Cables shall comply with AS/NZS3008.1.2.
- c) The insulation shall be general purpose XLPE or PVC 600 / 1000V Grade.
- d) Flat TPS cable shall not be selected for process installations and is allowed for building services only.
- e) Cable connectors shall comply with AS/NZS4325.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) for cable to AS/NZS3008.1.2.
- c) Product certification (ISO Type 5) for cable connectors to AS/NZS4325.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Cable – Coaxial		
RG58 50 ohm (radio dependant)	Electrical Wholesalers (refer: Procurement)	
RG59 75 ohm (radio dependant)	Electrical Wholesalers (refer: Procurement)	
Cable – Control & Instrument (Digital Signals)		
General Cables – B41 series	General Cables	
General Cables - 0.5mm ² "PVC multicore" series	General Cables	
Olex - 0.5mm ² "PVC Flexible control" series	Olex	
Triangle - 0.5mm ² CF series	Triangle Cables	
Prysmain Group	Prysmain Group	
Cable – Control & Instrument (Analogue Signals)		
General Cables – B50 series	General Cables	
Olex - "Instrolex Cable" series	Olex	
Triangle - RD series	Triangle Cables	
Prysmain Group	Prysmain Group	
Cable – Power		
General Cable	General Cables	

Product model/name	Manufacturer/supplier	Specific limitation
Olex	Olex	
Firstflex	Firstflex	
Triangle Cables	Triangle Cables	
Prysmain Group	Prysmain Group	
Cable – VSD to Motor		
General Cables - Kleenscreen series	General Cables	
Olex - Varolex series	Olex	
Firstflex - HDXCY Series	Firstflex	
Triangle Cables - EU Series	Triangle Cables	
Prysmain Group	Prysmain Group	
Cable – Elect. Core/Wire Labels		
Grafoplast	Electrical Wholesalers (refer: Procurement)	

14.13.9 Cable support and conduit

Excludes ducting for fibre optic cable. Refer to [section 14.13.10](#).

General requirements

- a) Cable supports and conduit shall comply with AS/NZS3000,
- b) Cable support shall be heavy duty manufactured from stainless steel 316, galvanised steel or PVC as required for the specific installation environment Cable tray shall be aluminium or stainless steel 316 minimum 1.5mm thickness and 2.5mm thickness for damp environments. The minimum conduit size shall be 20mm diameter and be of PVC or MDPE. Stainless steel may only be used on approval by Watercare.
- c) Cable ladder shall comply with NEMA 16.
- d) Galvanised componentry shall comply with AS 1214.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body's requirements.
- b) Product certification (ISO Type 5) for conduits to AS/NZS3000.
- c) Product certification (ISO Type 5) for cable ladders to NEMA 16.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Cable Tray		
Unistrut Aluminium	Electrical Wholesalers (refer: Procurement)	
Cable Ladder		
Unistrut Aluminium	Electrical Wholesalers (refer: Procurement)	
Conduit		
UV Stabilised - High Impact Plastic Grey	Electrical Wholesalers	
Conduit Fasteners and Saddles		
Stainless Steel Saddles with Stainless Steel Fixings	Electrical Wholesalers	

14.13.10 Fibre optic cable, ducting and components

General requirements

- a) Cable shall be supplied in the form of a 12 x single mode G652 (OS1) fibre with a polyethylene and nylon sheathed fibre bundle.
- b) External Loose Tube Backbone Cabling:
 - UV stabilized nylon 12 outer sheath
 - High strength for installation in reactive soils
 - Polyethylene outer sheath (under nylon)
 - No metal elements to be used
 - Moisture-swell tape surrounding fibre tubes and fillers
 - Solid PE fillers used where glass fibres are not present
 - Glass Reinforced Plastic (GRP) to be used as a Central Strength Member (CSM)
 - The outer sheath marked with A-tick approval, supplier name, month/year of manufacturer, product description, part number and metre marking for every metre of cable
 - ACMA approved
 - Compliant with AS/ACIF S008, IEC 60793 and IEC 60794
 - The loose tube fibre jacket colour for Watercare is black
 - Must be AFC LT112-GREEN for 12 core and AFC LT124- BLACK 24 core
 - All Loose tube cable shall be SMOF
- c) Internal tight buffered backbone cabling (not to be used outdoors):
 - Core locked outer jacket which is UV and fungus resistant
 - Flame retardant
 - Super-absorbent-polymer coated yarn, which swells upon exposure to water
 - Colour coded 900µm diameter tight-buffered fibre that is helically stranded
 - Ripcord for cable stripping
 - Aramid yarn for strength
 - Crush resistance of 1800 N/cm
 - Impact resistance of 1500 impacts
 - Flex resistance of 2000 cycles
 - Operating temperature of -40 °C to +85 °C
 - Outer sheath marked with A-tick approval, suppliers name, month/year of manufacturer, product description, part number and metre marking for every metre of cable
 - Be ACMA approved
 - Outer jacket colour shall be Yellow
 - Must be AFC D112 (12 core SMOF) or ADFD124 (24 core SMOF)
- d) MTP cabling:
 - Meet array connector polarity requirements of ANSI/TIA-568-C-0
 - Meet polarity requirements for duplex optical fibre connectors under ANSI/TIA-568-C-0
 - Have a maximum insertion loss per connector of 0.35dB
 - Have end face geometry compliant with IEC PAS 61755-3-31
 - Have polarity & connectors compatible with FRE-12MTPM series MTP cassettes
 - Utilise round mini cable construction of 3.0mm diameter
 - Comply with AS/ACIF S008, IEC 60793 and IEC 60794
 - Be AFC RMxMTPFX, where x is fibre type, and the core count and length are as required
- e) Pigtailed, patch leads and connectors:
 - Machine polished ferrules
 - All pigtails in conformance with TIA-598C colour code specification. Single colour pigtails such as white or grey are not acceptable
 - All connectors which terminate SMOF shall be SC
 - Compliance with ITU-T G.657.A for bend insensitive SMOF

- Through connectors shall have high tolerance ceramic alignment sleeves to ensure high inter-connect ability
- Compliance with TIA-568-C for pair cross orientation and identification
- LC/UPC duplex patch leads shall have LC duplex connectors
- All SMOF pigtails, patch cords and connectors shall comply with Telcordia standards GR-326 for Telco Grade Networks to ensure ferrule end faces meet the geometry requirements for minimum insertion loss. This should be done using interferometer end face geometry testing. Test reports shall be provided
- All connectors shall be inspected using a factory grade video inspection device. The connections shall comply with IEC 61300-3-35 and AS/NZS ISO/IEC 14763.3 for pits/chips, defects and scratches on the end face of the connector during manufacturing

f) Fibre Optic Splice Cassettes:

- Be of flame retardant and RoHS compliant ABS plastic construction
- Include a high density Acetyl splice comb, for double stacked splices
- Include hinge mechanisms that support stacking multiple cassettes
- Incorporate two or more columns of not less than 30mm to reverse the fibre direction and spool excess fibre
- Contain spring loaded fibre clamps with padded faces to hold fibres at any of the points of entry
- Include fibre channels that protect pigtails and fibres on both sides
- Provide two dedicated “dark” fibre storage locations for unterminated fibres, preventing unterminated fibre ends from mixing with terminated fibres
- Support mounting directly to a rack mount enclosure tray without the requirement for an additional bracket to avoid reducing the available vertical space within the enclosure
- Include a hinged lid to cover and protect splices and fibres
- Attached is the AFC document for the installation instructions for the large fusion splice cassette

Rack mount enclosures

a) Enclosures for loose tube fibre cable:

- Double extension sliding rails
- Method of securing the incoming fibre on the rear of the enclosure, so that the cable remains static and no pressure is put onto the fibre as the enclosure draw is engaged
- Rear bracket capable of allowing six cable sheathes to be brought into the enclosure for termination
- A reversible rear bracket to allow left or right cable entry
- Modular snap in adapter plates incorporating silk screened labelling for fibre identification
- Provision of a method of upgrade to a rodent proof enclosure through the addition of rodent proof brackets or panels, capable of supporting termination of four cable sheathes into the enclosure
- Rack mountable with the multi position option for forward or recessed mounting
- Made of 1.6mm mild steel, powder coated charcoal grey.
- Enclosure supplied fully loaded with all 24 SC pigtails, two splice trays, and 12 SC simplex through connectors with splice protector
- Must be fully loaded AFC FRE-1RU-MOD-SS2 Static Sliding enclosure
- The code for this AFC enclosure is RC-1CX1ML-BB-2L
- If only 12 cores are connected these will be stored in the bottom splice tray
- If only 12 cores are connected the spare 12 cores of pigtails will be plugged into adaptors in the tray and the tails will be stored in the top splice tray with spare splice protectors
- When the next 12 cores are connected they will be installed in the top splice tray
- The instruction manual for installation of the Static Sliding Enclosure is attached to this document

- b) Enclosure for tight buffered fibre cable:
- Double extension sliding rails
 - M-shaped bracket with four entry ports on the rear of the enclosure to allow for multiple entry directions
 - Modular snap in adaptor plates with silk screened labelling for fibre identification
 - Blanking plates installed for unused portions of the enclosure
 - Rack mountable with the multi-position option for forward or recessed mounting
 - Cable management fitted to the front of the enclosure with a protective cover
 - Enclosure supplied fully loaded with all pigtails, splice trays, and through connectors
 - Fully loaded AFC FRE-1RU-MOD-SS2 slider enclosure
 - Enclosure should be supplied fully loaded with all 24 SC pigtails, 2 splice trays, and 12 SC simplex through connectors and splice protector
 - The code for this AFC enclosure is RC-1CX1ML-BB-2L
- c) Enclosures for MTP installation:
- Angled left and right wings at the rear of the enclosure to allow cable entry from either side without a cable gland or other entry
 - Slotted left & right rear wings to allow secure attachment of pre-terminated or MTP cables
 - Modular snap in adaptor plates with silk screened labelling for fibre identification
 - Blanking plates installed for any unused portion of the enclosure
 - Rack mountable with the multi position option for forward or recessed mounting
 - Cable management fitted to the front of the enclosure with a protective cover
 - Internal fibre clips to facilitate internal management of cables
 - AFC FRE-1RU-MOD-WB with C tray and protective cover for labelling
- d) Enclosures for wall mounting:
- A wall mount enclosure may only be used with the prior approval of Watercare
 - Two doors provided for each enclosure with a key lock
 - Internal fibre clips provided for management of incoming fibres
 - Is capable of supporting the fixed mounting of a splice cassette
 - Is capable of supporting cable entry via the top or bottom of the enclosure
 - A strain relief post provided for the termination of loose tube fibre
 - Modular panel design with silk screened labelling for fibre identification
 - Must be AFC FWE-MOD-XX wall enclosure with splice cassette (splice cassette can be omitted for pre-terminated or MTP applications)
- e) Enclosures for DIN rail mounting:
- A DIN Rail Clip provided for mounting to an existing DIN Rail
 - Rodent Proof
 - Capable of supporting the fixed mounting of a splice cassette
 - Capable of supporting cable entry via the top or bottom of the enclosure with a cable gland and strain relief
 - Capable of supporting either modular panel design, or the doubling of its capacity via mating two enclosures together. In this case a knockout must be provided between enclosures for fibre transport
 - Silk screened labelling for fibre identification
 - Must be AFC FDE-xx DIN rail enclosure (where xx identifies the core count and fibre type)
- f) IP rated external enclosures:
- All 9 core connections to 24 fibres shall use EZ Mate connectors. All externally mounted wall mounted enclosures must:
- Be made from 316 Stainless Steel
 - Be minimum IP66 rated

- Have lockable doors
- Use SCA for SMOF
- Use SC for MMOF
- Have a splice tray fitted when used for splicing
- Be AFC RITxx-SCA

Pre-terminated harsh environment fibre optic networks

All pre-terminated harsh environment fibre optic networks shall use pre-terminated IP rated connections to simplify fibre optic connections. All 8 core connections or less shall use expanded beam connectors, and:

- a) Be made from 316 Stainless Steel.
- b) Be MIL-DTL-83526 compliant.
- c) Be Hermaphroditic.
- d) Have an insertion loss with a maximum of 1.5db for SMOF.
- e) Have an insertion loss with a maximum of 1.0db for MMOF.
- f) Have a return loss > -32db.
- g) Have crush resistance of 6.7kN.
- h) Have cable retention of 1500N.
- i) Be capable of water immersion to at least 15 metres.
- j) Have an operating temperature range of at least -40 °C to +85 °C.
- k) Be AFC expanded beam connectors.
- l) Be made from 316 Stainless Steel.
- m) Be hermaphroditic.
- n) Have a maximum insertion loss of .75db for SMOF or MMOF.
- o) Have a return loss of > -40db.
- p) Have an operating temperature of -54 °C to +71 °C.
- q) Have mating durability compliant with TIA-455-21.
- r) Have impact resistance compliant with TIA-EIA-455-2.
- s) Have Cable retention compliant with TIA-455-6.
- t) Have Crush resistance compliant with TIA-455-26.
- u) Have Water immersion compliant with EIA/TIA-455-98.
- v) Must be AFC EZ Mate connectors.
- w) All pre-terminated harsh environment connectors shall be factory terminated onto milspec cable complaint to TIA/EIA-455-41, TIA/EIA-455-25 and TIA/EIA-455-104 military requirement.

Quality Control

- a) All products shall be marked in accordance with the conformity assessment body’s requirements.
- b) Product certification (ISO Type 5) to the referenced standard where nominated.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Fibre Cable - Accessories		
AFC - Pigtails, Patchcords, Connectors, Large Fusion Splice Cassettes SPLCASS-LSH-HD etc.	Maser Communications (NZ) Ltd	
Fibre Cable – Blown Cores		
AFC 12 x Single Mode G652 (OS1) Fibre, Part No. QQDU10EA012	Maser Communications (NZ) Ltd	
Fibre Cable - Duct		

Product model/name	Manufacturer/supplier	Specific limitation
32mm Dura-line Tornado Plus	Maser Communications (NZ) Ltd	
Fibre Cable – Labels		
TNA Industries Cable Markers	Electrical Wholesalers	

14.13.11 Variable speed drives (VSD)

General Requirements

- a) Maximum and minimum speed limit independently adjustable from 0% to 120% of rated motor speed.
- b) Acceleration and deceleration times independently adjustable by way of variable ramp rates and times.
- c) Critical speed skipping at three adjustable frequencies.
- d) VSD's shall have the following features:
 - Drive run/stop input
 - Drive Latch start
 - Drive Stop reset
 - Drive running output
 - Drive fault output
 - Manual speed control via electronic faceplate.
 - Remote speed control (4-20ma).
 - Current signal output (4-20ma)
 - Speed (frequency) signal output (4-20ma)
 - Full load efficiency greater than 96%
 - Average supply power factor of 0.96cos ϕ over full operating range
- e) VSD's shall be provided with a keyboard and display unit for VSD configuration, manual control and indication. The keyboard and display unit shall allow use without the need to open the VSD cabinet door(s). Manual control and indication shall include manual start/stop control, drive status, indication and alarms and fault interrogation.
- f) Communication options for control and diagnostics shall be included if required.
- g) Provision for CAT3 safe-torque off shall be included as standard to be used if the drive is to be incorporated in an E-Stop circuit (CAT 0 or 1 as appropriate). Alternatively a supply contactor may be used to trip the drive under E-Stop conditions (CAT 0 or 1 as appropriate)

Power Rating

- a) The VSD kW rating shall exceed the rated output of the connected motor by a minimum of 15% and shall have an overload capacity of 150% of the rated motor kW for 30 seconds in keeping with motor specification.
- b) VSDs shall provide a minimum of 150% of full load torque at start-up. The VSDs shall provide an automatic voltage boost by measurement of motor current to prevent stalling of the motor at start-up or during any portion of the run-up. Any de-rating of the drive due to temperature or alterations to switching frequency shall not detract from the power requirements.

The power supply will be derived from a fused isolator or circuit breaker within the supply MCC.

EMC/RFI

- a) The VSDs shall comply fully with the requirements of the Radio communications Interference Notice 1993, including amendments 1 - 4. Any filters or other means necessary to achieve compliance shall be included.
- b) The VSD shall include integrated radio frequency suppression according to the requirements of AS/NZS CISPR 11:2002 or equivalent.

Cabling

- a) The cable shall minimise capacitance of the power conductors and have an electrically balanced construction including split earths and a copper screen.

- b) The supplier shall declare the required cable types, sizes and formats necessary to comply with the requirements for current carrying capacity, system earthing, installation conditions, maximum lengths, EDM mitigation and other functional requirements set out by the design specification.

Harmonic Mitigation

The VSD supplier shall be required to take full consideration of the potentially detrimental effect of VSD generated harmonics on the power supply system and other connected loads. Any proposed additional equipment shall be supplied with the calculated reduction in harmonic levels.

- The harmonic voltage limitation shall be as defined in AS/NZS 61000 and NZECP36 at the Point of Common Coupling (PCC) for the power supply parameters given. Consideration shall be taken of the power supply impedances, existing harmonic levels and other loads connected to the power system.
- Identify all measures necessary to ensure maximum acceptable values of harmonic voltage and current distortion are not exceeded, and will not result in any detrimental effects on other equipment connected to the same power system.

Protection

- a) The VSDs shall have built-in motor thermal protection by electronic current sensing.
- b) The VSDs shall be capable of withstanding a short circuit between phases and to ground at the output terminals without damage.
- c) Under heavy loads the VSDs protection shall trip as appropriate to prevent damage to itself or the motor.
- d) In the event of a supply interruption or excessive voltage drop at the input to the VSD, the control circuit shall shut down the drive system in an orderly manner without damage or operation of fuses or circuit breakers. Immediate restart shall be possible after resetting any alarms. For voltage interruptions with duration of less than 50 ms the VSD shall be able to ride through the voltage dip and continue to function normally when the voltage returns to acceptable limits.
- e) The VSDs shall incorporate a log of the causes of the last 10 trips.
- f) An option shall be provided to allow the VSD to automatically restart without damage or tripping when connected to a spinning motor after a brief interruption to the supply voltage.

Enclosure

- a) The enclosure shall be to the Vendor's standard, with IP ratings and mountings as specified. The enclosure shall be rated for a minimum of IP54.
- b) Access for operation and maintenance shall be from front only.
- c) The VSDs shall operate within the manufacturer's guaranteed performance and reliability figures at any ambient temperature between 0°C and 40°C. Where necessary, the manufacturer shall provide additional forced cooling to maintain temperatures at the VSD within acceptable operational limits for the above ambient temperature range. Where forced cooling is required within the enclosure, an alarm facility for fan failure shall be provided. Calculations or Type Test Results shall be provided to verify the adequacy of the ventilation fans for maintaining the temperature within the acceptable limits, taking into consideration any filters, where provided.
- d) VSDs shall have special protection in the form of a conformal coating for components to protect against damage from H₂S rich atmosphere, where applicable.

- e) The doors shall have concealed hinges and 135° full swing around a vertical axis. Doors shall be effectively earthed by flexible copper braids. The doors shall have a resilient, full perimeter neoprene gasket.
- f) Welds shall be full fillet of neat appearance with all scale and weld spatter removed. Visible welds shall be ground and treated so that they conform in appearance and finish to the component material used. Welding shall be performed so as to minimise internal stresses and to prevent distortion.
- g) Where appropriate and depending on the size, make and model of the VSD Unit, the following shall apply:-
 - i. A gland plate shall be provided for cable entry. The gland plate shall be removable and of the following material:
 - For multicore cables - PVC with internal galvanised cable/screen support clamps aluminium 3 to 5 mm thick
 - For single core cables – aluminium 5 mm thick
 - The conductors and cable cores shall be identified by appropriate coloured sleeves.
 - ii. An earth bar shall be provided within the enclosure. All non-current carrying metal parts shall be earthed by connecting to this bar.
- h) Floor standing VSDs shall be mounted on a steel plinth.

Motors

- a) Where PWM VVVF VSDs are offered, the supplier shall provide a guarantee against damage to the motor bearings caused by Electro Discharge Machining (EDM) and other related phenomenon. The measures to be taken shall be fully described in the tender submission.
- b) The motor insulation shall not be stressed by high switching speeds or the voltage reflection effect. The Tenderer shall provide details of any motor cable length, type or configuration restrictions and optional details for output reactors/cable terminators in case it is necessary to exceed the critical cable length.
- c) The VSDs will be used with standard (not inverter) duty motors. Harmonics produced by the VSD shall not require any de-rating of the motor due to any additional heating caused by harmonic currents. Dv/dt filters shall be provided for uses where the insulation integrity of the motor is old or unknown.

Parameter Set

A full parameter sheet shall be supplied for each installed VSD.

Procurement schedule

Minimum standard required	Design specific requirements	Supplier submission
Application use description		
Critical speed skipping frequencies		
Communication options for control and diagnostics		
E-stop provisions		
Drive de-rating		
Cable requirements		
Harmonic mitigation measures		

Minimum standard required	Design specific requirements	Supplier submission
Enclosure IP rating (min. IP54)		
Enclosure mounting requirements		
Special environmental protection requirements		
VSD cooling requirements		

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
ATV 71/61	Schneider Electric	
Powerflex 750 series	NHP Electrical Products (NZ) Ltd.	
ABB ACS series	ABB	
SD700	Power Electronics	
Hydrovar	Xylem	Only for local network water booster pump stations

14.13.12 Air circuit breakers (ACB)

General Requirements

LV Air Circuit Breakers (ACB) circuit shall be of the draw out type, with matching current transformers and solid state protection unit. The solid state protection unit shall have over current short circuit and earth fault characteristics adjustable on time and current basis. The circuit breaker shall have the following accessories:

- Motor operated, spring charged operating mechanism (close-open-close cycle before recharge)
- Handle for hand charging the spring
- Close - open push button
- Spring "charged" - "discharged" mechanical indicators
- Key locks for "connected", "disconnected" and "test" position
- Door interlock
- Functional position indicator : "connected", "disconnected" and "test" position
- Breaker "on" and "off" indication
- Padlocking facilities in "disconnected" or "test" position
- Fault trip indicator/breaker reset push button
- Operation counter
- Under voltage release / Shunt trip / Closing coil
- 2NO + 2NC auxiliary contacts
- Safety shutters on busbar and cable side with pad locking facility.
- On and off push buttons
- Separate earth fault relay with a current transformer mounted on the neutral

The short circuit breaking capacity of the circuit breaker shall be equal to or more than the busbar fault level.

Current transformers shall comply with applicable standards and shall be supplied to suit the protection and metering being provided. Unless otherwise shown the metering current transformers shall be of accuracy class 1 and 7.5 VA burden. All C.T.'s shall have the same secondary current rating of 1 amp.

Standardised products

Product model/name	Manufacturer/supplier	Specific limitation
Circuit Breakers - ACB		
Schneider	Schneider Electric	
NHP Terasaki AR series	NHP Electrical Products (NZ) Ltd.	
ABB	ABB	

15. Miscellaneous accepted products

Listing No.	Product model/name	Manufacturer/supplier	Application	Limitation	Conformity / Quality Control
Hydrant parts					
1	Hydrant Tee		Water networks	Z-ring type	AS/NZS 2280:2004 Ductile Iron Pressure Pipes and Fittings
2	Hydrant marker	Road Mark Systems			Thermoplastic triangle
3	Polyurethane Hydrant Washers	N & P Industries - James Walker	Water networks		
General pipe and fittings					
4	Micro liner	Aquatech	Wastewater internal pipe repair	Small pipe size. Large pipe requires design input from supplier	
5	Pipe fittings: Copper Alloy Brass	Spartan Engineering; Mason Engineers Ltd	Water networks	50mm and below	DZR, PN16
6	Post formed uPVC pipe bend	Solo plastics	Water networks		
7	EBCO 2, 4, 6 port manifold	Ebco	Multiple-meter connections	6-port, to be installed with 2" supply at port entry necked-down. Length of supply must be checked for adequate flow	BS EN 1982
Valve repairs					
8	Valve Packing:				
	"Superlon" 1724 PTFE	Stevenson Chesterton Packing Division	Water networks	Valves up to 250mm	
	"Sepco" ML2254 Teflon	N & P Industries			
Valve Cones on 100 mm and 150 mm valves	N & P Industries - James Walker				
9	Valve Rubber Stem Cone	N & P Industries - James Walker	Water networks		
10	Valve - non-return	WaStop	Wastewater networks	Stainless Steel version. low pressure flood and odour protection only	SS 316 grade

Listing No.	Product model/name	Manufacturer/supplier	Application	Limitation	Conformity / Quality Control
Access structures					
11	Moddex modular handrails and balustrades	Moddex	Water and Wastewater		AS 1074 for galvanised steel; AS/NZS 1170 for structural design and AS/NZS 1657 certification for fixed platforms, walkways, stairways and ladders.
Tracer wire and buried service identification tape					
12	Trace-Safe RT1802W	Neptco	Water and Wastewater	Use with proprietary connectors and tracing point	
13	SoloShot EHS-CCS HDPE 45mil	Copperhead	Water and Wastewater	Use with proprietary connectors and tracing point	
14	ELV cable 4 core, 4mm copper, PE sleeved		Water and Wastewater		
15	Warning strip tape		Water and Wastewater	Minimum 150mm wide	Colour to AS/NZS 2648 Manufacture and testing to AS/NZS 4275
Concrete repair					
16	EMACO Nanocrete R4	BASF	Water	Repair of concrete lining in pipe.	
17	SewperCoat 2000 HS	Kerneos	Wastewater	Calcium aluminate cement (concrete corrosion resistant) mortar repair. Dry spray application grade	
18	SewperCoat PG	Kerneos	Wastewater	Wet spray , low pressure application	Requires approval on case-by-case basis by Watercare
19	Monotop 352N	Sika	Wastewater - manhole benching repair	Small repair areas to correct minor defects. Minimum and maximum thickness as per the product specification	
20	EMACO Nanocrete R2	BASF	Wastewater - manhole benching repair	Small repair areas to correct minor defects. Minimum and maximum thickness as per the product specification	
Other					
21	Flange dress sets. (Galvanised bolts with	Hynds	Local networks flange installations		As per section 14.5, 14.6 & 14.7

Listing No.	Product model/name	Manufacturer/supplier	Application	Limitation	Conformity / Quality Control
	EPDM flange gasket)				
22	HiBuild 1000 Acrylic Paint	Paint Plus	Water and Wastewater	Colour codes: White, blue, black and road marking yellow to mark valves service connections, ducts and fire hydrants respectively. Not to be used for corrosion protection	