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Manufacturers

**Project
specific
requirements**

Councils

Suppliers

WS-SPEC

Developers

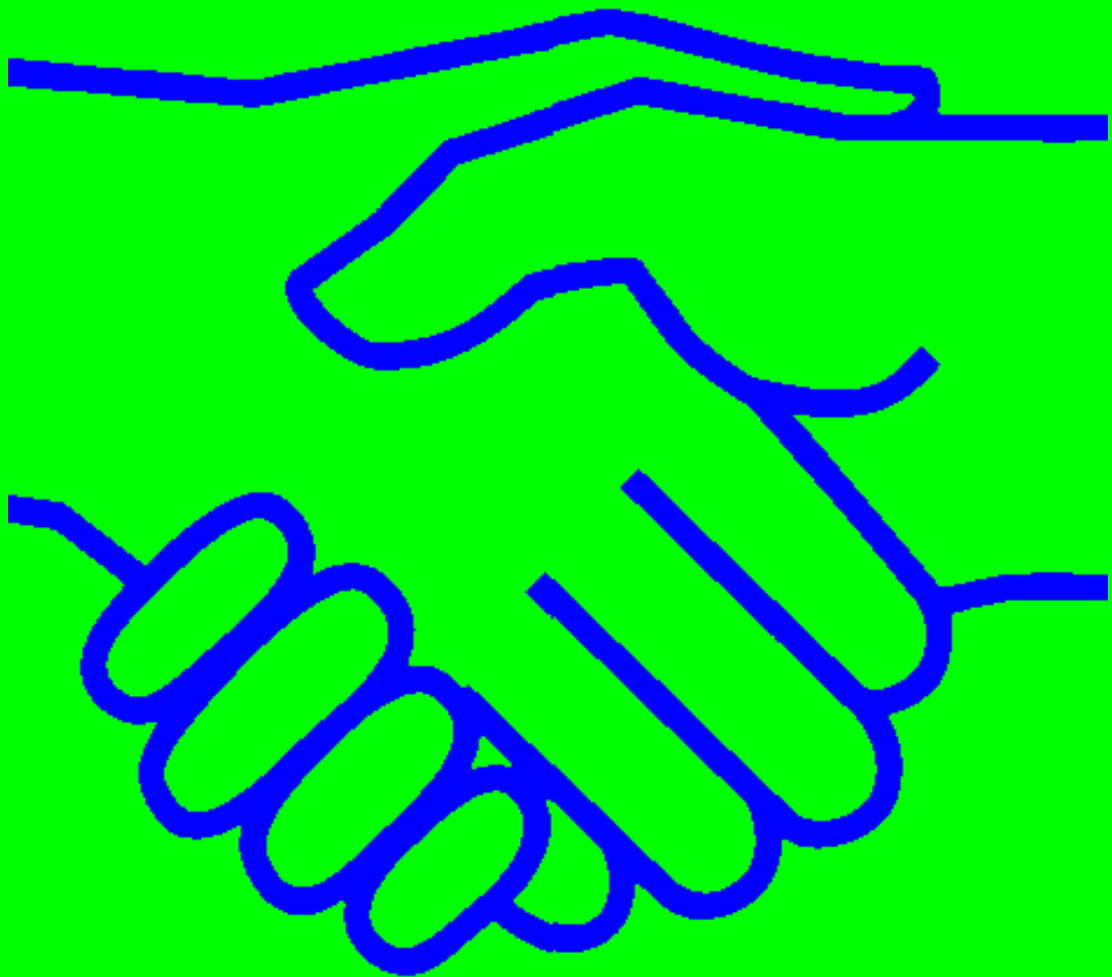
Consultants

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WS-SPEC

WATER SERVICES SPECIFICATION



WS-SPEC : 2000

ACKNOWLEDGMENTS

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- WSAA-QAN (previously AWAQAN)
- WS-SPEC Technical Committee (previously other names)

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- South Australian Water Corporation
- Water Corporation, WA

Together with the support of the following:

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- Brisbane Water
- City West Water Limited
- Department of Natural Resources, Qld
- Hunter Water Corporation
- Gold Coast Water
- Power and Water Authority, NT
- South East Water Limited
- Yarra Valley Water Limited
- AEEMA (Aust. Electrical and Electronic Manufacturers' Assoc.)
- APAS (Australian Paint Approval Scheme)
- APMCA (Australian Premixed Concrete Assoc.)
- APMF (Aust. Paint Manufacturers' Federation)
- ASSDA (Aust. Stainless Steel Development Assoc.)
- AUSPOLY (Polyethylene Pipelines Assoc. of Australasia Ltd)
- CCF (Civil Contractors Federation)
- CIA (Composites Institute of Australia)
- CPAA (Concrete Pipe Association of Australasia)
- ITAB (Industry Training Advisory Bodies)
- PIPA (PVC Pipelines Industry Assoc. of Australasia Ltd)
- Individual manufacturers, too numerous to list individually

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FOREWORD

As Chairman of the Australian Procurement and Construction Council, I am pleased to endorse the publication of this first edition of the Water Services Specification (WS-SPEC). It represents an initiative that will make a valuable contribution to greater efficiency in Australian water industry contracts.

WS-SPEC is designed to improve procurement practices for strategic infrastructure products and construction services that are commonly outsourced by water agencies. To achieve this objective, it provides reference documents to enable the efficient preparation of quality contract documentation and technical specifications. WS-SPEC adopts an approach to contract documents that is in use in the general construction industry and so has value to both the water industry and the construction industry.

WS-SPEC should deliver substantial economic benefits across the water industry. Its use will result in contract documentation that will better communicate water agencies' needs and practices to their suppliers. This will reduce the potential for those omissions and errors that can lead to significant costs, including expensive dispute resolution processes. DPWS' experience in both the building and water industries has resulted in WS-SPEC being suitable for water agency use in both technical and commercial dealings with the construction industry.

The Water Services Specification joins a range of other reforms recently introduced to improve building and construction industry performance. It is a welcome development in achieving an internationally competitive Australian water industry.

Dick Persson
Chairman, Australian Procurement and Construction Council
Director-General, NSW Department of Public Works and Services

The Water Services Association of Australia (WSAA) recognises that Australia is in a period of rapid change driven by the need to reform our industries to remain competitive within the global community. Therefore WSAA encourages industry wide cooperation where this can achieve gains in productivity and performance. Hence it has supported the development of WS-SPEC, a document which reflects the collective wisdom and experience of relevant individuals and groups throughout the water industry, as can be seen from the page of acknowledgments. Acknowledgment is due to the NSW Department of Public Works and Services for its leadership role in initiating and coordinating WS-SPEC.

WS-SPEC is a useful contribution to the Australian water industry's drive to achieve best practice and strategic standardisation in the delivery of water and wastewater infrastructure that is both fit for purpose and cost effective.

Dr John Langford BE (Ag) PhD FTSE FIE Aust
Executive Director of the Water Services Association of Australia

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PREFACE

INTRODUCTION

WS-SPEC is a suite of standard technical specifications or a master specification system, that can be linked or coupled to the specific requirements of any project, that is the project specifics or the technical clauses. It is designed to avoid all the duplication that occurs in preparing this information for each project, and for individual agencies to prepare and maintain a similar system. It is also an agency consensus document, and by listing agency practices, standardisation across the water industry, in the national interest, is facilitated. However, each user must appraise the suitability of WS-SPEC to each project application including the currency of any listed practices.

USAGE

WS-SPEC is intended for use by agencies, councils, consultants and developers for the procurement of strategic products and construction services associated with but not restricted to water supply, sewerage, drainage and water re-use.

Specifically, WS-SPEC can:

- Set the technical and quality standard for developer works, service contracting such as BOT, BOO, BOOT, DCO, and other procurements systems;
- Be used in *performance specifications* and Design and Construct (D&C) contracts as the *deemed-to-comply* or *deemed-to-satisfy* solution;
- Be used with most “General Conditions of Contract” commonly available in Australia as it only addresses technical requirements for contract documentation.

The General Conditions of Contract, other contractual or preliminary clauses and drawings are added to the technical clauses or specification to form the complete set of contract documents. Many Standards and Codes are referenced from the contract documents and the options or selections contained therein, are closed out either in the master specification or the project specifics.

SCOPE

This document addresses:

- **Strategic products** (SP – Sections)
All water industry strategic products, for example: pipes, fittings, valves, maintenance holes and shafts, water meters and pre-mixed concrete;
- **Technical requirements** (TR – Sections)
The technical requirements of work elements, for examples: earthworks, fabrication, installation, construction, protective coatings, including application of the strategic products.

It also provides, separately as attachments, guidance in preparing project specifications, including: a model specification, reference contacts, summary of certification requirements and other useful information.

FORMAT AND STYLE

The format and style of WS-SPEC reflects *current best practice*, a range of industry sectors throughout the world having adopted this system. This approach also integrates with that of NATSPEC, the national building and services specification, thus avoiding duplication and further reducing the cost of preparing contract documents.

Unlike the WSAA Codes and Australian Standards, requirements are stated without explanation or guide notes as these remove responsibility from the contractor or supplier, negating the role of the quality assurance provisions. The use of incomplete sentences and the imperative language style are used to keep the requirements short and clear. Each section, where possible, addresses a strategic product or work element, which can then be called up as required without duplicating or conflicting with the contents of other sections. Because each section is complete in itself, this reduces the need for cross-referencing, a frequent source of error.

Wherever possible, requirements have been given in quantitative terms. However, where these have not been available they have been flagged as “[To be determined]”.

QUALITY

WS-SPEC addresses the requirements that are fundamental to quality and consistent auditing, namely:

- Strategic product compliance;
- Construction ITP (Inspection and Test Plans); and
- Competency based training qualifications.

A rationalised approach to the certification of strategic products has been adopted and a summary of certification requirements is included as Attachment C.

AUSTRALIAN STANDARDS

In some instances, the use of Australian Standards that are still being developed has been made possible by listing both the "Draft" number and the "AS" number. In other cases, where an Australian or other appropriate Standard is not available, a specification has been prepared and included in Australian Standard format as an attachment to the SP-Section. As such the attachment becomes a "defacto" Australian Standard until an Australian Standard can be published.

SPECIFICATION PREPARATION

The adoption of a common language and contract documentation structure is critical for specification preparation, hence the inclusion of Attachment E, which outlines the commonly adopted approach in the water and construction industries. Creating a technical specification for a project, including those covered by the WSAA Codes, is shown in Attachment F, and Model Specifications are included in Attachments G and H. The Model Specifications are technically arbitrary, the focus being to suggest ways of documenting a variety of competing strategic products. Consequently, example entries for the project requirements may look inconsistent between similar products. It is expected that the contents of the project specifics tables will be altered to suit each specification.

There remains considerable scope for new sections, however, until they are developed, users will need to prepare their own requirements and include them as project specifics.

The recommended use of WS-SPEC as a *reference document* does not preclude the attachment of individual sections to contract documents. However this alternative approach is not favoured as it unnecessarily increases the thickness of the contract documents, with its added complexity and paper wastage. Also, the use of any individual part of WS-SPEC as a *proforma*, that is marking up project specifics within a table without having transferred the project specifics table to the contract documents, is not intended nor recommended.

FUTURE ISSUES

This issue of WS-SPEC is only available as a hard copy, but later issues will take advantage of delivery systems such as CD Rom and downloading from the Internet to improve communication across the many interfaces involved in the construction process. Linking in with electronic tendering will further enhance efficiency and productivity.

Re-issuing this living document on a regular basis is both desirable and planned, hopefully improved and enlarged each time. To ensure the best possible service is offered, a Suggestion/Improvement Request Form is included as Attachment J and your input in responding to this will be appreciated.

SECTION SP1 STEEL PIPES AND FITTINGS**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of welded steel pipes and fittings, and associated components for water supply and sewerage applications.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS 1579](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2. [under preparation] The total exposed storage period from date of manufacture, of taped external coating systems for steel pipes and fittings, not to exceed 6 months.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project bases.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A coupled with Table A1, [AS 1579](#) and the following.

JOINT TYPE TEST: For new joint designs or changes to elastomeric seals, Type Test to [AS 1579](#), Clause 2.1.3.3.

ELASTOMERIC SEAL JOINT PROFILE: Test by attributes (go and no-go gauges) to the designed profile including external coating, at a minimum frequency of 3 units, selected at random, every 8 hours.

CEMENT MORTAR LINING: Appendix A coupled with Clause 9, [AS 1281](#).
[Note: Frequency to be determined.]

FBPE COATING AND LINING: Appendix A coupled with Table 2, [AS 4321](#).

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 STEEL

STANDARD: To [AS 1579](#) with minimum nominal wall thickness 4.8 mm (tolerance on nominal ± 0.1 mm) unless otherwise specified. [To be reviewed]

3.4 CEMENT MORTAR LINING

STANDARD: To [AS 1281](#).

3.5 FBPE COATING

STANDARD: To [AS 4321](#).

3.6 FIELD JOINT COATINGS

WELDED JOINTS: To manufacturer's written instructions.

BOLTED JOINTS: To manufacturer's written instructions to suit bolting (fastener) selection.

3.7 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C.

3.8 FLANGE GASKETS AND O-RINGS

REQUIREMENTS: To Section SP15 and [AS 4087](#), Appendix D.

4 MANUFACTURE

4.1 PIPES

STANDARD: To [AS 1579](#).

LONGITUDINAL WELDS: Minimum stagger 200 mm ([AS 1579](#), Clause 2.1.2).

MARKING: Additional to markings required by [AS 1579](#) (including serial number), permanently mark spigots with a witness mark for site assembly of elastomeric seal joints.

4.2 FITTINGS

REQUIREMENT: Design by manufacturer, to nominated parameters. See *SYDNEY WATER CORPORATION, PRACTICE - CLAUSE 5.6* for typical designs.

STANDARD: To [AS 1579](#).

MARKING: Additional to markings required by [AS 1579](#) (including serial number), permanently mark each fitting with the angle of bend.

4.3 EXTERNAL COATING SYSTEMS

REQUIREMENT: Prepare surface and apply a protective coating system to all external surfaces except collars, coated spigot ends and within 50 mm of field weld lines.

FBPE COATING SYSTEM:

Standard: To [AS 4321](#).

DECORATIVE TOPCOAT: To Section SP30.

4.4 INTERNAL LINING

REQUIREMENT: Line all pipes and fittings with cement mortar. Sprayed application of mortar not accepted for pipes. For nominal sizes DN 750 and above, seal ends with polyethylene sheeting.

PREREQUISITES: Apply any joint protective coatings (eg. FBPE, epoxy) before applying cement mortar lining.

HAND APPLICATION: Prohibited on pipes except for repairing lining defects.

PROTECTION: Keep cement slurry off those sections of the joint protective coating which will not be covered by cement lining.

LINING SETBACKS: To [AS 1281](#), to suit product type and size.

4.5 WELDED COLLAR (OR BANDED) JOINTS

PREPARATION: Grit blast to [AS 1627.4](#), Class 2½. Leave metal bare.

THICKNESS: Minimum 1 mm thicker than the pipe or fitting.

LENGTH:

- | | |
|----------------------|--------------|
| - Pipes up to DN 200 | 100 mm long; |
| - DN 200 to DN 900 | 150 mm long; |
| - Over DN 900 | 200 mm long. |

4.6 FLANGED JOINTS

FLANGES: Integral, full face to [AS 4087](#), Class 14, 21 or 35.

4.7 JOINT PERFORMANCE

REQUIREMENT: [To be reviewed.]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- | | |
|-------------------------|---|
| AS 1199 | - Sampling procedures and tables for inspection by attributes |
| AS 1281 | - Cement mortar lining of steel pipes and fittings |
| AS 1579 | - Arc welded steel pipes for water and gas |

- AS 1627 - Metal finishing - Preparation and pretreatment of surfaces
- .4 - Abrasive blast cleaning
- AS/NZS 2566.2 - Buried flexible pipelines, Part 2: Installation [under preparation]
- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
- AS/NZS 4020 - Products for use in contact with drinking water
- AS 4087 - Metallic flanges for waterworks purposes
- AS 4321 - Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings
- BS EN 22063 - Metallic and other inorganic coatings.
Thermal spraying. Zinc, aluminium and their alloys
- AS/NZS - Quality systems: Model for quality assurance in design, development, production,
ISO 9001 installation and servicing.
- AS/NZS - Quality systems: Model for quality assurance in production, installation and
ISO 9002 servicing
- ANSI/AWWA - Cold-applied tape coatings for the exterior of special sections, connections, and
C209 fittings for steel water pipelines
- ANSI/AWWA - Tape coating systems for the exterior of steel water pipelines
C214

APAS SPECIFICATIONS:

- GPC-C-29/7P1 - Durable catalysed epoxy primer for protection of steel in potable water

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

5.2 DRAWINGS

REFERENCED:

Department of Public Works & Services, Standards:

STD WS/5.1 STEEL PIPE FITTINGS: Flanges, Thrust Flanges, Valve Connectors, Valve Tapers and Scour Branches.

STD WS/5.2 STEEL PIPE FITTINGS: Bends, Tees, Plain Tapers and Loose Plain Branches.

5.3 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Flange Gaskets and O-rings: One set for each flange-to-flange joint, excluding valve connections.

Lubricant: For all elastomeric seals, flange gaskets and O-rings.

Welded Collar (Banded) Joints: One loose or split collar (band) for all plain ends.

Field Joint Coatings: For each field joint requiring corrosion protection

5.4 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

STEEL PIPES AND FITTINGS: To Section SP1 and the following:

INFORMATION TO BE SUPPLIED (See AS 1579 Appendices C&F)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP1 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	
Pipes - Nominal size(s) (to Table F1) - Wall thickness and steel grade - Length (exact or random) - Joint type(s) - Angular joint deflection - Coating and lining	- - - - See Schedules and/or project drawings - -
Fittings - Design parameters/ratings - Nominal size(s) (to Table F1) - Type(s) and jointing - Coating and lining	- - - See Schedules and/or project drawings -
Welded collar (banded) joints	
Flanged joint bolting selection (excluding valves)	
Flange gaskets, O-rings and lubricants	
Field joint coatings - Welded joints - Bolted joints	- -
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP1	Manufacturer to supply

WS-SPEC

5.5 AGENCY PRACTICES

PIPELINE PRACTICE (●)	JOINTS AT BENDS		EXTERNAL CORROSION PROTECTION			INTERNAL PROTECTION			STEEL GRADE MPa
	WELDED	ELASTO SEALS	FBPE	FACTORY APPLIED TAPE WRAPS		CL (CEMENT LINING)	SEAL COAT (OVER CL)	FBPE	
				PIPES	FITTINGS				
ACTEW Corporation	●	●	●	●	—	●	—	—	
Barwon Water	●	●	●	●	●	●	●	—	
Brisbane Water	●	—	●	●	●	●	—	—	250
Dept of Land and Water Conservation, NSW	●	—	●	●	●	●	—	—	250
Dept. of Natural Resources, QLD	●	●	●	●	—	●	—	—	
Dept of Public Works & Services, NSW	●	—	●	●	●	●	—	—	250
Gold Coast Water	●	●	●			●	—	—	—
Hunter Water Corporation	●	●	●	●	●	●	—	—	
Melbourne Retail Water Companies	●		●		●	●	●		
Power & Water Authority, NT	●	●	●	●	●	●	—	●	
South Australian Water Corporation	●	—	●	—	—	●	—	—	
Sydney Water Corporation	●	●	●	●	●	●	—	●	
Water Corporation, WA	●	—	●	—	●	●	●	●	260 - 300

5.6 SYDNEY WATER CORPORATION, PRACTICE

STEEL FITTINGS (UNREINFORCED)

Fabricated from steel plate, Structural Grade Hd 250. All dimensions are in millimetres (minimum).

UNEQUAL TEES: $P_r = 1.22 \text{ MPa (max.)}$					UNEQUAL TEES: $P_r = 2.15 \text{ MPa (max.)}$					
NOMINAL SIZE DN x Dn	PIPE		BRANCH		NOMINAL SIZE DN x Dn	PIPE		BRANCH		
	2L	t	t ₁	L ₁		2L	t	t ₁	L ₁	
300 x 250	600	5	6	190	300 x 250	750	6	7.5	255	
350 x 250	650	5		245	350 x 250	1000	6	7.9	270	
350 x 300	880	6		265	350 x 300	1000	7.5	9.2	310	
450 x 250	750	6	6	300	450 x 250	750	10	6	330	
450 x 300	750	8		350	450 x 300	900	10	8	380	
450 x 400	1200			350	450 x 350	1000	11	9	400	
500 x 250	620	8	6	350	500 x 250	660	11	6	360	
500 x 300	800			350	500 x 300	800		7	410	
500 x 400	860	10		370	500 x 350	850		8	420	
500 x 450	1080		8	400	500 x 450	1250	14	11	500	
600 x 300	870	8	6	400	600 x 300	750	16	8	440	
600 x 400	1160		420	600 x 350	900	8		450		
600 x 450	1150	10	8	450	600 x 450	1250		11	540	
600 x 500	1325		470	600 x 500	1450	12.3		580		
750 x 400	1065	8	6	460	750 x 350	1000	12	8	500	
750 x 450	1200			480	750 x 450	1330		8	540	
750 x 500	1330			500	750 x 500	1480			560	
750 x 600	1470	10	8	550	750 x 600	1460	16	12	650	
900 x 450	1160	10	6	560	900 x 450	1200	16	8	540	
900 x 500	1290			570	900 x 500	1330		560		
900 x 600	1550			600	900 x 600	1600		10	690	
900 x 750	1905	12	10	700	900 x 750	-	*			
1050 x 500	1250	10	6	650	1050 x 500	800	16	8	700	
1050 x 600	1500			680	1050 x 600	1500		10	760	
1050 x 750	2150	12	10	780	1050 x 750	-				
1050 x 900	2600				840	1050 x 900		-	*	
1200 x 600	1715	12	8	780	1200 x 600	1780	16	8	800	
1200 x 750	2150			820	1200 x 750	2200		10	800	
1200 x 900	2200	16	10	920	1200 x 900	-				
1200 x 1050	-	*			1200 x 1050	-		*		
EQUAL TEES: $P_r = 1.22 \text{ MPa (max.)}$					EQUAL TEES: $P_r = 2.15 \text{ MPa (max.)}$					
300 x 300	700	5	6	235	300 x 300	900	7.5	9.2	295	
350 x 350	1000	6	7	260	350 x 350	1050	9.5	12.5	360	
450 x 450	945	10	8	370	450 x 450	1200	-	10	450	
500 x 500	1350				420	500 x 500	-	*		
600 x 600	1600	12	10	520	600 x 600	-				
750 x 750	1900				610	750 x 750	-			
900 x 900	-					900 x 900	-			
1050 x 1050	-	*		1050 x 1050	-					
1200 x 1200	-			1200 x 1200	-					

LEGEND: * Stiffener plates required
t Wall thickness of branch
Dn Nominal size of branch

For other symbols see AS 1579.

**5.7 DEPT. OF LAND & WATER CONSERVATION, NSW AND
DEPT. OF PUBLIC WORKS & SERVICES, NSW, PRACTICE**

EXTERNAL TAPE COATING:

STANDARD: To ANSI/AWWA C209 & C214 with additional requirements.

REQUIREMENT: Primer, filler, innerwrap and outerwrap equivalent to Polyken YG 111, applied in the factory, to the manufacturer's publication "Polyken Pipeline Coatings Application/ Construction Specifications" and to meet the following minimum total thicknesses for pipes. (Fittings to be protected with an equivalent system).

PIPE NOMINAL DIAMETER (mm)	MINIMUM THICKNESSES	
	TAPE SYSTEM (mm)	TOTAL POLYETHYLENE (mm)
Up to 375	1.50	1.10
400 up to 500	1.80	1.30
525 to 750	2.00	1.475

WELD PREPARATION: Void between parent metal, ground weld bead and innerwrap, not accepted.

TAPE OVERLAPS: Minimum tape overlap to be 20 mm.

INNERWRAP: Adhesive layer thickness to be greater than 0.275 mm.

OUTERWRAP: To be white in colour. Overlaps of 55% minimum will be considered to have double tape thickness(es).

EXTENT: Tape system to cover all surfaces up to 150 mm from the sockets and spigots.

FACTORY INSPECTION: Total system to be electrically tested to tape manufacturer's recommendations.

JOINT SURFACE COATINGS:

REQUIREMENT: Prepare all exposed ends to one of the following protective coating systems. Cement mortar lining, and external tape system (except FBPE) to overlap protective coating by 25 ± 5 mm.

EPOXY COATING: To Section SP30, 2 or 3 coat high build solventless epoxy.

ZINC COATING:

Standard: To BS EN 22063.

Sealer: Apply minimum two coats primer (GPC-C-29/7P1) to all exposed zinc-treated surfaces and to the edge of the cement mortar lining at the socket. Minimum dry film thickness 40 micrometres.

Repairs: Build-up of under thickness coatings accepted up to 6 days from the first coat application.

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Clause 2.2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 1579](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Clause 2.2 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 1579](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 1579](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 1579](#).

A3.4 PIPE BATCH Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.

- A3.5 FITTING BATCH** Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the fitting manufacturer.
- A3.6 PRODUCTION BATCH** A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.
- A3.7 LOT** A clearly identifiable sub-division of a batch for inspection purposes.
- A3.8 SAMPLE** One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)
- A3.9 SAMPLING PLAN** A specific plan which indicates the number of units of components or assemblies to be inspected.
- A3.10 PROCESS VERIFICATION TEST (PVT)** A test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard. (Note: Such tests are not required to release batches of components and are carried out as a measure of process control.)
- A3.11 BATCH RELEASE TEST (BRT)** A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.
- A3.12 TYPE TESTING (TT)** Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

SECTION SP2 DUCTILE IRON PIPES AND FITTINGS**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of ductile iron pressure pipes and fittings, and associated components for water supply and sewerage applications of nominal size up to and including DN 750.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS/NZS 2280](#) including fittings for use with [AS/NZS 1477](#) PVC Series 1 (metric-pipe-series diameters).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2. [under preparation]

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To [AS/NZS 2280](#), Appendix B, and the following;

HYDROSTATIC TESTS: To [AS/NZS 2280](#).

Socket and spigot pipes and fittings: Test under bulkhead conditions.

Flanged pipes and fittings: Additional to [AS/NZS 2280](#), Clause D3, test flange/flange pipes and fittings under free-end conditions and flange/spigot or socket pipes and fittings under bulkhead conditions.

Failures: Reject, do not repair.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C.

3.4 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To Section SP15 and [AS 4087](#), Appendix D.

3.5 SLEEVING

MATERIAL: Polyethylene to [AS 3680](#), supplied on rolls with protective end flanges and perforated at 6.1 metre intervals.

COLOUR: Green for potable water supply, cream for sewerage and lilac for recycled water pipelines.

3.6 ADHESIVE TAPE, STRAP AND BUCKLE

MATERIALS: To [AS 3680](#), Appendix C.

4 MANUFACTURE

4.1 EXTERNAL COATING

REQUIREMENT: Apply coating to [AS/NZS 2280](#), Clause 7.3.

4.2 DECORATIVE COATINGS, INTERIOR ATMOSPHERIC ENVIRONMENTS

REQUIREMENT: To Section SP30.

4.3 LINING

REQUIREMENT: Line all pipes and fittings with cement mortar, to [AS/NZS 2280](#), Table 7.1, or where specified, line with thermal bonded coating to [AS/NZS 4158](#).

CEMENT MORTAR LINING: Apply to coating-free surfaces, except at ends. Bitumen dipping of fittings to [AS/NZS 2280](#), after cement mortar lining, is optional.

Fitting Bore Diameter: Minimum diameter, after cement mortar lining:

- DN 100 84 mm
- DN 150 138 mm
- DN 200 185 mm

4.4 PIPES AND FITTINGS

MARKING: Additional to [AS/NZS 2280](#), permanently mark each pipe and fitting with the following:

- Traceability code.

- Place of manufacture (may be incorporated in traceability code).

4.5 FLANGED JOINTS

FLANGES: Supply and drill to [AS 4087](#), Appendix B.

DI to DI: Class 16 or 35.

DI to CI: Class 14, 21 or 35. Manufacturer to recommend maximum torque to be applied.

[Note: For pressures greater than 2.1 MPa, special gaskets may be required.]

SCREW-ON (BOSS) FLANGES: Threaded, raised face, Class 16 or 35 on Class K12 pipe.

4.6 JOINT PERFORMANCE

REQUIREMENT: [To be reviewed].

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS/NZS 1477](#) - PVC pipes and fittings for pressure applications
- [AS/NZS 2280](#) - Ductile iron pressure pipe and fittings
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3680](#) - Polyethylene sleeving for ductile iron pipelines
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes
- [AS/NZS 4158](#) - Thermal bonded polymeric coatings on valves and fittings for water industry purposes.
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing.
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Flange Gaskets and O-rings: One set for each flange-to-flange joint, excluding valve connections.

Flanged Joint Bolting: One set of bolts, nuts and washers for each joint excluding valve connections.

Lubricant: For all elastomeric seals, gaskets and O-rings.

Sleeving: For all below ground applications.

Adhesive Tapes, Straps and Buckles: For all sleeving applications.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

DI PIPES AND FITTINGS: To Section SP2 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2280 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP2 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	
Pipes - Nominal size(s) - Class(es) - Jointing - Coating and lining	- - - See Schedules and/or project drawings - *
Fittings - Nominal size(s) - Class(es) - Type(s) and jointing - Coating and lining	- - - See Schedules and/or project drawings -
For PVC pipelines, Series 1 (metric) or Series 2 (cast iron OD)	
Flanged joint bolting selection (excluding valves)	
Flange gaskets, O-rings and lubricant	
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Polyethylene sleeving	
Adhesive tape, straps and buckles	
Hydrostatic testing of fittings	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP2	Manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	HYDROSTATIC TESTING OF FITTINGS	SEAL COAT OVER CEMENT LINING		POLYETHYLENE SLEEVING **		FLEXIBLE RESTRAINED JOINTS
		PIPES	FITTINGS *	ALL PIPELINES	CASE BY CASE	
ACTEW Corporation	●	● (≤DN300)	—	●	—	
Barwon Water	—	●	●	●	—	
Brisbane Water	—	—	—	●	—	Trial
Dept of Land & Water Conservation, NSW	●	—	—	● (WS)	● (SGE)	Trial
Dept of Natural Resources, QLD	●	—	—	●	—	Trial
Dept of Public Works & Services, NSW	●	—	—	● (WS)	● (SGE)	Trial
Gold Coast Water	—	—	—	●	—	—
Hunter Water Corporation	—	—	—	●	—	
Melbourne Retail Water Companies	—	●		●		
Power & Water Authority, NT	●	—	—	●	—	●
South Australian Water Corporation	—	—	—	●	—	●
Sydney Water Corporation	—	● (≤DN300)	—	●	—	●
Water Corporation, WA	—	Both, for aggressive waters		●	—	

* Bitumen (dipped) coatings on fittings to [AS/NZS 2280](#), are not seal coats

** For general environments where the soil is not aggressive

WS Water Supply

SGE Sewerage

Trial Project-by-project acceptance

SECTION SP3 GREY (CAST) IRON FITTINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of cast iron fittings, and associated components for water supply and sewerage applications of nominal size up to and including DN 600.

1.2 STANDARDS

MANUFACTURE:

Fittings: To [AS/NZS 2544](#), including for use with [AS/NZS 1477](#) PVC Series 1 (metric-pipe-series diameters).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2. [under preparation]

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,

OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A and the following.

HYDROSTATIC TESTS: To [AS/NZS 2544](#).

Flange/flange fittings: Test under free end conditions.

Flange/spigot fittings: Test under bulkhead conditions.

Failures: Reject, do not repair.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and the following.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C.

3.4 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To Section SP15 and [AS 4087](#), Appendix D.

3.5 SLEEVING

MATERIAL: Polyethylene to [AS 3680](#).

COLOUR: Green for potable water supply, cream for sewerage and lilac for recycled water pipelines.

3.6 ADHESIVE TAPE, STRAP AND BUCKLE

MATERIALS: To [AS 3680](#), Appendix C.

4 MANUFACTURE

4.1 EXTERNAL COATING

REQUIREMENT: Apply coating to [AS/NZS 2544](#), Section 6 and [AS/NZS 2280](#), Clause 7.3.

4.2 DECORATIVE COATINGS, INTERIOR ATMOSPHERIC ENVIRONMENTS

REQUIREMENT: To Section SP30.

4.3 LINING

REQUIREMENT: Line all fittings with cement mortar or where specified, line with thermal bonded coating to [AS 4158](#).

CEMENT MORTAR LINING: Apply to coating-free surfaces, except at ends. Bitumen dipping of fittings to [AS/NZS 2280](#), after cement mortar lining, is optional.

Thickness: To [AS/NZS 2544](#) Table 6.1.

Fitting Bore Diameter: Minimum diameter, after cement mortar lining:

- DN 100 84 mm
- DN 150 138 mm
- DN 200 185 mm

4.4 FITTINGS

SOCKET PROFILE: To detail provided in Schedule of Technical Data.

MARKING: Additional to [AS/NZS 2544](#), permanently mark each fitting with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.5 FLANGED JOINTS

FLANGES: Supply and drill to [AS 4087](#).
Integral, full (flat) face Class 14, 21 or 35.

[Note: For pressures greater than 2.1 MPa, special gaskets may be required.]

4.6 JOINT PERFORMANCE:

[Under review]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS/NZS 1477](#) - PVC pipes and fittings for pressure applications
- [AS 1830](#) - Iron castings – grey cast iron
- [AS/NZS 2280](#) - Ductile iron pressure pipe and fittings
- [AS/NZS 2544](#) - Grey iron pressure fittings
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3680](#) - Polyethylene sleeving for ductile iron pipelines
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS 4087](#) - Metallic flanges for waterworks purposes
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4158](#) - Thermal bonded polymeric coatings on valves and fittings for water industry purposes.
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing.
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Flange Gaskets and O-rings: One set for each flange-to-flange joint, excluding valve connections.

Flanged Joint Bolting: One set of bolts, nuts and washers for each joint excluding valve connections.

Lubricant: For all elastomeric seals, gaskets and O-rings.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

CI FITTINGS: To Section SP3 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2544 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP3 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	
Fittings	
- Nominal size(s)	-
- Class(es)	-
- Type(s) and jointing	- See Schedules and/or project drawings
- Coating and lining	- *
For PVC pipelines Series 1 (metric) or Series 2 (cast iron OD)	
Flanged joint bolting selection (excluding valves)	
Flange gaskets and lubricant	
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Hydrostatic testing of fittings	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP3	Manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	HYDROSTATIC TESTING OF FITTINGS
AGENCY	
ACTEW Corporation	●
Dept of Land & Water Conservation, NSW	●
Dept of Natural Resources, QLD	●
Dept of Public Works & Services, NSW	●
Hunter Water Corporation	●
Melbourne Retail Water Companies	●

Note: See *AGENCY PRACTICES - SECTION SP2*, for seal coat over cement lining and polyethylene sleeving.

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS/NZS 2544](#).

A3.2 RETESTING In the event of a test failure, the products within the batch shall be 100% tested and only those items found to comply may be claimed and/or marked as complying with [AS/NZS 2544](#).

A3.3 FITTING BATCH Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting valve batch is defined by the fitting manufacturer.

A3.4 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.5 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.6 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

A3.7 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

A3.8 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.9 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.10 NEW FORMULATION [under preparation]

TABLE A1
FITTINGS TO AS/NZS 2544

Characteristic	Clause	Requirement	Test Method	Frequency
Type Tests				
Material Properties	3.4	Effect on water	AS 3855 or AS/NZS 4020	At change in material composition or design or every five years whichever occurs first
Performance	4	Socketed joints	***	
Batch Release Tests				
Dimensions	5	Wall thickness	Appendix G	* Each fitting
	5	External diameter	Appendix G	* Machined dia: each fitting * As cast: one per production batch
	4	Joints - socket profile	Go/No-go gauges	* Each fitting
		Joints - flanges	Go/No-go gauges	* Each fitting
Freedom from defects	-	Structural and surface defects	Visual	Each fitting
Material Properties	3.1	Tensile	Appendix C	Each batch
	3.2	Hardness	Appendix C	Each batch
	3.1	Microstructure	AS 1830	** Each treatment
Performance	3.3	Fittings	Appendix D	Each fitting, if specified
Coating/Linings	7.3.1	Cement mortar thickness	Spear	* Each fitting

* Where a manufacturer has product certification, as detailed in Clause A2, and adequate process control can be demonstrated to the certifying body, the frequency of testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for these requirements.

** Required to demonstrate process control

*** To be determined.

SECTION SP4 PVC PIPES AND FITTINGS**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of PVC pipes and fittings, and associated components for water supply and sewerage applications.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS/NZS 1260](#), [AS/NZS 1477](#), [AS/NZS 4441 \(Int\)](#) and [AS/NZS 4765 \(Int\)](#).

Stabilisers: Use non-lead stabilisers for potable water pipes and fittings.

Colour: Lilac for re-cycled water pipes, others to above Standards.

CLASSIFICATION: For selection of pipe class(es) in pipelines subject to cyclic loading, refer to “Surge and Fatigue Design Guidelines for PVC and PE Pipe Systems”, prepared by PIPA (PVC Pipelines Industry Association of Australasia Ltd.) and AUSPOLY (Australasian Polyolefin Pipeline Systems Inc.).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2, [under preparation] and [AS 2032](#). The total exposed storage period from date of manufacture, of PVC pipes and fittings, not to exceed 12 months.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 SOLVENT CEMENT

MATERIAL: Priming fluid and solvent cement to [AS/NZS 3879](#). [Note: Do not use with OPVC]

3.4 THREAD SEALANTS

REQUIREMENT: Use only PTFE.

4 MANUFACTURE

4.1 SOLVENT JOINTS

FACTORY ASSEMBLED JOINTS: To manufacturer's requirements.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS/NZS 1260](#) - PVC pipes and fittings for drain, waste and vent applications
- [AS/NZS 1462](#) - Methods of test for plastics pipes and fittings
Parts [1](#), [3](#), [6](#), [15](#), [16](#) and [17](#)
- [AS/NZS 1477](#) - PVC pipes and fittings for pressure applications
- [AS 2032](#) - Code of practice for installation of UPVC pipe systems
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 3879](#) - Solvent cements and priming fluids for use with unplasticated PVC (UPVC) pipes and fittings
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS/NZS 4441\(Int\)](#) - Oriented PVC (OPVC) pipes for pressure applications
- [AS/NZS 4765\(Int\)](#) - Modified PVC (PVC-M) pipes for pressure applications
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development production, installation and servicing.
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Lubricant: For all elastomeric seals.

Solvent Cement and Priming Fluid: For all solvent joints.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

PVC PIPES AND FITTINGS: To Section SP4 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (*See Practices Table of Sections SP4 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	
Series 1 (metric) or Series 2 (cast iron OD)	*
Pipes - Nominal size(s) - Class(es)	- -
Fittings - Type (pressure, non-pressure) - Nominal size(s) - Class(es) - Types	- - - -
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certification of Compliance, to Section SP4	Manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES: PRESSURE (WS & SGE)

PIPELINE PRACTICE (●)	SERIES 1 OR SERIES 2	OPVC	PRESSURE FITTINGS	RETICULATION MIN. CLASS(ES)		SOLVENT JOINTING MAX SIZES	
				WS	SGE	WS	SGE
ACTEW Corporation	2	—	●	16	9	—	DN 150
Barwon Water	1 & 2	—	—	12	12	—	DN 100
Brisbane Water	2	—	—	16 **	—	—	—
Dept of Land and Water Conservation, NSW	1	Trial	Trial	9 *	9 *	—	DN 100
Dept of Natural Resources, QLD	1 & 2	Trial	—	12	—	—	—
Dept of Public Works & Services, NSW	1	Trial	Trial	9 *	9 *	—	DN 100
Hunter Water Corporation	1 & 2	—	—	20	16	—	—
Gold Coast Water	2	—	—	16	16	—	—
Melbourne Retail Water Companies	SGE 1, WS 2	—	—	12	9	—	—
Power & Water Authority, NT	1	—	≤ DN 80	12	12	DN 80	DN 80
South Australian Water Corporation	2	Trial	●	16	16	—	—
Sydney Water Corporation	2	—	●	16	12	—	—
Water Corporation, WA	2	Trial	● **	12	12	—	—

WS Water Supply
SGE Sewerage

Trial Use on project-by-project basis
* Re-rated for fatigue

** Excluding pumped pipelines

WS-SPEC

5.5 AGENCY PRACTICES: NON-PRESSURE (SGE)

PIPELINE PRACTICE (●)	STRUCTURED WALLS *		PLAIN WALL MIN CLASS(ES)		SOLVENT JOINTING	ELASTO SEAL SIZE RANGE
	AGENCY	RIB'D/PROF'LD	SANDWICH	DN 100		
ACTEW Corporation	≤ DN 300	—	◆	◆	DN 150	> DN 150
Barwon Water	≤ DN 150	—	SN10	SN8	DN 100	All
Brisbane Water	—	—	SN10	SN8	—	All
Dept of Land and Water Conservation, NSW	Trial	—	◆	◆	≤DN 100	All
Dept of Natural Resources, QLD	●	—	—	—	—	—
Dept of Public Works & Services, NSW	Trial	—	◆	◆	≤DN 100	All
Hunter Water Corporation	●	—	SN10	SN8	—	All
Gold Coast Water	●	—	SN6	SN8 (≤ 5m)	—	All
Melbourne Retail Water Companies	≤ DN 375	Trial	SN10	SN8	≤ DN 225	> DN 225
Power & Water Authority, NT	—	—	◆	◆	DN 100	All
South Australian Water Corporation	●	—	◆	◆	≤ DN 300	—
Sydney Water Corporation	≤ DN 300	DN 150	—	SN8	DN 150	All
Water Corporation, WA	Trial	Trial	SN6	SN8	≤ DN 300	> DN 300

* As defined in [AS/NZS 1260](#)
 Trial Project-by-project acceptance

◆ [Cover < 3m: SN6 (DN 100) or SN4 (> DN 100)
 Cover > 3m < 6m: SN10 (DN 100) or SN8 (> DN 100)

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 may be used by the certifying body as a guide for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Tables A2 and A3 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS/NZS 4441\(Int\)](#) or [3879](#).

[Note: See tables for other products in existing "AS" and "AS/NZS" Standards].

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Tables A2 and A3, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS/NZS 4441\(Int\)](#) or [3879](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS/NZS 4441\(Int\)](#), or [3879](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS/NZS 4441\(Int\)](#), or [3879](#).

A3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

- A3.5 PIPE BATCH** Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.
- A3.6 FITTING** Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the fitting manufacturer.
- A3.7 PRODUCTION BATCH** A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.
- A3.8 LOT** A clearly identifiable sub-division of a batch for inspection purposes.
- A3.9 SAMPLE** One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)
- A3.10 SAMPLING PLAN** A specific plan which indicates the number of units of components or assemblies to be inspected.
- A3.11 PROCESS VERIFICATION TEST (PVT)** A test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard. (Note: Such tests are not required to release batches of components and are carried out as a measure of process control.)
- A3.12 BATCH RELEASE TEST (BRT)** A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.
- A3.13 TYPE TESTING (TT)** Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.
- A3.14 CAVITY** A part of the mould which gives the form to the moulded product.
- A3.15 NEW FORMULATION** For the purpose of defining a change in material compound formulation, the dosage level of ingredients shall not exceed the tolerance as given in the Table A1. The values of X shall be specified by the manufacturer's quality plan. If any level exceeds the dosage band or if a type is changed, this variation in formulation constitutes a change in material/compound and the relevant characteristics in the minimum sampling and testing frequency plan have to be retested. A change in the supplier of a material or within a type of stabiliser does not necessarily constitute a change in formulation. A change in the chemical nature of the stabiliser, eg from Pb to Ca-Zn, shall constitute a change in formulation.

TABLE A1
PIPES AND FITTINGS TO AS/NZS 1260, 1477, 4441 (Int) and 4765 (Int)

Materials/Ingredients	Type	Value X and Tolerance Band
PVC resin 100 parts	K-value	$X_1: \pm 2$
Stabilisers	Pb, Ca-Zn, Sn, others	$X_2: \pm 40\%$
Total quantity of other additives	CaCO ₃ , pigments, etc	$\Sigma X_i: \pm 50\%$

TABLE A2
PIPES TO AS/NZS 4441 (Int)

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	2.2	Composition	Process control	Any change in formulation or design or every five years whichever occurs first
	3.2	Effect on water	AS 3855 or AS/NZS 4020	
	3.3	Vinyl chloride monomer	AS/NZS 1462.15	
	3.5	Long term hydrostatic pressure	AS 1462.6	
Performance	3.9	Joint hydrostatic test	AS 1462.17	
	3.10	Joint infiltration test	AS 1462.17	
	3.11	Reversion test	Draft method AS/NZS 1462.4	
Batch Release Tests				
Dimensions	2.3	Diameter and wall thickness	AS/NZS 1462.1	One per hour of orientation
	2.5.1	Effective length	AS/NZS 1462.1	
	2.6	Pipe spigot ends	AS/NZS 1462.1	One per 8 hours of orientation
	2.7	Sockets formed on pipe	AS/NZS 1462.1*	
Freedom from defects	2.8	Structural and surface defects	Visual	Once per 8 hours of orientation
Performance	3.6	Impact characteristics at 0°C	AS 1462.3	One oriented sample per 8 hours of feedstock
	3.7	Short term hydrostatic pressure	AS 1462.6	
	3.8	High temperature test	AS/NZS 1462.16	

* Test by attributes (eg. go and no-go gauges)

TABLE A3
SOLVENT CEMENT AND PRIMING (CLEANING) FLUID TO AS/NZS 3879

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	4.3	Effect on water	AS 3855 or AS/NZS 2040	At any change of formulation of the solvent cement
Performance	5.2	Short term shear strength	Appendix C	
	5.3	Long-term pressure test	Appendix D	
Batch Release Tests				
Performance	5.1	Viscosity	Appendix B	Each batch

SECTION SP5 GRP PIPES AND FITTINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of GRP pipes and fittings, and associated components for water supply, sewerage and drainage applications, but excluding jacking and microtunnelling.

1.2 STANDARDS

MANUFACTURE:

Pipes: To [AS 3571](#), including Appendix B.

Fittings: To [AS 2634](#), [AS 3571](#) and BS 7159.

DESIGN:

Fittings: To [AS 2634](#) and BS 7159 to project specifics.

CLASSIFICATION: To [AS 3571](#) and the following:

- Pipes and fittings classified as non-pressure and of minimum stiffness SN 5000, may be used for pressures up to 0.25 MPa if joints to same pressure rating.
- The combined maximum steady state and surge pressure not to exceed the working pressure rating of the nominal pressure class.
- For a service life with more than 10⁵ surge events (ie. one start and stop or equivalent to 2 cycles), refer to manufacturer for rerating factors.
- For wall temperature applications greater than 35°C, refer to manufacturer.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. The total period of exposure from date of manufacture, of GRP pipes and fittings without UV protection, not to exceed 12 months. Reduce this period to 9 months for internal lining, UV exposed.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.2 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).

- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS

MATERIAL: For potable water, to [AS 3855](#) or [AS/NZS 4020](#).

Bactericide: [For potable water, requirement to be determined].

4 MANUFACTURE

4.1 PIPES AND FITTINGS

PIPES: External spigot diameters to [AS 3571](#), Table 3.1.

FITTINGS:

- For nominal working pressures above 0.25 MPa, minimum factor of safety to be 6 and working strain less than 0.2%, with calculated pressure rating and stiffness at least equal to that of any connecting GRP pipework. External spigot diameters to [AS 3571](#), Table 3.1, with overall fitting dimensions to manufacturer's details.
- For nominal working pressures below 0.25 MPa, including "non-pressure", to be rated at a minimum of 0.25 MPa.

EXPOSED FIBRES: Seal with flow coat.

CUT ENDS: Except where pipes and fitting components are centrifugally cast, seal spigot ends with flow coat to form a corrosion barrier equivalent to that of the pipe or fitting internal surface.

MARKING: To [AS 3571](#), Clause 2.9 except for liner resins to [AS 3855](#), Clause 2.9 (e) is not required. Also permanently mark angle of bends, branch diameters and flange classes.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 2634](#) - Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3571](#) - Glass filament reinforced thermosetting plastics (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
- [AS 3572-](#) Plastics - Glass filament reinforced plastics (GRP) - Methods of test

(Parts 4, 8, 10 to 16 and 22)

- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
- AS/NZS 4020 - Products for use in contact with drinking water
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing.
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing
- BS 7159 - Design and construction of glass reinforced plastics (GRP) piping systems for individual plants or sites

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Couplings: One fitted joint coupling for each pipe and one less coupling than the total number of spigot ends on each fitting.

Lubricant: For all elastomeric seals in slip joints.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

GRP PIPES AND FITTINGS: To Section SP5 and the following:

INFORMATION TO BE SUPPLIED (See AS 3571 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP5 & SP15)
Application (water: potable/non-potable, sewerage, pressure or non-pressure)	
Pipes - Nominal size(s) - Pressure class(es) - Stiffness(es) - Couplings	- - - -
Fittings - Nominal size(s) - Pressure class(es) - Stiffness(es) - Types/configuration - Couplings - Overall dimensions	- - - - - - - Manufacturer to supply
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP5	Manufacturer to supply

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 may be used by the certifying body as a guide for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 2634](#) or [AS 3571](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance to [AS 2634](#) or [AS 3571](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 2634](#) or [AS 3571](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying to [AS 2634](#) or [AS 3571](#).

A3.4 MATERIAL/COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

A3.5 PIPE BATCH Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.

A3.6 FITTING BATCH Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The batch is defined by the fitting manufacturer.

A3.7 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.8 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality.

A3.9 TEST SPECIMEN Fully cured pipes, minimum 16 hours after manufacture.

A3.10 NEW FORMULATION [under preparation]

**TABLE A1
PIPES AND COUPLINGS TO AS 3571**

Characteristic	Clause	Requirement	Test Method	Frequency
Pipe Type Tests				
Material properties	2.7	Effect on potable water	AS 3855 or AS/NZS 4020	At any new material formulation or design or every five years whichever occurs first
Performance	4.1.3	Stiffness	AS/NZS 3572.8	
	4.1.4	Ring deflection	AS/NZS 3572.14	
	4.1.6	Resistance to strain corrosion	AS/NZS 3572.15	
	4.1.5	Resistance to internal pressure	AS/NZS 3572.9	
Pipe Batch Release Tests				
Dimensions	3.1/3.2	Diameter and wall thickness	AS/NZS 3572.4	Each pipe
	3.1	Spigot end dimensional tolerances	Tape	Each pipe
	3.3/5.4	Length and witness mark location	AS/NZS 3572.4	Each pipe
	3.4	Squareness of ends	AS/NZS 3572.4	Each pipe
Freedom from defects	2.6/2.9	Surface defects	Visual	Each pipe
Material properties	2.5	Surface hardness (internal)	AS 3571	Each pipe
Marking	2.9	Identification	Visual	Each pipe
Performance	4.2.1	Stiffness	AS/NZS 3572.10	One pipe per batch
	4.2.2	Ring deflection	AS/NZS 3572.11	One pipe per batch
	4.2.4	Longitudinal tensile strength	AS/NZS 3572.13	One pipe per batch
	4.2.3	Resistance to internal pressure	AS/NZS 3572.12	One pipe per batch
Coupling Type Tests				
Material properties	2.7	Effect on potable water	AS 3855 or AS/NZS 4020	At any new material formulation or design or every five years whichever occurs first
	5.3	Elastomeric seal characteristics	AS 1646	
Performance	5.6	Resistance to leakage, vacuum in specified joint test configurations	AS/NZS 3572.16 and as set out in AS 3571 Table 5.2	
Coupling Batch Release Tests				
Dimensions	5.5	Jointing gasket profile and dimensional tolerances	Comparison gauges, go and no-go gauges	One coupling per batch
Freedom from defects	2.6/2.9	Surface defects	Visual	Each coupling
Material properties	2.5	Surface hardness	AS 3571	Each coupling
Marking	2.9	Identification of conformance	Visual	Each coupling
Performance	4.2.3	Resistance to internal pressure	AS/NZS 3572.12	One coupling per batch

TABLE A2
FITTINGS TO AS 3571

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	2.7	Effect on potable water	AS 3855 or AS/NZS 4020	At any new material formulation or design or every 5 years whichever occurs first
Performance	-	Design capability *	AS 2634 and BS 7159	
Batch Release Tests				
Dimensions	3.1	Outside spigot diameter	AS 3572.4	Each fitting
	3.2	Wall thickness	AS 3572.4	Each fitting
	3.4	Squareness of ends	AS 3572.4	Each fitting
Freedom from defects	-	Structural and surface defects	Visual	Each fitting
Material properties	2.5	Surface hardness	AS 3571	Each fitting
	2.6	Surface defects	AS 2634 Appendix D	Each fitting
Performance	-	Design capability *	AS 2634 and BS 7159	-

* To be demonstrated

SECTION SP6 POLYETHYLENE PIPES AND FITTINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of polyethylene (PE) pipes and fittings, and associated components for water supply and sewerage applications.

1.2 STANDARDS

MANUFACTURE:

Pipes: PE 80 and PE 100 to [AS/NZS 4130](#).

Fittings: To [AS/NZS 4129\(Int\)](#).

Electrofusion Fittings: EF (electrofusion) fittings to have an inbuilt recognition system for operation and completion of jointing.

[Note: Compatibility of pipeline elements for welding and/or EF to be certified.]

Colour: To [WSA 01](#).

CLASSIFICATION: For selection of pipe class(es) in pipelines subject to cyclic loading, refer to “Surge and Fatigue Design Guidelines for PVC and PE Pipe Systems”, prepared by PIPA (PVC Pipelines Industry Association of Australasia Ltd.) and AUSPOLY (Australasian Polyolefin Pipeline Systems Inc.).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#) [under preparation] and [AS 2033](#). The total exposed storage period from date of manufacture, of PE pipes non-carbon-black stabilised, not to exceed 6 months.

PACKAGING: EF fittings to be individually packaged and be free of contamination.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

-Traceability required from receipt (Clause 4.8).

-Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.

-Customer verification required (Clause 4.6.4.2).

-Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 EF AND MECHANICAL JOINTS

REQUIREMENT: To [AS/NZS 4129](#).

3.2 FLANGED JOINTS

BOLTING (FASTENERS): Selection to [AS 4087](#), Appendix C. Torque to manufacturer's written instructions.

BACKING RINGS: Use galvanised steel, or stainless steel 304 or 316. Thickness and drilling to [AS 4087](#).

STUB FLANGES: [Minimum outside diameter to be determined].

3.3 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.4 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.5 THREAD SEALANT

REQUIREMENT: Use only PTFE.

4 MANUFACTURE

[To be prepared]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 2033](#) - Installation of polyethylene pipe systems
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation].
- [AS 3707](#) - Method for testing pressure cycling resistance of pipe and fittings
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with potable water
- [AS 4087](#) - Metallic flanges for waterworks purposes

- AS/NZS 4129 - Fittings for polyethylene (PE) pipes for pressure applications
- AS/NZS 4130 - PE pipes, pressure applications
- AS/NZS 4131 - PE pipes, compounds
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

WSAA CODES

- WSA 01 - Polyethylene Pipeline Code

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Mechanical Fittings: One for each mechanical joint, including elastomeric seal and lubricant.

EF Fittings: One for each EF joint.

Backing Rings: One for each flanged joint.

Flanged Joint Bolting: One set of bolts, nuts and washers for each joint excluding valve connections.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

PE PIPES AND FITTINGS: To Section SP6 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (*See Practices Table of Sections SP6 & SP15)
Application (water: potable/non-potable, sewerage, pressure or non-pressure)	
Pipes - Nominal size(s) - Class(es) - Polymer type	- - - *
Fittings - Type (EF, mech, butt) - Nominal size(s) - Class(es) - Polymer type - Types	- - - * - Manufacturer to nominate -
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Backing rings - Material - Bolting selection (excluding valves)	- -
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP6	Manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	PE RETICULATION PIPES									
	MIN CLASS DN	PE 80B OR PE 100	PREFERRED NOM. SIZES					JOINT TYPES		
			DN 63	DN 110	DN 125	DN 160	DN 180	Butt Welds	EF Fittings	Mech. Fittings
AGENCY										
Brisbane Water	16	PE 80B	●	–	–	–	–	●	●	●
Dept. of Natural Resources., QLD	12.5	–	–	●	–	●	–	●	●	●
Gold Coast Water	16	PE 80B	■	–	–	–	–	–	–	●
Melbourne Retail Water Companies	16	Both	●	–	●	–	●	●	●	●
Power & Water Authority, NT	≤ DN 90, 16 > DN 90, 12.5	Both	○ PE 80B	○ PE 80B	○ PE 80B	–	○ PE 100	≥ DN 90	○	○
South Australian Water Corporation	16	PE 80B			●		●	● *		●
Sydney Water Corporation	16	Both	●	–	●	–	●	●	●	●
Water Corporation, WA	12.5	PE 80B	●	–	●	–	●	–	●	●

- PROPOSED PRACTICE
- WATER SERVICE ONLY

* Factory only

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL [AS/NZS 4129, 4130](#) and [4131](#), Table A1 of each, sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Clause A3.1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS/NZS 4129, 4130](#) or [4131](#), for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS/NZS 4129, 4130](#) or [4131](#), shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS/NZS 4129, 4130](#) or [4131](#).

A3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

- A3.5 PIPE BATCH** Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.
- A3.6 FITTING** Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the fitting manufacturer.
- A3.7 PRODUCTION BATCH** A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.
- A3.8 LOT** A clearly identifiable sub-division of a batch for inspection purposes.
- A3.9 SAMPLE** One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)
- A3.10 BATCH RELEASE TEST (BRT)** A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.
- A3.11 TYPE TESTING (TT)** Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.
- A3.12 NEW FORMULATION** [under preparation]

SECTION SP7 VITRIFIED CLAY PIPES AND FITTINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of vitrified clay sewer pipes and fittings, polypropylene sleeves, and associated components.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS 1741](#), and additional material herein sourced from EN 295 Parts 1, 2 and 3.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 as applicable. [under preparation]

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 POLYPROPYLENE SLEEVES:

REQUIREMENT: To Appendix A.

3.3 LUBRICANTS FOR POLYPROPYLENE SLEEVES

MATERIAL: To pipe manufacturer's requirements.

4 MANUFACTURE

4.1 PIPES, FITTINGS AND POLYPROPYLENE SLEEVES

MARKING: [To be reviewed].

4.2 FITTINGS

FABRICATED FITTINGS: To manufacturer's details.

Marking: Permanently mark date of bonding, place of manufacture (if manufacturer has more than one site), size and angle of bend on each fitting.

4.3 JOINT PERFORMANCE

REQUIREMENT: To [AS 1741](#), Section 6.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1145](#) - Determination of tensile properties of plastic materials
- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 1741](#) - Vitrified clay pipes and fittings with flexible joints - Sewer quality
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing
- [EN 295](#) - Vitrified clay pipes and fittings and pipe joints for drains and sewers (Parts 1, 2 & 3)
- [ISO 1133](#) - Plastics - Determination of melt flow rate (MFR) and melt volume flow rate (MVR) of thermoplastics

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Polypropylene Sleeves: One for each plain end pipe.

Lubricant: For all elastomeric seals (except roll-on rubber rings).

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

VC PIPES AND FITTINGS: To Section SP7 and the following:

INFORMATION TO BE SUPPLIED (See AS 1741 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP7 & SP15)
Pipes - Nominal size(s) - Class(es) - Plain ended - Spigot and socket	- - - -
Fittings - Nominal size(s) - Class(es) - Types - Fabricated fittings	- - - - Manufacturer to supply details
Sleeves (single class) - Nominal size(s) - Polypropylene - Other	* - - -
Elastomeric seal material	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP7	Manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	VC PIPE JOINTING SYSTEM	
	INTEGRAL SOCKET	POLYPROPYLENE SLEEVES
ACTEW Corporation	●	—
Barwon Water	●	—
Brisbane Water	●	●
Dept of Land & Water Conservation, NSW *	●	●
Dept of Natural Resources, Qld	●	●
Dept of Public Works & Services, NSW *	●	●
Gold Coast Water	●	●
Hunter Water Corporation	●	—
Melbourne Retail Water Companies	●	●
Power & Water Authority, NT	●	●
South Australian Water Corporation	—	—
Sydney Water Corporation	●	●
Water Corporation, WA	●	●

* Only pipes and fittings marked as manufactured after 1st August 1996 and to Section SP7, will be accepted.

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 General Tables A1 to A8 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 1741](#).

A3.2 Pipes & Fittings Sampling and testing shall comprise continuous inspection by the pipe manufacturer in accordance with Table A1.

**TABLE A1
TESTING AND SAMPLING SCHEDULE - PIPES & FITTINGS**

Item	Batch Period (i)	Socket Burst	Crushing Strength	Beam Load	BMR	Permeability	Hydro Test	Physical Defects
DN100	1 day	Table A3	Table A3	Table A5	n.a.	Table A4	n.a.	100%
DN150	1 day	Table A3	Table A3	Table A5	n.a.	Table A4	n.a.	100%
DN225	1 day	Table A3	Table A3	n.a.	Table A5	Table A4	n.a.	100%
DN300	1 week	Table A3	Table A3	n.a.	n.a.	Table A4	n.a.	100%
DN375	1 week	Table A3	Table A3	n.a.	n.a.	Table A4	n.a.	100%
DN450	1 week	Table A3	Table A3	n.a.	n.a.	Table A4	n.a.	100%
DN525	1 week	Table A3	Table A3	n.a.	n.a.	Table A4	n.a.	100%
DN600	1 week	Table A3	Table A3	n.a.	n.a.	Table A4	n.a.	100%
Fittings	1 week	Table A3	n.a. (ii)	n.a.	n.a.	n.a.	1 (iii)	100%

(i) Continuous kiln - See Clause A3

- (ii) n.a. = not applicable
- (iii) Hand stuck fittings only

A3.3 Polypropylene Sleeves - Performance Requirements

- a. Visual/Dimensional Inspection: Quality control on consignments from the sleeve manufacturer, shall comprise measurement for conformity to dimensions and visual inspection for defects. Sampling schedule shall be in accordance with Table A6.
- b. Line Displacement Tests: A Line Displacement Test shall be conducted by the pipe manufacturer, on a rig which has two mandrels each representing the spigot of a pipe. The outside diameter of one mandrel shall be within the upper quartile of the dimensional range. The outside diameter of the other mandrel shall be within the lower quartile of the dimensional range. After jointing the coupling onto the mandrel ends to form a joint assembly they shall be axially aligned and then a line displacement of not less than 6 mm shall be applied. Under this displacement the assembly shall withstand either:
 - a constant internal water pressure of 60 kPa for a minimum of 1 minute without visible leakage; OR
 - a constant internal air pressure of 30 kPa for 1 minute whilst submerged in water without visible leakage.
 Sampling schedule shall be in accordance with Table A7.

A3.4 Polypropylene Sleeves - Material Requirements

The sleeve manufacturer shall be responsible for quality control on the material requirements for the sleeves to ensure compliance with Table A2. The testing and sampling schedule is described in Clause A5.6.

**TABLE A2
MATERIAL REQUIREMENTS FOR POLYPROPYLENE SLEEVES**

Test	Units	Requirement	Australian Standard
Melt flow index	-	Less than or equal to 1.5 times nominal value	ISO 1133 (iv)
Tensile strength	MPa	Greater than or equal to 20	AS 1145
Elongation at break	%	Greater than or equal to 200	AS 1145
Elevated temperature	-	No defects	n.a.

(iv) No equivalent Australian Standard is published

- a. *Melt flow index*: The melt flow index of material taken from the coupling body shall be determined in accordance with the procedures given in, and using Condition 12 in Tables A1 and A2 of [ISO 1133](#).
- b. *Tensile strength and elongation at break*: Tests for tensile strength and elongation at break shall be conducted on samples (avoiding engraving, weld lines and split lines) prepared from sleeve bodies. The shape of the test specimen shall be as given for Type 2 in [AS 1145](#). The specimens shall be conditioned for at least 3 hours at 23 ±2°C before testing. The tests shall be conducted in accordance with the procedures given in [AS 1145](#) with the rate of grip separation being 100 mm / min ±10%. The tensile stress at yield shall be expressed in MPa.
- c. *Elevated temperature test*: The sleeve sample shall be stored horizontally on a flat surface in an oven at 150 ±3°C for 1 hour. After this period it shall be removed from the oven and allowed to cool at room temperature. The sleeve shall be checked for any blisters, cracks or delaminations. Any of these shall be considered as defects.

A4 BATCHES

A4.1 Kiln Fired Products

- a. Continuous kilns - a batch is not greater than the production drawn from one kiln within the period set down in Table A1 for each diameter.
- b. Intermittent kilns - a batch is the total production of each diameter from one kiln, per firing.
- c. For Permeability Testing the above definitions apply except that batches are considered independent of diameter.
- d. Pipes cannot be considered as being from the same batch if:
 - Firing conditions are altered (other than those required to maintain a setting),
 - A clay blend formula is changed.

A4.2 Polypropylene Sleeves Each consignment from the sleeve manufacturer, sub-divided into one design and one nominal size as necessary, shall constitute a batch for sampling purposes at the pipe manufacturer's premises.

A5 SAMPLING PLANS

Use statistical rules set out in [AS 1199](#) 'Sampling procedures and tables for inspection by attributes' for the application to testing as set out in Tables A3 through A7 below.

A5.1 Crushing Strength & Socket Burst

TABLE A3
CRUSHING STRENGTH(v) & SOCKET BURST TESTING
(AQL 6.5%, INSPECTION LEVEL S3) (vi)

Batch size	Number of samples taken → <i>Acceptance / Rejection numbers</i>					
	Single sampling			Double sampling		
	Normal	Reduced	Tightened	Normal	Reduced	Tightened
2 - 15	2 → 0/1	2 → 0/1	2 → 0/1	Use Single Sampling	Use Single Sampling	Use Single Sampling
16 - 50	3 → 0/1	2 → 0/1	3 → 0/1	Use Single Sampling	Use Single Sampling	Use Single Sampling
51 - 150	5 → 1/2	2 → 0/2	5 → 1/2	3(3) → 0/2(1/2)	Use Single Sampling	3(3) → 0/2(1/2)
151 - 500	8 → 1/2	3 → 0/2	8 → 1/2	5(5) → 0/2 (1/2)	2(2) → 0/2 (0/2)	5(5) → 0/2 (1/2)
501 - 3200	13 → 2/3	5 → 1/3	13 → 1/2	8(8) → 0/3 (3/4)	3(3) → 0/3 (0/4)	8(8) → 0/2 (1/2)

- (v) Note that Crushing Strength shall be done on wet pipe (refer [AS 1741](#)). Samples may be either immersed in water prior to testing or tested within 1 hour after being taken from Permeability Test. Sections cut from pipe may be used.
- (vi) Crushing Strength together with Socket Burst are the two most important properties of vitrified clay pipe. Assuring Socket Burst and Crushing Strength requires application of a testing regime based on a relatively low AQL and a high inspection level.

A5.2 Permeability

TABLE A4
PERMEABILITY(vii) (AQL 10%, INSPECTION LEVEL S1) (viii)

Batch size (ix)	Number of samples taken → <i>Acceptance / Rejection numbers</i>					
	Single sampling			Double sampling		
	Normal	Reduced	Tightened	Normal	Reduced	Tightened
501-3200	5 → 1/2	2 → 0/2	5 → 1/2	3(3) → 0/2(1/2)	Use Single Sampling	3(3) → 0/2(1/2)

- (vii) Permeability is a pipe property that is dependent on the clay mix and the firing cycle so all pipes made similarly will have similar water permeability. The pipe extrusion process has no effect on Permeability unlike Crushing Strength and Socket Strength where the extrusion process is a major influencing factor.
- (viii) Table A4 uses a higher AQL and a lower Inspection Level than Table A3: this recognises that permeability is significantly less critical than Socket Burst and Crushing Strength to the performance of the pipes.
- (ix) There is no reason to treat every individual diameter differently if in fact they have all been made from the same clay blend and fired in the same kiln under the same firing conditions. The sampling regime in Table A4 is based on pipe batches made according to these circumstances. Samples for testing should be chosen at random from all pipes within the batch regardless of diameter.

A5.3 Beam Load and BMR

TABLE A5
BEAM LOAD, BMR(x) (AQL 10%, INSPECTION LEVEL S1)(xi)

Batch size	Number of samples taken → <i>Acceptance / Rejection numbers</i>					
	Single sampling			Double Sampling		
	Normal	Reduced	Tightened	Normal	Reduced	Tightened
2- 15	2 → 1/2	2 → 0/2	2 → 1/2	Use Single Sampling	Use Single Sampling	Use Single Sampling
16 - 50	2 → 1/2	2 → 0/2	2 → 1/2	Use Single Sampling	Use Single Sampling	Use Single Sampling
51 - 150	3 → 1/2	2 → 0/2	3 → 1/2	2(2) → 0/2(1/2)	Use Single Sampling	2(2) → 0/2(1/2)
151 - 500	3 → 1/2	2 → 0/2	3 → 1/2	2(2) → 0/2(1/2)	Use Single Sampling	2(2) → 0/2(1/2)
501 - 3200	5 → 1/2	2 → 0/2	5 → 1/2	3(3) → 0/2(1/2)	Use Single Sampling	3(3) → 0/2(1/2)

- (x) BMR and Beam Load tests are done on dry pipe in accordance with AS 1741.
- (xi) Beam Load and BMR are tests designed to provide an extra level of confidence for pipes installed in the ground where virtually no bedding is provided. Obviously this will rarely occur, therefore testing of pipes to Beam and BMR requirements can be far less stringent than for Crushing Strength testing hence the higher AQL and the lower Inspection Level chosen for Table A5 compared to Table A3.

A5.4 Polypropylene Sleeves - Visual Defects and Dimensional Conformance

TABLE A6
POLYPROPYLENE SLEEVES - INSPECTION FOR VISUAL DEFECTS AND DIMENSIONAL CONFORMANCE (AQL 10%, INSPECTION LEVEL II)

Batch size	Number of samples taken → <i>Acceptance / Rejection numbers</i>					
	Single sampling			Double sampling		
	Normal	Reduced	Tightened	Normal	Reduced	Tightened
501 - 1200	80 → 5/6	32 →2/5	80 → 3/4	50(50) → 2/5(6/7)	20(20) → 0/4(3/6)	50(50) → 1/4(4/5)
1201 - 3200	125 →7/8	50 →3/6	125 →5/6	80(80) → 3/7(8/9)	32/32 → 1/5(4/7)	80(80) → 2/5(6/7)
3201 - 10000	200 →10/1 1	80 →5/8	200 →8/9	125(125) → 5/9(12/13)	50(50) → 2/7(6/9)	125(125) → 3/7(11/12)
10001 - 35000	315 →14/1 5	125 →7/1 0	315 →12/1 3	200(200) → 7/11 (18/19)	80/80 → 3/8(8/12)	200(200) → 6/10(15/16)

A5.5 Polypropylene Sleeves - Line Displacement Test

TABLE A7
POLYPROPYLENE SLEEVES - LINE DISPLACEMENT
(AQL 2.5%, INSPECTION LEVEL II)

Batch size (xii)	Number of samples taken → <i>Acceptance / Rejection numbers</i>					
	Single sampling			Double sampling		
	Normal	Reduced	Tightened	Normal	Reduced	Tightened
16-25	5 → 0/1	2 → 0/1	5 → 0/1	Use Single Sampling	Use Single Sampling	Use Single Sampling
26 - 50	8 → 0/1	3 → 0/1	8 → 0/1	Use Single Sampling	Use Single Sampling	Use Single Sampling
51 - 90	13 → 1/2	5 → 0/2	13 → 0/1	8(8) → 0/2(1/2)	3(3) → 0/2(0/2)	8(8) → 0/2(1/2)
91 - 150	20 → 1/2	8 → 0/2	20 → 0/1	13(13) → 0/2(1/2)	5(5) → 0/2(0/2)	13(13) → 0/2(1/2)
151 - 280	32 → 2/3	13 → 1/3	32 → 1/2	20(20) → 0/3(3/4)	8(8) → 0/3(0/4)	20(20) → 0/2(1/2)
281 - 500	50 → 3/4	20 → 1/4	50 → 2/3	32(32) → 1/4(4/5)	13(13) → 0/4(1/5)	32(32) → 0/3(3/4)

(xii) The samples that have passed the Visual Defects inspection are considered as the batch size for Line Displacement testing.

A5.6 Polypropylene Sleeves-Material Tests

Melt flow index, tensile strength, elongation at break and elevation temperature tests shall be conducted at a rate of one sample from a coupling from each tool every 48 hours, or every production run if shorter than 48 hours.

In the event of a moulding failing a test, a further three samples from the same cavity shall be tested. If one failure occurs on re-test the batch shall be rejected and scrapped. The cause of the non-conformity shall be determined and necessary corrective action taken and recorded.

A6 BATCH ACCEPTABILITY IN TABLES A3 TO A7

A6.1 Single Sampling If the number of defectives found in the sample is equal to or less than the acceptance number, the batch shall be accepted. If the number of defectives is equal to or greater than the rejection number, the batch shall be rejected.

When reduced inspection is in effect and the acceptance number has been exceeded but the rejection number has not been reached, the batch shall be accepted and normal inspection reinstated.

If the rejection number has been reached or exceeded, the batch shall be rejected and normal inspection be reinstated.

A6.2 Double Sampling The number of sample units inspected shall be equal to the first sample size given in the table. If the number of defectives found in the first sample is equal to or less than the first acceptance number, the batch shall be accepted. If the number of defectives found in the first sample is equal to or greater than the first rejection number, the batch shall be rejected. If the number of defectives found in the first sample is between the first acceptance and rejection numbers, the second sample of the size (bracketed) given in the table shall be inspected.

The number of defectives found in the first and second samples shall be accumulated. If the cumulative number of defectives is equal to or less than the second acceptance number (within the brackets), the batch shall be accepted. If the cumulative number of defectives is equal to or greater than the second rejection number (within the brackets), the batch shall be rejected. If this occurs on reduced inspection, normal inspection shall be reinstated for the next batch.

When reduced inspection is in effect and, after inspecting the second sample, the acceptance number has been exceeded but the rejection number has not been reached, the batch shall be accepted and normal inspection reinstated.

A7 SWITCHING RULES IN TABLES A3 TO A7

A7.1 Normal to Reduced Inspection A reduced inspection level may be used when normal inspection is in effect, provided the following conditions are satisfied:

- a. the preceding 10 batches (except where they consist of less than 30 sample units in total - see Table A8) have been on normal inspection.
- b. the total number of defectives in the samples from the 10 preceding batches is equal to or less than the applicable number in Table A8.

When double sampling is in use, both first and second samples inspected shall be included in the total.

A7.2 Reduced to Normal Inspection When reduced inspection is in effect, normal inspection shall be reinstated if a batch is rejected, or if a batch is accepted without either acceptance or rejection criteria having been met.

A7.3 Tightened Inspection When 2 or more batches have been rejected in any 5 consecutive batches of normal inspection or for inspecting a new product.

A7.4 Tightened to Normal Inspection Tightened inspection shall continue until 5 consecutive batches are accepted then normal inspection may be resumed.

A7.5 Discontinuation of Tightened Inspection If 10 consecutive batches remain on tightened inspection the provision of these sampling plans shall be discontinued pending corrective action to the process. Until re-establishment of process control has been demonstrated, all product shall be rejected.

TABLE A8
LIMIT NUMBERS FOR REDUCED INSPECTION

Number of sample units from last 10 batches	Limit number of defectives
20 - 29	n.a. (xiii)
30 - 49	0
50 - 79	0
80 - 129	2
130 - 199	4
200 - 319	8

(xiii) In this case the number of sample units from the last 10 batches is not sufficient for reduced inspection to be allowed. In this instance more than 10 batches must be used for the calculation and they must be sequential

A8 RECORDS

Records shall be retained for a minimum period of 10 years and shall include:

- a. Data indicating the blend (or stockpile) of clay used and the dates of production of ware manufactured from that blend.
- b. The specification and batch identification of materials used for fixing fired parts together (e.g. epoxy resins) in the manufacture of fittings. (The requirements in [AS/NZS ISO 9002](#), Clause 4.10.2, shall be met prior to use of bonding/fixing materials).
- c. Records from the polypropylene sleeve supplier of material testing of sleeves.

SECTION SP8 PRECAST CONCRETE PIPES**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of precast concrete pipes and associated components, for water supply and sewerage applications and drainage pipes in aggressive buried environments.

1.2 STANDARDS

MANUFACTURE: To [AS 4058](#).

1.3 STORAGE AND TRANSPORT

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2, as applicable. [under preparation]

STACKING HEIGHT: Restrict so that maximum load on bottom pipes is less than 70% of their proof load.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A coupled with routine testing to [AS 4058](#), Table 4.1 and Appendix A, and below, if nominated in *AGENCY PRACTICES - CLAUSE 5.4*. Sacrificial thicknesses to be omitted in load and pressure tests. [Note: To be reviewed]

Roller Suspended Process Pipes: To *PIPES - CLAUSE 4.1*.

SEWER PIPES: Test as follows:

Load Test: Test 1 in 50 pipes for cracking load and 1 in 100 for ultimate load.

Hydrostatic Pressure Test: Test 1 in 20 pipes, including all those tested for cracking load. Test all fittings.

Absorption Test: Test 1 in 100 pipes.

PRESSURE PIPES: Test as follows:

Load Test: Test 1 in 50 pipes for cracking load.

Absorption Test: Test 1 in 100 pipes.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS FOR SKID TYPE SEALS

MATERIAL: To pipe manufacturer's requirements and to [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 CEMENT

REQUIREMENT: For unlined sewer pipe, to [AS 3972](#), Type SR, or other type with equivalent performance characteristics.

3.4 AGGREGATE

REQUIREMENT: Dense aggregate (fine and coarse) to [AS 2758.1](#).
Water absorption to [AS 2758.1](#), Clause 8.3 - maximum 2.5%.
Durability [AS 2758.1](#), Clause 10, concrete exposure classification - Severe.

3.5 CONCRETE

REQUIREMENT: To [AS 1379](#).

Admixtures: To be identified and recorded.

3.6 REINFORCEMENT

REQUIREMENT: To manufacturer's design. Main cage longitudinal and socket reinforcement to be overlapped and the relative positions maintained during the manufacturing process.

SUPPORTS: To [AS 4058](#), unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

4 MANUFACTURE

4.1 PIPES

ROLLER SUSPENSION PROCESS: For pipes and products of 900 nominal size or greater, to *AGENCY PRACTICES - CLAUSE 5.4*.

- Each plant operator to be experienced for concrete mix compaction of each product size. Pre-qualification testing to be by coring or NDT (Non Destructive Testing) followed by on-going testing for compaction of production pipes.
- Criteria for acceptance and rejection of production products to be prepared by the manufacturer for the purchaser's acceptance.

MARKING: Additional to markings required by [AS 4058](#), score the following into the obvert of the bore of the concrete pipes:

- Pipe class and traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.2 FITTINGS

REQUIREMENT: To manufacturer's details.

4.3 CONCRETE DURABILITY

CEMENTITIOUS MATERIAL CONTENT: Minimum quantity per cubic metre of concrete, to *AGENCY PRACTICES - CLAUSE 5.4*.

CONCRETE COVER: Minimum clear cover over reinforcement to *AGENCY PRACTICES - CLAUSE 5.4*.

CURING: To either of the following:

Steam curing: Commence minimum one hour after completion of concrete placing and keep the rate of increase in pipe temperature, and subsequent decrease, at a uniform controlled rate until the concrete has attained a minimum of 50% of its characteristic compressive strength.

Moist curing: Cure continuously, externally and internally, until the concrete has both attained a minimum of 50% of its characteristic compressive strength and has cured for a minimum of 7 days.

WATER ABSORPTION: Maximum 6.5%.

4.4 JOINT PERFORMANCE

REQUIREMENT: [To be reviewed]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [As 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 1478](#) - Chemical admixtures for use in concrete
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation. [under preparation]
- [AS 2758](#) - Aggregates and rock for engineering purposes
- [.1](#) - Concrete aggregates
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS 3972](#) - Portland and blended cements
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4058](#) - Precast concrete pipes (pressure and non-pressure)
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing.

AS/NZS - Quality systems: Model for quality assurance in production, installation and
 ISO 9002 servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Lubricant: For all skid type elastomeric seals.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

PRECAST CONCRETE PIPES: To Section SP8 and the following:

INFORMATION TO BE SUPPLIED (See AS 4058 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP8 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	
Pipe nominal size(s)	
Pipe class(es)	
Reinforcement support type	*
Concrete cover	*
Plastic lining material	
Elastomeric seal material and lubricant	*
Bactericidal lubricant	
Roller suspension process acceptance criteria	To be prepared by the manufacturer
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP8	Manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	REQUIREMENTS							
	AGENCY	CEMENTITIOUS MATERIAL (kg/m ³)	REO SUPPORTS	CONCRETE COVER (INTERNAL & EXTERNAL)		TESTING TO AS 4058	TESTING TO CLAUSE 2.2	ROLLER SUSPENSION TESTS
				SEWERAGE (mm)	PRESSURE (mm)			
ACTEW Corporation	400	SS 304	(i)	(i)	●	●	●	
Brisbane Water	400	—	(ii)	—	●	—	—	
Dept. of Land and Water Conservation, NSW	400	SS 304	20	20	—	●	●	
Dept. of Natural Resources, QLD.	400	SS 304	20	20	—	●	●	
Dept. of Public Works & Services, NSW	400	SS 304	20	20	—	●	●	
Gold Coast Water	400	SS 304	25	—	●	—	—	
Hunter Water Corporation	400	SS 304	20 (EXT), (v)	—	—	●	●	
Melbourne Retail Water Companies (iii)	400	SS 304	25	—			●	
Power & Water Authority, NT	400	SS 304	25 (EXT), (v)	—	●	●	●	
South Australian Water Corporation	400	SS 304/316	25 (EXT), (iv)	20	—	●	●	
Sydney Water Corporation	400	SS 304	20 (EXT), (v)	—	—	●	●	
Water Corporation, WA	400	—	20 (INT), (v)		—	●	●	

- (i) To AS 4058, Table 3.4. For trunk sewers, up to 50 mm sacrificial layer on inside face, and for other sewers, 10 mm minimum sacrificial layer.
- (ii) Project based additional sacrificial layer, 20 to 30 mm, internally and/or externally.
- (iii) Other requirements to Melbourne Water Corporation Specification 93.A.141.
- (iv) Externally 50 mm, including 25 mm sacrificial layer, using fine and coarse aggregates to Specification DS3(c) - Calcareous Aggregate.
- (v) Internally, PVC lined to at least 359 degrees of circumference with 10 mm clear cover to reinforcement (20mm for PAWA, NT).

Notes: Generally cementitious materials and covers shown are minimum values and requirements may change to suit individual projects.

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Clause 2.2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 4058](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 4058](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 4058](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 4058](#).

SECTION SP9 MAINTENANCE HOLES PRECAST CONCRETE

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of precast concrete maintenance hole components for sewerage applications.

[Note: Also referred to as MH, manholes and access chambers.]

1.2 STANDARD

MANUFACTURE: To [AS 4198](#).

1.3 STORAGE AND TRANSPORT

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2, as applicable. [under preparation]

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,

OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A coupled with [AS 4198](#), Clause A5.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS FOR SKID TYPE SEALS

MATERIAL: To pipe manufacturer's written requirements.

3.3 OTHER JOINT MATERIALS

REQUIREMENT: To main supplier's written instructions, including for installation.

3.4 CEMENT

REQUIREMENT: To AS 3972, Type SR or other type with equivalent performance characteristics.

3.5 AGGREGATE

REQUIREMENT: Dense aggregate (fine and coarse) to AS 2758.1, maximum size 20 mm.

Water absorption to AS 2758.1, Clause 7.3 - maximum 2.5%.

Durability AS 2758.1, Clause 9, concrete exposure classification – B2

3.6 CONCRETE

REQUIREMENT: To AS 1379.

Admixtures: To be identified and recorded.

3.7 REINFORCEMENT

REQUIREMENT: To manufacturer's design.

SUPPORTS: To AS 4058, unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

3.8 LIFTING ELEMENTS

REQUIREMENT: Either foot anchors of appropriate capacity or lifting inserts (M20 x 27 mm minimum thread, 15 mm projection), 2 of each galvanised or chemical inert.

4 MANUFACTURE

4.1 CONCRETE DURABILITY

CEMENTITIOUS MATERIAL CONTENT: Minimum weight per cubic metre of concrete to *AGENCY PRACTICES - CLAUSE 5.4*.

WATER ABSORPTION: To AS 4058, Clause 4.2.7 (a), unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

CONCRETE COVER:

Maintenance hole covers and frames

Type H (heavy duty) - 25 mm minimum.

Type L (light duty) - 20 mm minimum.

Conversion slabs - 25mm minimum

Component joint ends - 20 mm minimum.

Elsewhere - To AS 4058, Clause 3.3.2.4, unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

CURING: Either of the following:

Steam curing: Commence minimum one hour after completion of concrete placing and keep the rate of increase in pipe temperature, and subsequent decrease, at a uniform controlled rate until the concrete has attained a minimum of 50% of its characteristic compressive strength.

Moist curing: Cure continuously, internally and externally until the concrete has attained a minimum of 50% of its characteristic compressive strength, and has cured for minimum 7 days after moulding.

Unreinforced components: For zero slump concrete with water to cement ratio not greater than 0.32, steam or moist curing not required.

4.2 CONCRETE COMPONENTS

MARKING: To AS 4198 Clause 1.4 and the following, all to be permanent:

- Date (may be incorporated in traceability code).

4.3 INTERNAL SURFACE FINISH

PHYSICAL QUALITY: To AS 3610, Clauses 3.3, 3.4 and 5.6 for Class 2X.

SURFACE APPEARANCE: To AS 3610, Appendix B for Class 2X. Blow hole depth, maximum 5 mm.

SMOOTHNESS: Hand finish, as necessary, to remove abrasive roughness. Do not bag.

4.4 UNREINFORCED COMPONENTS

CRACKS: To be less than 0.05 mm by feeler gauge at 3 mm depth.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS 1379 - The specification and manufacture of concrete
- AS/NZS 2566.2 - Buried flexible pipelines, Part 2: Installation [under preparation]
- AS 2758 - Aggregates and rock for engineering purposes
- .1 - Concrete aggregates
- AS 3610 - Formwork for concrete
- AS 3972 - Portland and blended cements
- AS 4058 - Precast concrete pipes (pressure and non-pressure)
- AS 4198 - Precast concrete access chambers for sewerage applications
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Mastic: For each non-flexible joint.

Lubricant: For all skid type elastomeric seals.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

MAINTENANCE HOLES PRECAST CONCRETE: To Section SP9 and the following:

INFORMATION TO BE SUPPLIED (See AS 4198 Appendix B)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP9 & SP15)
Maintenance hole nominal internal diameter	
Maintenance hole cover clear opening	
Maintenance hole cover - material and type	
Configuration details	
Step iron or ladders	*
Reinforced or unreinforced components	Manufacturer to supply details
Component details and dimensions	Manufacturer to supply
Jointing method	
Elastomeric seal material and lubricant	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP9	Manufacturer to supply

5.4 AGENCY PRACTICES

ACT & NSW AGENCIES STANDARD DRAWINGS:

Figure NSWGSS - SP9.01 Type P1 & P2 Precast Concrete Access Chamber Components

Figure NSWGSS - SP9.02 Type L Light Duty Access Cover and Frame for Precast Concrete Access Chambers

Figure NSWGSS - SP9.03 Type H Heavy Duty Access Cover and Frame for Precast Concrete Access Chambers

Figure NSWGSS - SP9.04 Step Iron Arrangement for Precast Concrete Access Chambers

Figure NSWGSS - SP9.05 Standard Monorail Ladder for Precast Concrete Access Chambers

WATER CORPORATION, WA: To Wastewater Manual, Volume 1.

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	JOINTING METHODS			REO SUPPORTS	WATER ABSORPTION (%)	CONCRETE COVER ELSEWHERE (mm)	CEMENT-ITIOUS MATERIAL (Kg/m ³)	STEP IRONS	LADDERS
	ELASTO-MERIC	MASTIC	EPOXY						
ACTEW Corporation	●	●	—	SS 304	6.5 (4.5 for ≥ DN750)	35	400	●	●
Barwon Water	●	●	—	—	—	—	—	—	—
Brisbane Water	—	●	—	—	—	—	—	● (≤ 3m)	● (>3m)
Dept of Land and Water Conservation, NSW	●	●	—	SS 304	6.5	35	400	●	—
Dept of Natural Resources, QLD	●	●	—	SS 304	6.5	35	400	●	●
Dept of Public Works & Services, NSW	●	●	—	SS 304	6.5	35	400	●	—
Gold Coast Water	●	●	—	SS 304	6.5	35	400	—	—
Hunter Water Corporation	●	●	—	SS 304	6.5	35	400	—	●
Melbourne Retail Water Companies	●	●	—	SS 304	—	—	400	●	●
Power & Water Authority, NT *	—	—	●	SS 304	6.5	45 (INT), 35 (EXT)	400	●	●
South Australian Water Corporation **	●	●	—	SS 304/316	6.5	40 (INT), 25 (EXT)	400	—	—
Sydney Water Corporation	●	●	—	SS 304	6.5	35	400	●	—
Water Corporation, WA	●	●	—	—	6.5	34 (INT), 20 (EXT)	400	●	●

* Proposed practice

** Lifting elements to be “Swift Lifts”. Fine and course aggregates to Specification DS3(c) - Calcareous Aggregate.

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

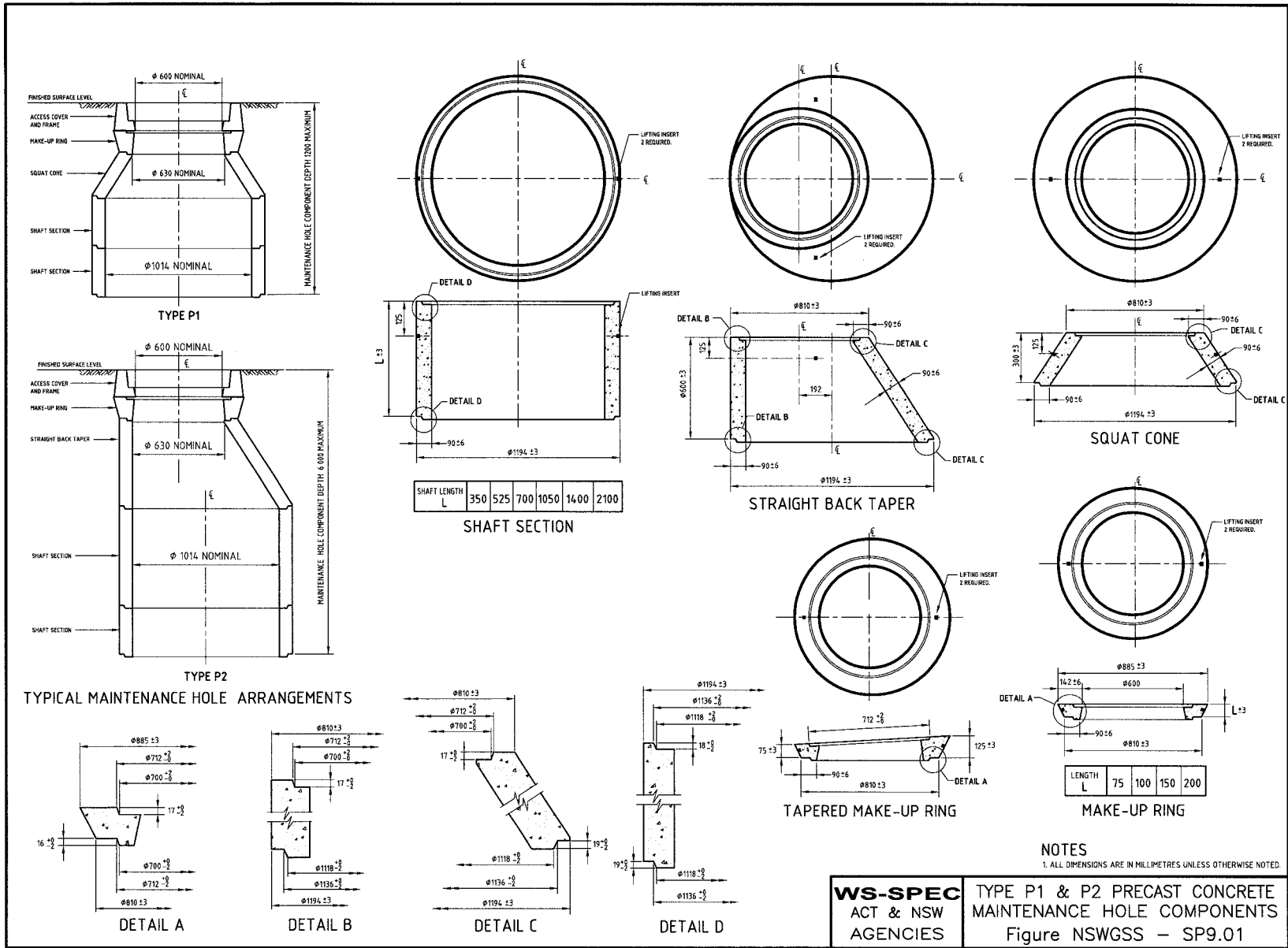
A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

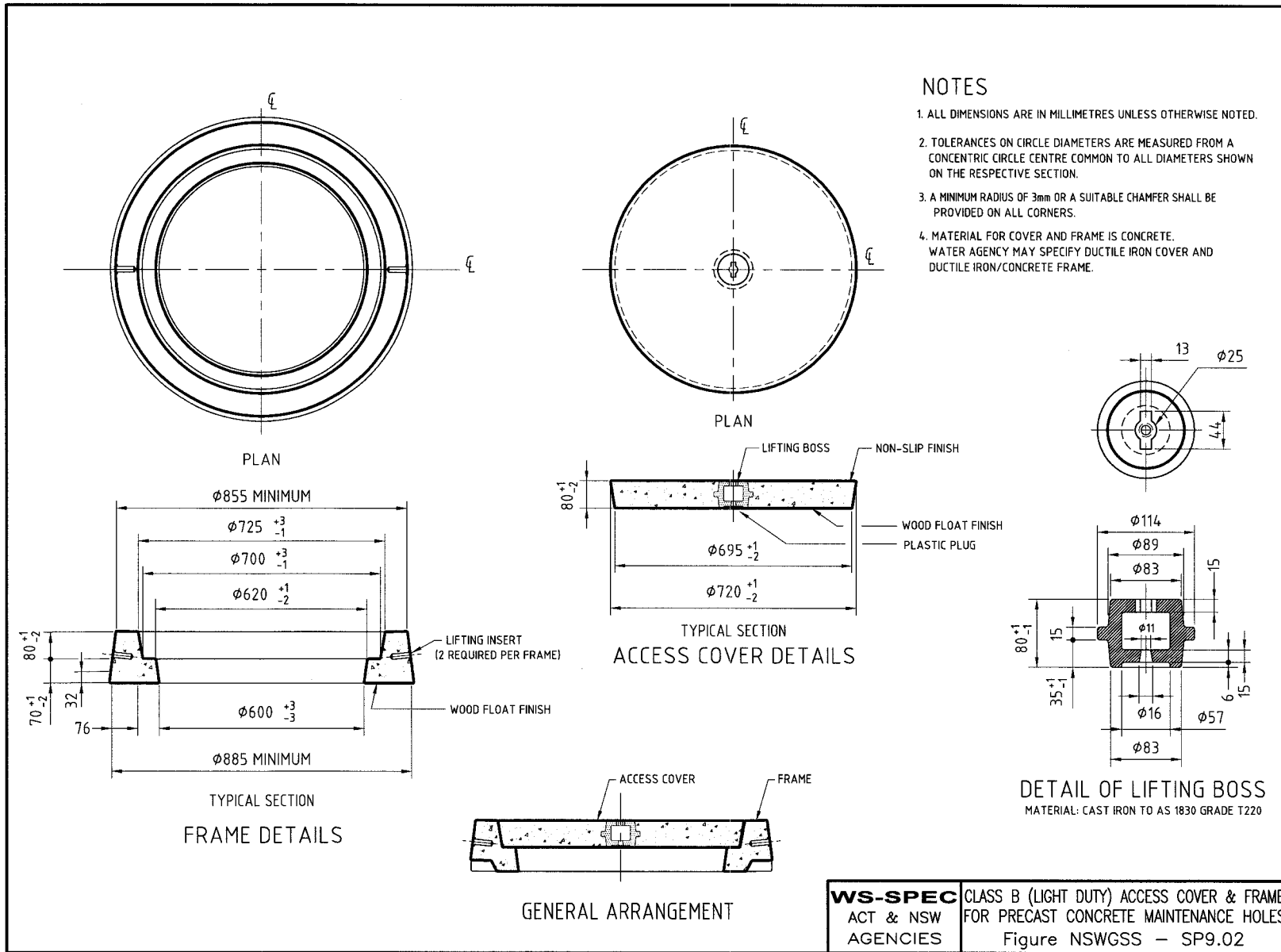
A3.1 GENERAL Clause 2.2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 4198](#).

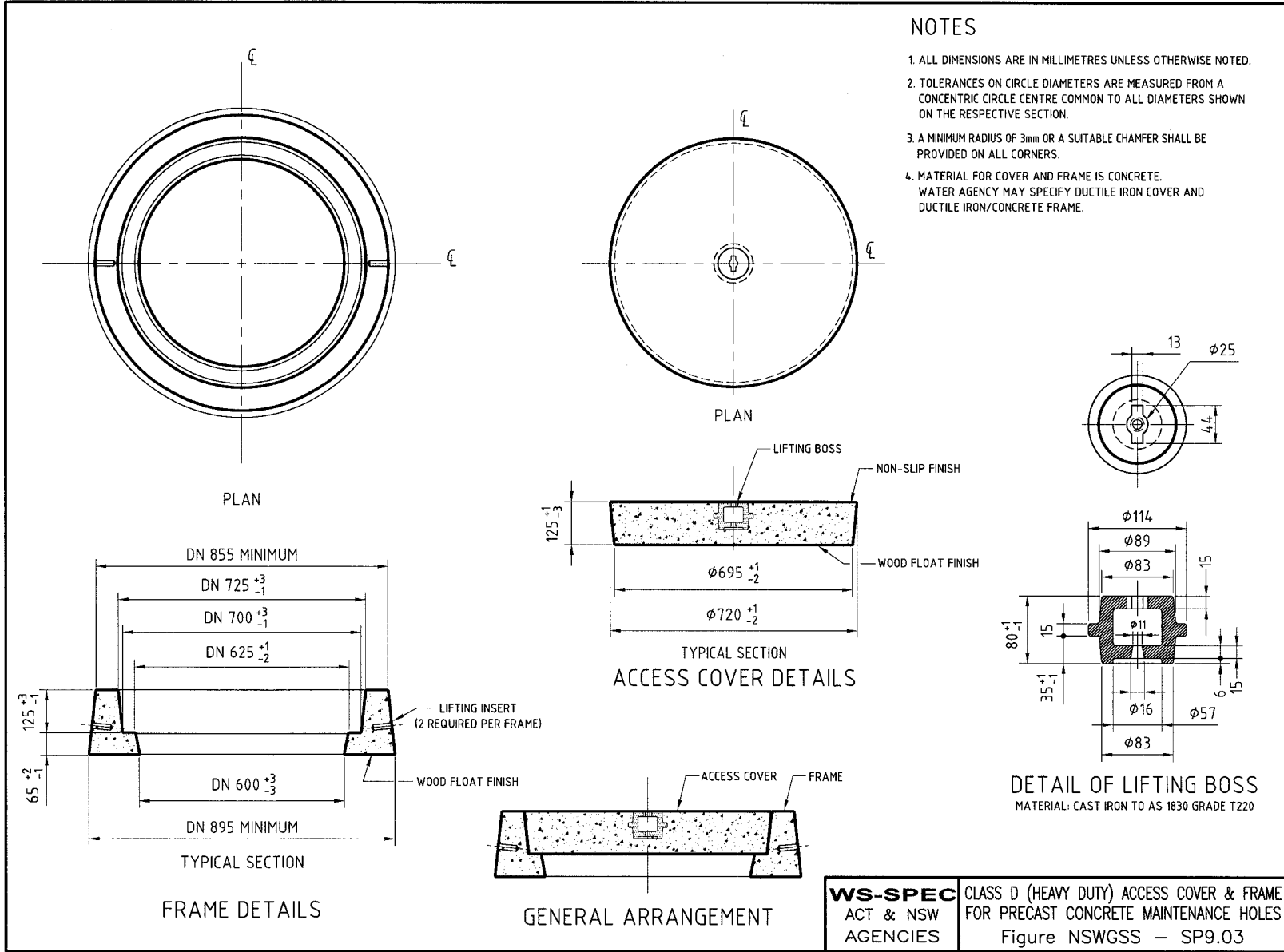
A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 4198](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 4198](#) shall be suspended until the cause of the failure has been identified and corrected.

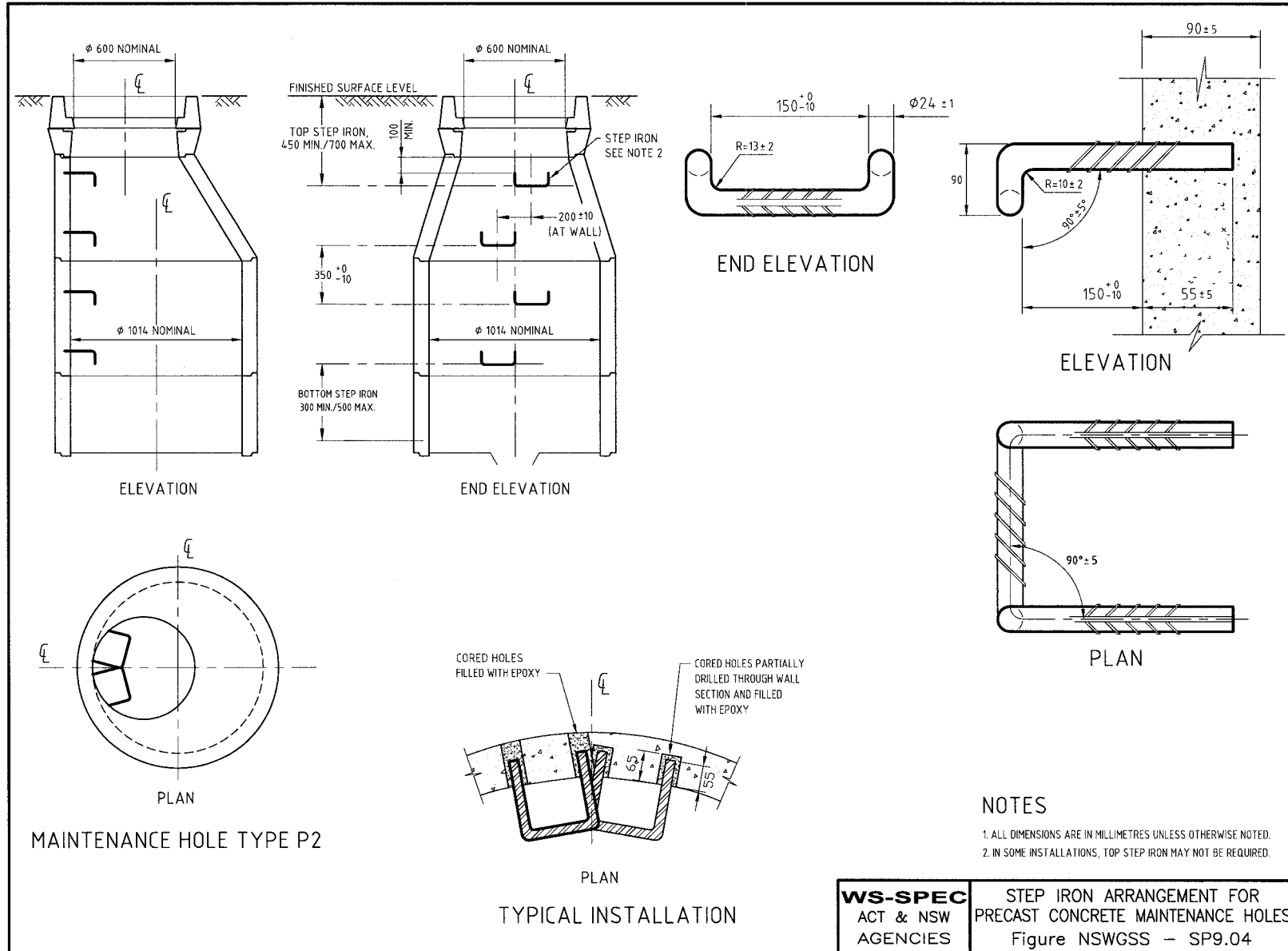
A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 4198](#).

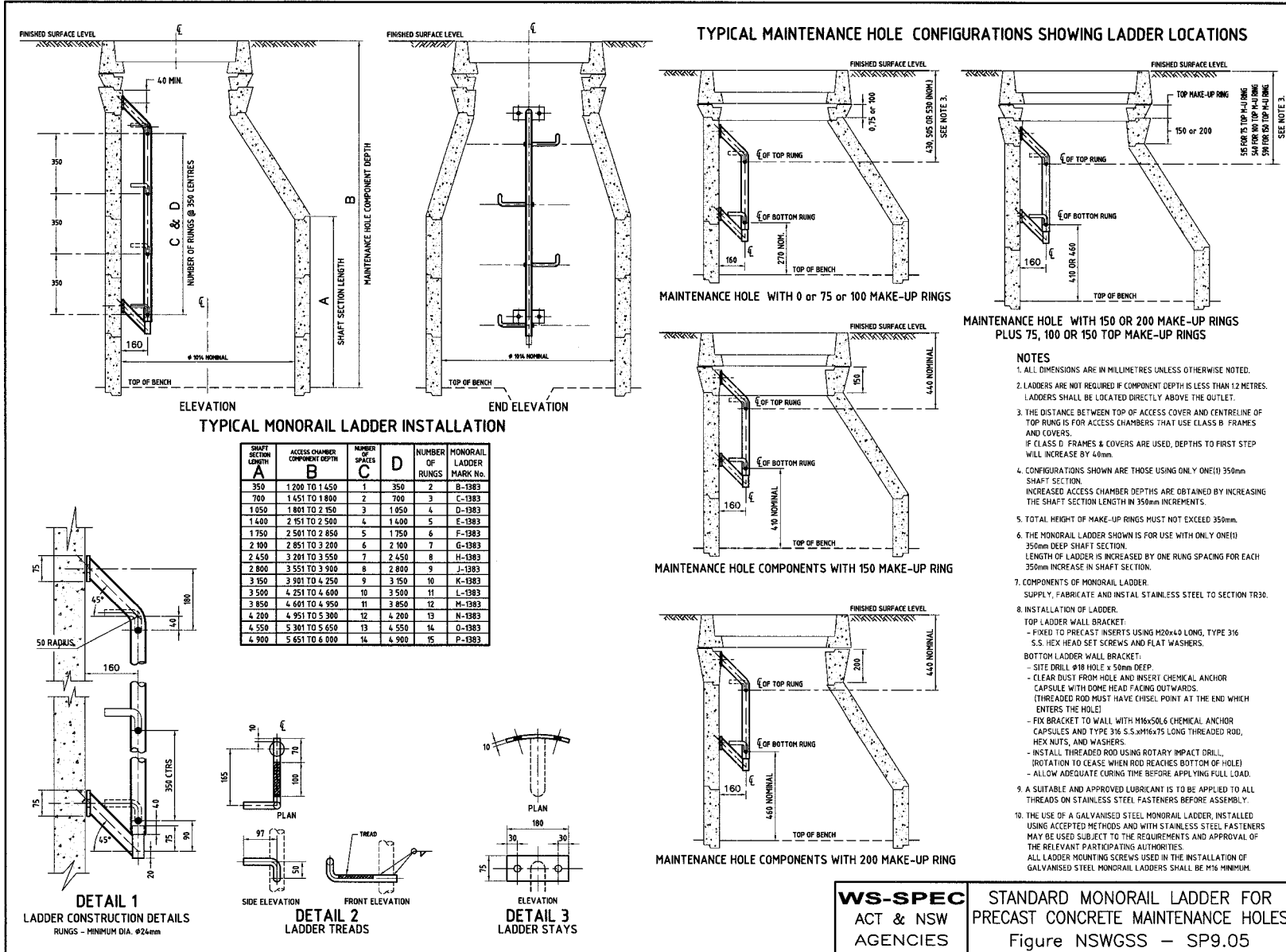






WS-SPEC CLASS D (HEAVY DUTY) ACCESS COVER & FRAME
ACT & NSW FOR PRECAST CONCRETE MAINTENANCE HOLES
AGENCIES Figure NSWGSS – SP9.03





WS-SPEC
ACT & NSW
AGENCIES

**STANDARD MONORAIL LADDER FOR
PRECAST CONCRETE MAINTENANCE HOLES**
Figure NSWGSS - SP9.05

SECTION SP10 PRECAST CONCRETE DRAINAGE PIPES, PITS AND HEADWALLS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of precast concrete pipes, pits, headwalls and associated components, for drainage and stormwater applications. For aggressive buried environments defined below, use pipe to Section SP8.

1.2 STANDARDS

MANUFACTURE: Concrete pipes to [AS 4058](#). Pits and headwalls to project specifics.

1.3 STORAGE AND TRANSPORT

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2, as applicable. [under preparation]

PIPE STACKING HEIGHT: Restrict so that maximum load on bottom pipes is less than 70% of their proof load.

1.4 AGGRESSIVE BURIED ENVIRONMENTS

REQUIREMENT: For water absorption, not greater than 6.5%, use Table E1 of [AS 4058](#) and 20mm cover. For water absorption greater than 6.5%, but less than 8.0%, use the table below.

CONSTITUENT	SOIL CLASSIFICATION		
	CLAY/STAGNANT	MEDIUM	SANDY/FLOWING
<i>Chloride</i> (p.p.m. Cl ⁻) max *			
Unreinforced concrete	20,000	20,000	20,000
Reinforced concrete	5,000	5,000	5,000
<i>Sulfate</i> (p.p.m. SO ₄ ⁻²) max	1,000	1,000	1,000
<i>Acidity</i> .*			
Acid (pH) (min)	5.5	6.0	6.5
Exchangeable soil acid	**	**	**
<i>Aggressive CO₂</i>	**	**	**

* In groundwater or of soil extract (2:1 water to soil by mass)

** Assess with site performance records of existing concrete structures and/or local knowledge which may over-ride the other criteria

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PIPE COMPLIANCE

REQUIREMENT: To Appendix A coupled with type testing and routine testing to [AS 4058](#), Table 4.1 and Appendix A, if nominated in *AGENCY PRACTICES - CLAUSE 5.4*.

Roller Suspended Process: To Clause 4.1.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 LUBRICANTS FOR SKID TYPE SEALS

MATERIAL: To meet elastomeric seal manufacturer's requirements.

3.3 CONCRETE

REQUIREMENT: To [AS 1379](#)

Admixtures: To be identified and recorded

3.4 PIPE REINFORCEMENT

REQUIREMENT: To manufacturer's design. Relative positions of main cage longitudinal and socket reinforcement to be maintained during the manufacturing process.

[Note: Reinforcement at socket connection to be reviewed].

SUPPORTS: To [AS 4058](#), unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

4 MANUFACTURE

4.1 PIPES

ROLLER SUSPENSION PROCESS: For pipes and products of 900 nominal size or greater, to *AGENCY PRACTICES - CLAUSE 5.4*.

- Each plant operator to be experienced for concrete mix compaction of each product size. Pre-qualification testing to be by coring or NDT (Non Destructive Testing) followed by on-going testing for compaction of production pipes.
- Criteria for acceptance and rejection of production products to be prepared by the manufacturer for the purchaser's acceptance.

MARKING: Additional to markings required by [AS 4058](#), score the following into the overt of the bore of the concrete pipes:

- Pipe class and traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.2 PIPE CONCRETE DURABILITY

COVER: To [AS 4058](#), unless otherwise specified in *AGENCY PRACTICES - CLAUSE 5.4*.

CURING: To either of the following:

Steam curing: Commence minimum one hour after completion of concrete placing and keep the rate of increase in pipe temperature, and subsequent decrease, at a uniform controlled rate until the concrete has attained a minimum of 50% of its characteristic compressive strength.

Moist curing: Cure continuously, externally and internally, until the concrete has both attained a minimum of 50% of its characteristic compressive strength and has cured for a minimum of 7 days.

4.3 PITS AND HEADWALL CONCRETE DURABILITY

STRENGTH GRADE: As shown on the drawings, but not less than 20 MPa.

COVER: As shown on the drawings, but not less than 25 mm clear cover.

CURING: As for pipe concrete.

DEFECTS: To meet requirements of [AS 4058](#), Clause 3.3.4 for “drainage pipe rubber ring joints”.

4.4 JOINT PERFORMANCE

REQUIREMENT: [To be reviewed]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 2758](#) - Aggregates and rock for engineering purposes
- [.1](#) - Concrete aggregates
- [AS 3972](#) - Portland and blended cements
- [AS 4058](#) - Precast concrete pipes (pressure and non-pressure)
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP8: Concrete Pipes

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Lubricant: For all skid type elastomeric seals.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

PRECAST CONCRETE DRAINAGE PIPES: To Section SP10 and the following:

INFORMATION TO BE SUPPLIED (See AS 4058 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP10 & SP15)
Application type	Drainage
Pipe nominal size(s)	
Pipe class(es)	
Jointing method	
Elastomeric seal material and lubricant	*
Roller suspension process acceptance criteria	To be prepared by the manufacturer
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP10	Manufacturer to supply

5.4 AGENCY PRACTICES

STANDARD DRAWINGS

BRISBANE CITY COUNCIL: To Drainage Standard Drawings, Department of Works, Design Branch.

DEPT OF LAND & WATER CONSERVATION, NSW, AND DEPT OF PUBLIC WORKS & SERVICES, NSW: To RTA (Roads & Traffic Authority) NSW, Standard Drawings.

S201	Concrete Headwalls for Single Cell Pipe Culverts (2 sheets)
S202	Concrete Headwalls for Double Cell Pipe Culverts (2 sheets)
S205	Concrete Headwalls for Pipe Culverts
S221	Headwall for Box Culvert
S222	Precast Headwalls
S250	Standard Gully Pit or Gutter Type 'SC' Median
S253	Gully Pit Type 'SA' with Precast Concrete Lintels
S254	Standard Gully Pit 'SH1' for Gutter Type 'SH'
S255	Details of Intersection Pit
S257	Gully Pit 'SA' (2 sheets)
S258	Precast Concrete Lintels for Type 'SA' Gully Pits
S273	Pipe Culvert in Cut Batter
S279	Standard Gully Pit Grating and Frame Type SK

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	JOINTING METHODS						REQUIREMENTS				
	AGENCY	FLUSH	MORTAR	ELASTO-MERIC BAND (External)	ELASTO-MERIC SEAL (Non-Pressure)	ELASTO-MERIC SEAL (Tested to 90 kPa)	JACKING PIPES STEEL BANDED	TYPE & ROUTINE TESTING	< 6.5% WATER ABSORP		ROLLER SUSPENSION TESTS
									EXTERNAL COVER (mm)	REO-SUPPORTS **	
Brisbane City Council	●	—	—	●	—	—	●	—	—	—	—
Dept of Land and Water Conservation, NSW	—	—	—	—	—	●	●	●	20	SS 304	●
Dept of Natural Resources, QLD	●	—	—	●	—	●	●	●	20	SS 304	●
Dept of Public Works & Services, NSW	—	—	—	—	—	●	●	●	20	SS 304	●
Hunter Water Corporation	—	—	—	—	—	●	●	●	20	SS 304	●
Melbourne Water Corporation *	●	●	—	●	—	●	●	●	20	SS 304	●
Melbourne Retail Water Companies	●	—	—	—	—	—	—	—	—	—	—
Sydney Water Corporation	—	—	—	—	—	●	●	●	20	SS 304	●
Water Corporation, WA	—	—	—	—	—	●	●	●	20	SS 304	●

* Other requirements to Melbourne Water Corporation Specification 93.A.014.

** To be reviewed.

APPENDIX A
COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Clause 2.2 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 4058](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 4058](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 4058](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 4058](#).

SECTION SP11 FRC PIPES AND FITTINGS
1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of FRC (fibre reinforced concrete) pipes and fittings (including pits), and associated components for stormwater drainage applications. The limitations for use in aggressive buried environments is defined below.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS 4139](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2, as applicable. [under preparation]

PIPE STACKING HEIGHT: Restrict so that maximum load on bottom row of pipes is less than 70% of their proof load.

1.4 AGGRESSIVE BURIED ENVIRONMENTS

REQUIREMENT: To the following table:

CONSTITUENT	SOIL CLASSIFICATION		
	CLAY/STAGNANT	MEDIUM	SANDY/FLOWING
<i>Chloride</i> (p.p.m. Cl ⁻) max.*	20,000	20,000	20,000
<i>Sulfate</i> (p.p.m. SO ₄) max.	1,000	1,000	1,000
<i>Acidity</i> .*			
Acid (pH) (min)	5.0	6.0	6.0
Exchangeable soil acid	**	**	**
<i>Aggressive</i> CO ₂	**	**	**

* In groundwater or of soil extract (2:1 water to soil by mass)

** Assess with site performance records of existing concrete structures and/or local knowledge which may over-ride the other criteria. If in doubt, consult the manufacturer.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least one per year or on a project-by project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.2 COUPLINGS:

REQUIREMENT: Machined from pipe to Section SP11.

3.3 LUBRICANTS

MATERIAL: To pipe manufacturer's requirements.

3.4 REINFORCEMENT

REQUIREMENT: Cellulose fibre to manufacturer's formulation and design specification.

3.5 SAND

MATERIAL: Washed, clean siliceous sand with a minimum dry silica content of 95%.

3.6 EPOXY BONDED JOINTS

MATERIAL: To pipe manufacturer's requirements.

4 MANUFACTURE

4.1 PIPES AND COUPLINGS

MARKING: To [AS 4139](#).

4.2 FITTINGS

REQUIREMENT: Fabricated from pipe to Section SP11.

SEGMENTED FITTINGS: To details provided in Schedule of Technical Data and bonding by certified operatives.

MARKING: Permanently mark date of bonding, place of manufacture, size and angle of bend on each fitting.

4.3 JOINT PERFORMANCE

REQUIREMENT: [To be reviewed]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS/NZS 2566.2 - Buried flexible pipelines, Part 2: Installation [under preparation]
- AS 4139 - Fibre reinforced concrete pipes and fittings.
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing.
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing.

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

Couplings: One fitted coupling for each pipe and one less coupling than the total number of spigot ends on each fitting.

Lubricant: For all elastomeric seals.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

FRC PIPES AND FITTINGS: To Section SP11 and the following:

INFORMATION TO BE SUPPLIED (See AS 4139 Appendix I)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP11 & SP15)
Application type	Drainage
Pipes	
- Nominal size(s)	-
- Class(es)	-
Fittings	
- Nominal size(s)	-
- Class(es)	-
- Types	-
Jointing method	
Elastomeric seal material	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance to Section SP11	Manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	JOINTING METHODS				REQ'MTS
	FLUSH	ELASTO-MERIC BAND (External)	ELASTOMERIC SEAL		ADDITIONAL TESTING
			No hydro-static test	Tested to 90 kPa	
ACTEW Corporation	-	-	-	-	-
Barwon Water	-	-	-	-	-
Brisbane Water	-	-	-	-	-
Dept of Land & Water Conservation, NSW	-	-	-	●	-
Dept of Natural Resources, Qld				●	
Dept of Public Works & Services, NSW	-	-	-	●	-
Gold Coast Water	-	-	-	-	-
Hunter Water Corporation					
Melbourne Retail Water Companies	-	-	-	-	-
Power & Water Authority, NT					
South Australian Water Corporation					
Sydney Water Corporation	-	-	-	-	-
Water Corporation, WA	-	-	-	-	-

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Tables A1 to A4 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 4139](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 4139](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 4139](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 4139](#).

A3.4 PIPE BATCH Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.

- A3.5 FITTING BATCH** Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the fitting manufacturer.
- A3.6 PRODUCTION BATCH** A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.
- A3.7 LOT** A clearly identifiable sub-division of a batch for inspection purposes.
- A3.8 SAMPLE** One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)
- A3.9 SAMPLING PLAN** A specific plan which indicates the number of units of components or assemblies to be inspected.
- A3.10 PROCESS VERIFICATION TEST (PVT)** A test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard. (Note: Such tests are not required to release batches of components and are carried out as a measure of process control.)
- A3.11 BATCH RELEASE TEST (BRT)** A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.
- A3.12 TYPE TESTING (TT)** Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.
- A3.13 NEW FORMULATION** [under preparation]

TABLE A1: PIPES TO AS 4139

Clause	Test method	Requirement	Minimum sampling frequency per production line
9.2 & 9.3	Diameter tape	Diameter and wall thickness	Two per hour
9.4	Measuring tape	Length	One per hour
9.5	Trysquare	Squareness and machined	Ten per hour
9.5	Go & nogo gauges	Tolerances of spigot ends	Ten per hour
9.6	Straight edge	Straightness	One per hour
10.1	Appendix C	Load test	See sample pipe
10.2	Appendix D	Hydrostatic test	One per batch
10.3	Appendix E	Water absorption	See sample pipe
10.4	Appendix F	Flexural strength	See sample pipe

TABLE A2: COUPLINGS TO AS 4139

Clause	Test method	Requirement	Minimum sampling frequency
7	Appendix D	Hydrostatic type test	At change in joint design
9.2 & 9.3	Diameter tape	Diameter and wall thickness	Two per hour
	Machine set up	Length	Each batch
	Comparison gauges	Socket profile	Ten per hour
	Trysquare	Squareness	Ten per hour
	Go & nogo gauges	Boring tolerances	Ten per hour
	Straight edge	Straightness	One per hour

TABLE A3: ADAPTOR COUPLINGS TO AS 4139

Clause	Test method	Requirement	Minimum sampling frequency
7	Appendix D	Hydrostatic type test	At change in joint design
9.2 & 9.3	Diameter tape	Diameter and wall thickness	Two per hour
	Machine set up	Length	Each batch
	Comparison gauges	Socket profile	Ten per hour
	Machine set up	Squareness and	Each batch
	Go & nogo gauges	Boring tolerances	Ten per hour
	Straight edge	Straightness	One per hour

TABLE A4: FABRICATED FITTINGS AS 4139

Clause	Test method	Requirement	Minimum sampling frequency
9.2 & 9.3	Diameter tape	Diameter and wall thickness	Two per batch
9.4	Measuring Tape	Length	Two per batch
9.5	Trysquare	Squareness and	Two per batch
9.5	Go & nogo gauges	Spigot tolerances	Two per batch
9.6	T-squ.,LCD-level	Straightness Angles etc	Two per batch
10.2	Appendix D	Hydrostatic test	Two per batch

SECTION SP12 ABS PIPES AND FITTINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of ABS pipes and fittings, and associated components, for water supply and sewerage applications. For chemical feed line applications, use only to manufacturer's recommendations.

1.2 STANDARDS

MANUFACTURE:

Pipes and Fittings: To [AS 3518.1](#) and [AS 3518.2](#). For potable water also to [AS 3855](#) or [AS/NZS 4020](#).

CLASSIFICATION: [Selection of class, for pipelines subject to cyclic loading, to be reviewed.]

1.3 TRANSPORTATION, HANDLING AND STORAGE

STANDARD: To [AS 3690](#).

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Handle, store and transport to avoid damage and preserve dimensional and physical properties.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 SOLVENT CEMENT:

MATERIAL: Priming fluid and solvent cement to [AS 3691](#).

3.2 FLANGE GASKETS:

MATERIAL: To Section SP15 and [AS 4087](#), Appendix D.

3.3 FLANGED JOINT BOLTING AND BACKING RINGS

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

3.4 THREAD SEALANTS:

REQUIREMENT: Use only PTFE tape to [AS 1272](#).

3.5 ELASTOMERIC SEALS:

REQUIREMENT: [Not yet available]

3.6 LUBRICANTS:

REQUIREMENT: [Not yet available]

4 MANUFACTURE

4.1 FITTINGS

MARKING: [To be reviewed]

4.2 SOLVENT JOINTS

FACTORY JOINTS: To manufacturer's requirements.

4.3 FLANGED JOINTS

FLANGES AND BACKING RINGS: Drill to [AS 4087](#).

STUB FLANGES: Maximum outside diameter to be equal to pitch circle diameter of the flange minus one bolt hole diameter, to manufacturer's details.

4.4 JOINT PERFORMANCE REQUIREMENT

REQUIREMENT: [To be reviewed]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1272](#) - Unsintered PTFE tape for thread sealing applications
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3518](#) - Acrylonitrile butadiene styrene (ABS) pipes and fittings for pressure applications
 - .1 - Pipes
 - .2 - Solvent cement fittings

- AS 3690 - Installation of ABS pipe systems
- AS 3691 - Solvent cement and priming (cleaning) fluids for use with ABS pipes and fittings
- AS 3855 - Suitability of plumbing and water distribution products for contact with potable water
- AS/NZS 4020 - Products for use in contact with drinking water
- AS 4087 - Metallic flanges for waterworks purposes
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing.

WS-SPEC SECTIONS:

Section TR30: Stainless Steel

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Solvent Cement and Priming Fluid: For all solvent cement joints.

Gaskets: One for each flange joint.

Flanged Joint Bolting: One set of bolts, nuts and washers for each flanged joint, excluding valve connections.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

ABS PIPES AND FITTINGS: To Section SP12 and the following:

INFORMATION TO BE SUPPLIED (See AS 3518.1 and AS 3518.2)	PROJECT REQUIREMENTS (* See Practices Table of Section SP12)
Pipes	
- Nominal size(s)	-
- Class(es)	-
- Jointing	-
Fittings	
- Nominal size(s)	-
- Class(es)	-
- Type and jointing	-
Flanged joint bolting and backing ring selection (excluding valves)	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP12	Manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	ABS PIPELINE APPLICATIONS	
	AGENCY	RETICULATION
ACTEW Corporation	Trial	●
Barwon Water	–	●
Brisbane Water	–	●
Dept of Land & Water Conservation, NSW	–	● Chemical dosing lines only
Dept of Natural Resources, Qld	–	●
Dept of Public Works & Services, NSW	–	●
Gold Coast Water	–	●
Hunter Water Corporation	–	●
Melbourne Retail Water Companies	–	–
Power & Water Authority, NT	–	●
South Australian Water Corporation	–	●
Sydney Water Corporation	Trial	●
Water Corporation, WA	≤ DN 150	≤ DN 150

Trial Use on a project-by-project basis

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 may be used by the certifying body as a guide for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Tables A1 to A3 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 3518, Parts 1 and 2](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 3518, Parts 1 and 2](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 3518, Parts 1 and 2](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 3518, Parts 1 and 2](#).

A3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

A3.5 PIPE BATCH Schedule of pipes, all the same nominal diameter and wall thickness, manufactured from the same compound on the same machine. The batch is defined by the pipe manufacturer.

A3.6 FITTING BATCH Schedule of fittings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the fitting manufacturer.

A3.7 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.8 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.11 CAVITY A part of the mould which gives the form to the moulded product.

A3.12 NEW FORMULATION [under preparation]

TABLE A1
PIPES TO AS 3518.1

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	8.5	Effect on water	AS 3855 or AS/NZS 4020	At any new formulation or every 5 years
Performance	9.3.2	Long-term hydrostatic pressure test	AS 3518.1 Appendix E	At any new formulation
	9.4	Heat ageing	AS 3518.1 Appendix F	At any new formulation
Batch Release Tests				
Dimensions	8.1	Diameter and wall thickness	AS 3518.1 Appendix B	Once per hour
	8.2	Length	AS 3518.1 Appendix B	Once per 8 hours
	8.3	Squareness of pipe ends	AS 3518.1 Appendix B	Once per 8 hours
Freedom from defects	8.4	Structural and surface defects	N/A	Once per 8 hours
Performance	9.1	Reversion	AS 3518.1 Appendix C	Once per 8 hours
	9.2	Impact characteristics at 0°C	AS 3518.1 Appendix D	Once per 8 hours
	9.3.1	Short-tem hydrostatic pressure test	AS 3518.1 Appendix E	Once per 8 hours

TABLE A2
MOULDED FITTINGS TO AS 3518.2

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Dimensions	8.2.3	Wall thickness	AS 3518.2 Appendix B	At change in design
Material properties	8.3	Effect on water	AS 3855 or AS/NZS 4020	At any new formulation or every 5 years
Performance	9.2.1(b)	Long-term hydrostatic pressure test (minimum 50 year failure pressure shall not be less than 2.13 times working pressure of joint of fittings)	AS 3518.2 Appendix C	At any new formulation
Batch Release Tests				
Freedom from defects	8.1	Structural and surface defects	N/A	Once per batch
Dimensions	8.2.1	Socket depth	AS 3518.2 Appendix B	Once per batch
	8.2.2	Socket diameter	AS 3518.2 Appendix B	Once per batch
Performance	9.2.1(a)	Short-term hydrostatic pressure test	AS 3518.2 Appendix C	Once per batch
	9.2.2	High temperature stress relief	AS 3518.2 Appendix D	Once per batch

TABLE A3
SOLVENT CEMENT AND PRIMING (CLEANING) FLUID TO AS 3691

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	4.3	Effect on water	AS 3855 or AS/NZS 4020	At any change of formulation of the solvent cement
Performance	5.2	Short term shear strength	Appendix C	At any change of formulation of the solvent cement
	5.3	Long-term pressure test	Appendix D	At any change of formulation of the solvent cement
Batch Release Tests				
Material properties	5.1	Viscosity	Appendix B	Each batch

SECTION SP13 MAINTENANCE HOLES PLASTICS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of circular maintenance hole (MH) systems in PE and GRP, either concrete bedded or encased, and associated components, for joining to sewers of all material types.

[Note: MH also referred to as manholes and access chambers.]

1.2 STANDARDS

MANUFACTURE: To this Section.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation].

1.4 DESIGN

SYSTEM: Internally, to meet requirements of vacuum and air test at 25 kPa, and/or hydrostatic test at 60 kPa, including all joints. Externally, as the constructed system, to meet standard pipeline loading requirements at the specified soil depths and live loads applicable to the application. Flootation, buckling and distortion to be addressed both for during construction and for long term performance.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 OPERATOR CERTIFICATION

REQUIREMENT: Prequalification of welders/laminators to a recognised certification scheme.

2.4 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 CHAMBERS

MATERIAL: PE to [AS/NZS 4131](#), Type 80B or 80C.
GRP to [AS 3571](#) and/or [AS 2634](#).

3.2 STEPS AND LADDERS

MATERIAL: Stainless steel to Section TR30.
PE to [AS/NZS 4131](#), Type 80B or 80C.
GRP to [AS 2634](#).

3.3 CONCRETE ENCASUREMENT

REQUIREMENT: To Section SP44, except where in contact with sewage, to Section SP45.

3.4 ACCESS COVERS

COVER AND FRAME: Metal: To [AS 3996](#) Classes B and D, release or bolt down.
Precast concrete: To [AS 4198](#).

SUPPORT STRUCTURE: To suit cover and frame.

3.5 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15, for sewer pipe.

3.6 LUBRICANTS

MATERIAL: To manufacturer's requirements.

4 MANUFACTURE

4.1 CHAMBERS

FABRICATION: PE fusion welds or GRP laminated joints, to be made in the factory to the manufacturer's requirements.

4.2 DIMENSIONS

REQUIREMENT: To project specifics.

4.3 EXTENSION PIECES

REQUIREMENT: To same fabrication as the MH, with ends prepared for elastomeric seal field jointing to the MH.

4.4 SEWER TO CHAMBER CONNECTION

REQUIREMENT: Spigot and socket, or mechanical, elastomeric seal joint, or solvent welded joint.

4.5 STEPS AND LADDERS

REQUIREMENT: To [AS 1657](#) for loadings and dimensions.

4.6 LIFTING LUGS

REQUIREMENT: Where provided, mark safe working load adjacent to or on.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS/NZS 1462 - Methods of test for plastics pipes and fittings
 - .8 - Method 8: Method of test for infiltration
 - .10 - Method 10: Method for hydrostatic pressure testing of fittings and elastomeric seal joints for non-pressure applications
- AS 1657 - Fixed platforms, walkways, stairways and ladders - Design, construction and installation.
- AS/NZS 2566.2 - Buried flexible pipelines, Part 2: Installation [under preparation].
- AS 2634 - Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins.
- AS 3571 - Glass filament reinforced thermosetting plastics (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
- AS 3572 - Plastics – Glass filament reinforced plastics (GRP) – Methods of test
 - .4 - Determination of the dimensions of glass filament reinforced plastics pipes
 - .22 - Method for determination of hardness by means of a Barcol impressor
- AS/NZS 4130 - PE pipes, pressure applications
- AS/NZS 4131 - PE pipes, compounds
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing.
- ISO 9969 - Thermoplastics pipes – Determination of ring stiffness

WS-SPEC SECTIONS

- Section SP5: GRP Pipes and Fittings
- Section SP15: Elastomeric Seals
- Section SP44: Concrete Supply Standard Class
- Section SP 45: Concrete Supply Special Class
- Section TR 30: Stainless Steel

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Solvent Cement and Priming Fluid: For all solvent cement joints.

Elastomeric Seals: One for each elastomeric seal joint.

Lubricant: For all elastomeric seal slip-on joints.

Cover and Frame: One for each MH.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

MAINTENANCE HOLES PLASTICS: To Section SP13 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (* See Practices Table of Section SP13)
System <ul style="list-style-type: none"> - Minimum dimensions - MH chamber/base material - Chamber nominal internal diameter - Extension pieces (pre-cut or cut on site) - Depth(s) (ie. from finished surface to mean invert level) - Configuration details - Chamber extension jointing method - Concrete or soil encased - Sewer diameter (DN) - Adaptors (identify connecting pipework) - Sewer pipe jointing (solvent welded or elastomeric seal) 	<ul style="list-style-type: none"> - - - - - - Manufacturer to supply - Manufacturer to supply details - Manufacturer to supply details - - -
Components <ul style="list-style-type: none"> - MH cover, clear opening - MH cover (material, class, release or bolt down) - Steps or ladders (material) - Elastomeric seal material - Lubricants 	<ul style="list-style-type: none"> - - - - -
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP13	Manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	MAINTENANCE HOLE SYSTEM		SGE PIPE CONN'CTN: SOLVENT WELD OR ELAST. SEAL	COVER RELEASE OR BOLT DOWN
	GRP FABRICATED	PE, MOULDED & FABR'CTD		
ACTEW Corporation	Trial	Trial	Elast. Seal	Both
Barwon Water	–	Trial	Solvent	Both
Brisbane Water	–	–	–	–
Dept of Land & Water Conservation, NSW	●	●	Elast. Seal	Release
Dept of Natural Resources, Qld	–	–	–	–
Dept of Public Works & Services, NSW	–	Trial	Elast. Seal	Release
Gold Coast Water	–	–	–	–
Hunter Water Corporation	–	–	–	–
Melbourne Retail Water Companies	–	●	Solvent	Release
Power & Water Authority, NT	–	Trial	Elast. Seal	Release
South Australian Water Corporation	–	–	–	–
Sydney Water Corporation	Trial	–	Elast. Seal	Both
Water Corporation, WA	–	–	–	–

Trial Project-by-project acceptance

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of this Standard.

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

The frequency of the sampling and testing plan as detailed in Clause A1 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Tables A1 and A2 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP13.

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Tables A1 and A2, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with Section SP13 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to Section SP13 shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with Section SP13.

A.3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

A.3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.6 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.7 NEW FORMULATION [under preparation]

**TABLE A1
GRP FABRICATED TO SECTION SP13**

CHARACTERISTIC	CLAUSE	REQUIREMENT	TEST METHOD	FREQUENCY
Type Tests				
Performance	1.4	Pressure test	*	At any new material formulation or design or every 5 years
	1.4	Pipe stiffness	*	
	1.4	Elastomeric joint	AS 3571	
	-	Ladder	AS 1657	
	-	Lifting lugs	*	
Batch Release Tests				
Material properties	4.2	Pipe stock	Section SP5	-
Dimensions	-	Product drawings	AS 3572.4	Each fitting
Freedom from defects	-	Structural and surface defects	AS 2634	Each fitting
Performance	-	Surface hardness	AS 3572.22	Each batch
	-	Pressure	*	*

* To be determined

**TABLE A2
PE MOULDED & FABRICATED TO SECTION SP13**

CHARACTERISTIC	CLAUSE	REQUIREMENT	TEST METHOD	FREQUENCY
Type Tests				
Performance	1.4	Pressure test	*	At any new material formulation or design or very 5 years
	1.4	Pipe stiffness	ISO 9969	
	1.4	Elastomeric joints	PL/21/96 - 08 and 09	
	-	Ladder	AS 1657	
	-	Lifting lugs	*	
Batch Release Tests				
Material properties	4.2	Pipe stock	*	-
Dimensions	-	Product drawings	*	Each fitting
Freedom from defects	-	Structural and surface defects	AS/NZS 4130	Each fitting
Performance	-	Pressure	*	*

* To be determined

SECTION SP14 MAINTENANCE SHAFTS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of maintenance shafts (MS) systems in PVC, PE and PP (polypropylene) and combinations of each, and associated components, for joining to sewers of all material types.

1.2 STANDARDS

MANUFACTURE: To Appendix A.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation].

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix B.

2.3 OPERATOR CERTIFICATION

REQUIREMENT: Prequalification of welders/laminators to a recognised certification scheme.

2.4 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 CHAMBERS

MATERIAL: PE [Not yet available]
PVC to [AS/NZS 1260](#)
PP [Not yet available]

3.2 SOLVENT CEMENT

MATERIAL: For PVC pipework, priming fluid and solvent cement to [AS/NZS 3879](#).

3.3 ADAPTORS, CAPS AND RESTRAINING JOINTS

REQUIREMENT: Dimensions and tolerances to suit connecting pipework.

3.4 EXTENSION PIECES

MATERIAL: PVC sewer pipe Class SN8, to [AS/NZS 1260](#).
PE pipe SDR 21, to [AS/NZS 4130](#).

3.5 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15, for sewer pipe.

3.6 SURFACE FITTING

COVER AND FRAME: Metal: To [AS 3996](#) Classes B and D.
Precast concrete: To [AS 4198](#).

SUPPORT STRUCTURE: To suit cover and frame.

3.7 LUBRICANTS

MATERIAL: To manufacturer's requirements.

4 MANUFACTURE

4.1 CHAMBERS

FABRICATION: Solvent welded and butt welded joints to be made in the factory to the manufacturer's requirements, including adaptors for mechanical joints and caps.

4.2 SHAFT TO CHAMBER CONNECTION

REQUIREMENT: Restrained joint, prepared as follows:

- PVC to PVC, solvent welded, spigot and socket
- PE to PE, welded, butt or electrofusion
- PVC to PE, mechanical, thread or flanged.

4.3 SEWER TO CHAMBER CONNECTION

REQUIREMENT: Spigot and socket elastomeric seal joint or solvent welded joint.

4.4 CAPS

REQUIREMENT: Release under surcharge pressure or locking cap type, (ie. "fixed").

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS/NZS 1260](#) - PVC pipes and fittings for drain, waste and vent applications.
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation].

- AS/NZS 3879 - Solvent cements and priming fluids for use with unplasticated PVC (UPVC) pipes and fittings.
- AS 3996 - Metal access covers, road grates and frames
- AS/NZS 4129 (int) - Fittings for polyethylene (PE) pipes for pressure applications.
- AS/NZS 4130 - PE pipes, pressure applications.
- AS/NZS 4131 - PE pipes, compounds
- AS 4198 - Precast concrete access chambers for sewerage applications
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing.

WS-SPEC SECTIONS

Section SP15: Elastomeric seals

5.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

MAINTENANCE SHAFTS: To Section SP14 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (* See Practices Table of Section SP14)
System - MS base/chamber material - Sewer diameter (DN) and materials - Sewer pipe joint (solvent welded or elastomeric seal)	- - -
Components - Adaptors (to suit above connecting pipework) - Cap (release or fixed) - Surface fitting (material and type) - Shaft extension pieces (pre-cut or cut on site) - Elastomeric material - Solvent cement - Lubricants	- - - - - - -
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP14	Manufacturer to supply

5.3 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Solvent Cement and Priming Fluid: For all PVC solvent cement joints.

Elastomeric Seals: One for each elastomeric seal joint.

Polypropylene Sleeves: One for each plain end pipe.

Lubricant: For all elastomeric seal slip-on joints.

Cap: One for each MS.

Cover and Frame: One for each MS.

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	MAINTENANCE SHAFT SYSTEM			SGE PIPE CONN'CTN: SOLVENT WELD OR ELAST. SEAL	SHAFT CAP: RELEASE OR FIXED
	AGENCY	PVC FABR'TD	PE MOULDED		
ACTEW Corporation	●	●	●	Both	Both
Barwon Water	●	●	—	Solvent	Fixed
Brisbane Water	—	Trial	—	Elast. Seal	Fixed
Dept of Land & Water Conservation, NSW	●	●	—	Elast. Seal	Fixed
Dept of Natural Resources, Qld	—	—	—	—	—
Dept of Public Works & Services, NSW	Trial	—	Trial	Elast. Seal	Both
Gold Coast Water	●	●	—	Elast. Seal	Fixed
Hunter Water Corporation	●	●	—	Elast. Seal	Release
Melbourne Retail Water Companies	●	●	—	Solvent	Release
Power & Water Authority, NT	Trial	Trial	—	Solvent	Release
South Australian Water Corporation	●	●	—	Solvent	Optional
Sydney Water Corporation	—	—	—	—	—
Water Corporation, WA	Trial	●	—	Solvent	Release

Trial Project-by-project acceptance

APPENDIX A

SECTION A1 SCOPE AND GENERAL

A1.1 SCOPE

This specification sets out the requirements for maintenance shafts for sewerage systems.

A1.2 REFERENCED DOCUMENTS

The following documents are referenced in this Specification:

AS 1199	Sampling procedures and tables for inspection by attributes
AS/NZS 1260	PVC pipes and fittings for drain, waste and vent applications.
AS 1646	Elastomeric seals for waterworks purposes.
AS 1741	Vitrified clay pipes and fittings with flexible joints - Sewer quality.
AS 3996	Metal access covers, road grates and frames.
AS/NZS 4130	Polyethylene pipes for pressure applications.
AS/NZS 4131	Polyethylene compounds for pressure pipes and fittings.
SAA HB18 .28	Guidelines for third-party certification and accreditation Guide 28 – General rules for model third-party certification system for products
EN 295	Vitrified clay pipes and fittings and pipe joints for drains and sewers.
WSA 02	Sewer Code of Australia

A1.3 DEFINITION

A maintenance shaft (abbreviation MS) is a component or system of components for use as part of a sewerage pipeline which:

- Permits maintenance of the pipeline by operators working from the surface using all commonly used maintenance and inspection equipment.
- Does not permit persons to enter confined spaces.

SECTION A2 MATERIALS AND COMPONENTS

A2.1 MATERIALS The MS shall be manufactured to:

- a) resist chemicals commonly occurring in sewage and ground water;
- b) provide a product or assembly which is fit for purpose;
- c) conform with the relevant requirements of [AS/NZS 4130](#) if manufactured from PE;
- d) conform with the relevant requirements of [AS/NZS 1260](#) if manufactured from PVC; and
- e) if manufactured from other materials, conform with appropriate Standards.

SECTION A3 DESIGN, MANUFACTURE AND INSTALLATION

A3.1 DESIGN The MS shall be designed to the following requirements:

- a) Base/Chamber Clearance Envelope(s).
- b) Meet all pipeline tests included in [WSA 02](#).
- c) Installation below ground to a depth of 6 metres maximum to invert of pipe. Loads simulating this depth shall be borne without cracking or significant deformation (defined as not exceeding 4% of any dimension).
- d) External hydrostatic loading of 70 kPa without buckling.
- e) Resist floatation when installed in water-charged ground.

A3.2 ACCESS The MS shall be manufactured/constructed with the following dimensions (refer to Figures):

- a) The minimum internal diameter of shaft shall be d_3 . The shaft shall include a cap or plug which can be removed and replaced, regaining the seal.
- b) The geometry shall permit access to the sewer pipeline of maintenance equipment of profiles shown in Figures A2 and A3 with cables attached each end to enable passage long-ways around the bend from the vertical shaft to the horizontal sewer pipeline with a maximum pulling force of 250 N.
- c) Internal joints shall be smooth to allow unhindered passage of equipment.

A3.3 SEALING

A3.3.1 Joint performance All joints shall be capable of field assembly and be leak-free and resistant to tree root penetration. The MS and all connections shall be capable of meeting all the pipeline tests included in [WSA 02](#).

For joints utilising elastomeric seals, compliance with the requirements of Clause 3.4 of [AS/NZS 1260](#) shall be sufficient to establish resistance to tree root penetration, whether the material being jointed is PVC or other material. Other types of joint will be assessed by appropriate methods.

A3.3.2 Elastomer Elastomeric seals, where used, shall comply with [AS 1646](#).

A3.4 SURFACE FITTING The MS system shall include a surface fitting and cover which shall bear the word "SEWER" in letters at least 50 mm high.

Surface covers shall provide load bearing capacity in accordance with Clauses 1.5.2 and 3.1 of [AS 3996](#) appropriate to the installation location and shall also comply with Clauses 3.2.1 and 3.2.2.1 of [AS 3996](#). The surface covers shall comply with other elements of [AS 3996](#) as appropriate. Subject to these requirements, materials other than those prescribed in [AS 3996](#) may be utilised.

A3.5 CONNECTIONS Pipe connections shall be provided which are compatible with:

- VC pipes to [AS 1741](#) and EN 295
- PVC pipes to [AS/NZS 1260](#)
- PE pipes to [AS/NZS 4130](#)

The MS may have multiple connections to suit different pipeline inlet configurations. Alternatively the MS shall provide for specific pipeline inlet configurations.

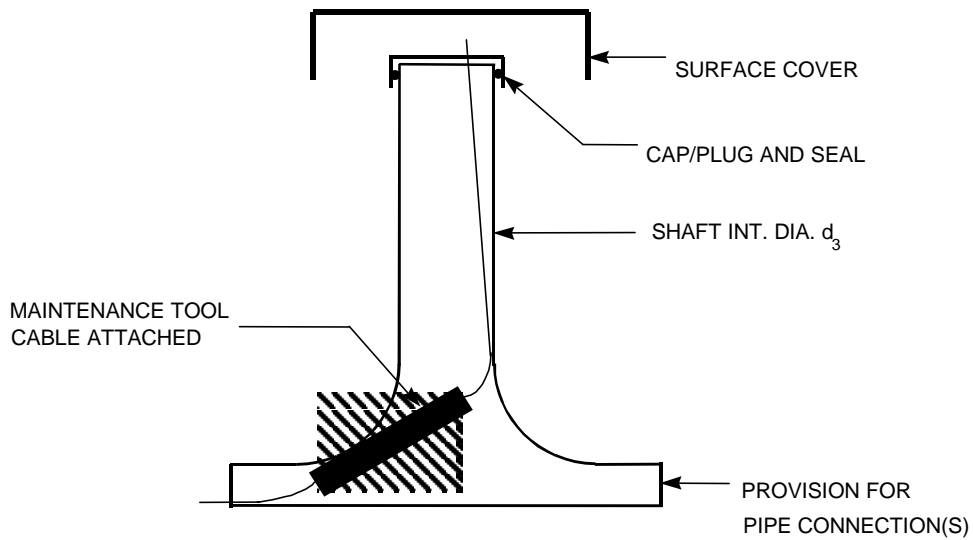


FIGURE A1
MAINTENANCE SHAFT FUNCTIONAL CONFIGURATION

A3.6 MAINTENANCE TOOL PROFILES

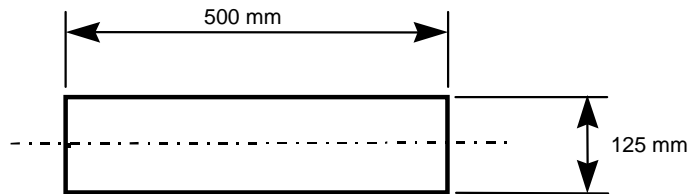


FIGURE A2
CAMERA PROFILE

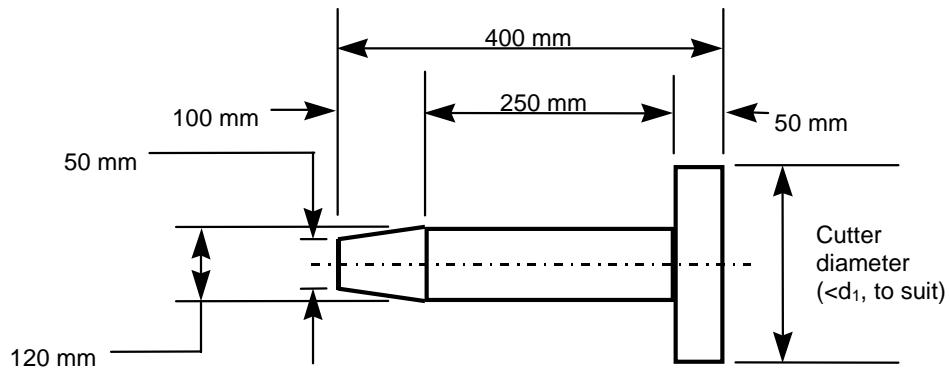


FIGURE A3
HYDRAULIC CUTTER PROFILE

A3.7 BASE/CHAMBER CLEARANCE ENVELOPE

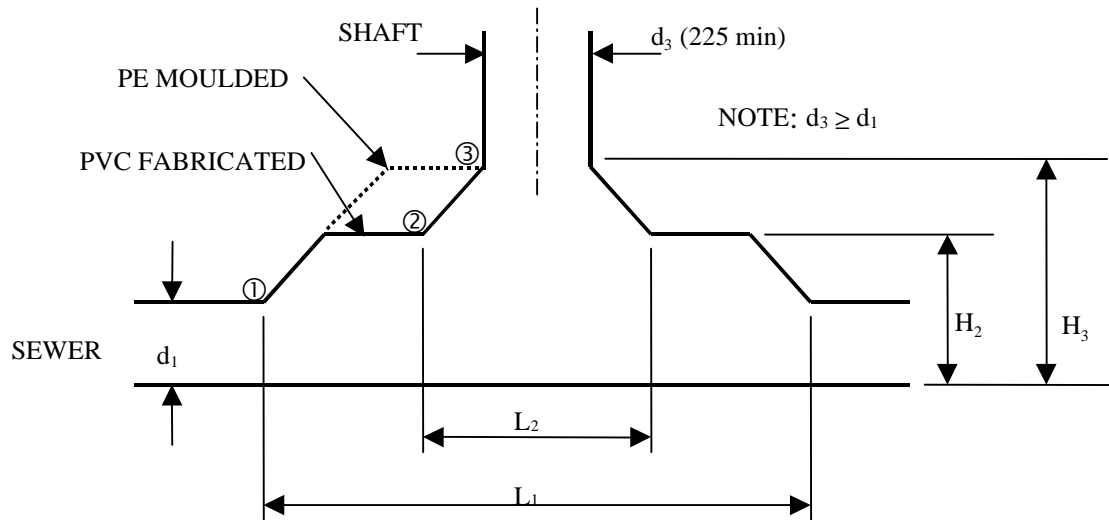


FIGURE A4

TABLE A1
BASE/CHAMBER CLEARANCE ENVELOPE

TYPE & CONFIGURATION	POINT ①		POINT ②		POINT ③	
	d_1	L_1	H_2	L_2	H_3	d_3
IN-LINE AND TERMINALS	150	900	295	500	450	225
	225	710	295	500	450	225
	300	900	295	500	450	375
	375	900	295	500	450	375
TEE -MAIN	150	900	295	500	450	225
	225	710	295	500	450	225
TEE -BRANCH	150	450	295	500	450	225
	225	355	295	500	450	225
90° BEND	150	1060	295	500	450	225
	225	970	295	500	450	225
45° BEND	150	1060	295	500	450	225
	225	970	295	500	450	225
30° BEND	150	1060	295	500	450	225
	225	970	295	500	450	225
22½° BEND	150	1060	295	500	450	225
	225	970	295	500	450	225
15° BEND	150	1060	295	500	450	225
	225	970	295	500	450	225

- NOTES:
- All dimensions are in mm and d_1 and d_3 are internal diameters
 - Base/chamber width $\geq d_3$
 - Centre-line of shaft on base/chamber axis of symmetry
 - For tee branches and terminals, the lengths shown are from the sewer centre-line
 - For bends, the lengths shown are along the sewer centre-line

SECTION A4 TESTING

A4.1 LOAD TEST Due to the variability in allowable geometry the actual design of the test and methods of application of load, and of support during testing, is not prescribed here. For any design of MS the details of structural test requirements shall be subject to negotiation with the Purchaser based on the above principle.

A4.2 TYPE TEST The MS shall be type tested to comply with the following:

- (a) Structural testing reports by a NATA-registered laboratory shall be provided to establish conformance with the design requirements of Clause A3.1.
- (b) Trial simulated applications of maintenance equipment. The standard equipment, or dummy equipment of the same dimensions, shall be inserted into the horizontal components in both directions via the shaft with a maximum pulling force of 250 N. Shaft shall be 2 metres minimum height for the test.
- (c) The Standard equipment shall include:
 - Camera of dimensions 500 mm long x 125 mm diameter, exclusive of attached cables, with power tilt and pan facilities. (Ref. Figure 2.)
 - Pipeline root cutter to suit DN 225 maximum sewer pipe. (Ref. Figure A3.)
 - Pipeline jetter.
 - Inflatable pipeline sealing plugs.

A4.3 BATCH RELEASE TESTS

- (a) Dimensional tests
- (b) Fabricated PVC fittings test to [AS/NZS 1260](#):
 - Operator prequalification for hot air PVC welding
 - Reinforcement material bond and adhesion tests
 - Reinforcement material tests
 - Hydrostatic pressure test
- (c) Moulded PE fittings, test to [to be determined].

SECTION A5 MARKING AND PACKAGING

A5.1 MARKING The body and cap/plug shall be durably marked. The marking shall include:

- a) The manufacturers name or registered trademark or both.
- b) Letters depicting the material of the body of the MS such as 'PE' or 'PVC'.
- c) Date of manufacture in the form 980721(year month day).
- d) Identification of the place of manufacture.
- e) Direction of flow (eg. base slopes 3° with respect to the shaft).

APPENDIX B

COMPLIANCE REQUIREMENTS

B1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

B2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of this Standard.

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

The frequency of the sampling and testing plan as detailed in Clause B1 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

B3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

B3.1 GENERAL Tables B1 and B2 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP14.

B3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Tables B1 and B2, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with Section SP14 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to Section SP14 shall be suspended until the cause of the failure has been identified and corrected.

B3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with Section SP14.

B3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

B3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

B3.6 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

B3.7 NEW FORMULATION [under preparation]

**TABLE B1
PVC FABRICATED TO SECTION SP14**

CHARACTERISTIC	CLAUSE	REQUIREMENT	TEST METHOD	FREQUENCY
Type Tests				
Dimensions	A3.7	Clearance	Trial	At any new material formulation or design or every 5 years
Performance	A4.2	Pressure	Vacuum	
	A4.2	**	Simulated external soil load test	
Batch Release Tests				
Material properties	A4.2	Pipe stock	Section SP4	-
Dimensions	A.4.3	Product drawings	Tape and callipers	Each fitting
Freedom from defects	-	Structural and surface defects	Visual	Each fitting
Material	A4.3	GRP reinforcement	AS/NZS 1260 Clause 6.2 *	*
Performance	A4.3	Pressure	Vacuum	1 in 20

* To be determined

** Demonstrated performance at 6 metres depth for 50 year design life

**TABLE B2
PE MOULDED TO SECTION SP14**

CHARACTERISTIC	CLAUSE	REQUIREMENT	TEST METHOD	FREQUENCY
Type Tests				
Dimensions	A3.7	Clearance	Trial	At any new material formulation or design or every 5 years
Performance	A4.2	Pressure	Vacuum	
	A4.2	**	Simulated external soil load test or analysis	
Batch Release Tests				
Material properties	A4.2	*	*	-
Dimensions	A4.3	Product drawings	Tape and callipers	One per mould and each 2 hours
Freedom from defects	-	Structural and surface defects	Visual	Each fitting
Material properties	A4.3	*	*	*
Performance	A4.3	Pressure	Vacuum	1 in 20

* To be determined

** Demonstrated performance at 6 metres depth for 50 year design life

SECTION SP15 ELASTOMERIC SEALS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of elastomeric seals for water supply, sewerage and drainage applications.

1.2 STANDARDS

MANUFACTURE: To [AS 1646](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Manufacturer to include on packaging labels.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and the following.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 ELASTOMER

MATERIAL: To Table of Agency Practices and manufacturer's specification, including all information required for Clause A2 of [AS 1646](#).

3.2 ROOT INHIBITOR

REQUIREMENT: Prohibited in water supply and pressure pipelines.

MARKING: Emboss letters RI and paint stripes to [AS 1646](#), Clause 1.8.3.

[Note: Use of root inhibitor is being reviewed].

4 MANUFACTURE

4.1 JOINS

[Note: Yet to be prepared.]

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS 1646 - Elastomeric seals for waterworks purposes
- AS/NZS 2566.2 - Buried flexible pipelines, Part 2: Installation [under preparation]
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Elastomeric Seals: One for each elastomeric seal joint.

5.3 PROJECT SPECIFICS

[Note: For separate purchase of elastomers, select from or add to the following and insert in project specifications.]

ELASTOMERIC SEALS: To Section SP15 and the following:

INFORMATION TO BE SUPPLIED (See AS1646 - Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Section SP15)
Elastomers	- * -] -] -] -] To pipe and fitting manufacturer's details
- Material	
- Type	
- Hardness	
- Profile	
Root inhibitor	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP15	Manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE MATERIALS		NORMAL PRACTICE: ELASTOMERIC SEALS IN PIPELINES								
		STEEL	DI/CI	PVC	GRP	PE	VC		CONC	FRC
							ROLL ON	SLEEVE		
AGENCY										
ACTEW Corporation		NR	NR	NR	EPDM		NR		NR	
Barwon Water	water	NR	NR	NR	EPDM	—	—	—	—	
	sewer	—	NR	CR	EPDM	—	CR	—	CR	
Brisbane Water		NR	NR	NR	EPDM	—	NR	NR	NR	NR
Dept. of Land & Water Conservation, NSW		NR/EPDM	NR/EPDM	NR	EPDM	—	NR	NR	NR	NR
Dept. of Natural Resources, QLD		NR	NR/EPDM	NR	EPDM	—	NR	NR	NR	NR
Dept. of Public Works & Services, NSW		NR/EPDM	NR/EPDM	NR	EPDM	—	NR	NR	NR	NR
Gold Coast Water		NR/EPDM	NR/EPDM	NR	EPDM	—	NR	NR	NR	—
Hunter Water Corporation *		NR/EPDM	NR/EPDM	NR	EPDM	—	NR	—	NR	
Melbourne Retail Water Companies	water	NR	NR/EPDM	NR	EPDM		—		—	
	sewer	CR	CR/EPDM	CR & SBR	EPDM		CR & SBR		CR	
	drainage	—	—	—	—		—		CR & NR	
Power & Water Authority, NT	water	NR/EPDM	NR/EPDM	NR/EPDM	—	—	—	—	—	
	sewer	SBR/EPDM	SBR/EPDM	SBR/EPDM	EPDM	*	EPDM/SBR/NBR	EPDM/SBR/NBR	SBR	
South Australian Water Corporation		NR/EPDM	NR/EPDM	NR/EPDM	EPDM	—	—	—	NR	—
Sydney Water Corporation		NR/EPDM	NR/EPDM	NR	EPDM	—	NR/CR/SBR	SBR/EPDM	NR	
Water Corporation, WA		NR/EPDM	NR/EPDM	NR/SBR	EPDM	NBR/EPDM	NR	NR	NR	

NR: Natural rubber

SBR: Styrene-butadiene rubber

CR: Polychloroprene

NBR: Nitrile-butadiene rubber

EPDM: Ethylene propylene-diene terpolymers

* Under Review

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Clauses A3.14 to A3.16 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 1646](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Clauses A3.14 to A3.16 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3, unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 1646](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 1646](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 1646](#).

A3.4 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

A3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

A3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

A3.9 PROCESS VERIFICATION TEST (PVT) A test performed by the manufacturer on materials, components, joints or assemblies at specific intervals to confirm that the process continues to be capable of producing components conforming to the requirements given in the relevant standard. (Note: Such tests are not required to release batches of components and are carried out as a measure of process control.)

A3.10 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.11 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.12 CAVITY A part of the mould which gives the form to the moulded product.

A3.13 NEW FORMULATION [under preparation]

A3.14 ELASTOMERIC COMPOUND PROPERTIES Test on laboratory prepared specimens the following:

AS 1646 CLAUSES	PROPERTY	INITIAL TYPE TEST	VERIFICATION TEST INTERVAL	
			CHANGE OF FORMULATION	FREQUENCY (MIN.)
2.1.3.1	Protective system	Yes	Yes	No
2.1.3.2	Filler	Yes	Yes	No
2.1.3.3	Polymer volume	Yes	Yes	No
2.1.4	Root inhibitor	Yes	Yes	No
2.1.5	Copper and manganese	Yes	Yes	No
3.2	Hardness	Yes	Yes	Annually
3.3	Tensile strength and elongation at break	Yes	Yes	Annually
3.4	Compression set	Yes	Yes	Annually
3.5	Low temperature compression set	Yes	Yes	Annually
3.6	Accelerated ageing	Yes	Yes	Annually
3.7	Water immersion	Yes	Yes	Annually
3.9	Ozone resistance	Yes	Yes	6 Monthly
3.10	Compression stress relaxation	Yes	Yes	No
3.11	Contamination of water	Yes	Yes	No
-	Revaluation of all type tests	-	-	5 Yearly

A3.15 IN-PROCESS INSPECTION AND TESTING Demonstrate control of mixing process, as documented in Quality Plans and Procedures, including:

- Hardness and rheometer trace tests, minimum one per batch;
- Pass/fail criteria, statistically set from on-going production batch records.

A3.16 FINAL PRODUCT INSPECTION AND TESTING

AS 1646 CLAUSES	PROPERTY	INITIAL TYPE TEST	VERIFICATION TEST INTERVAL	
			CHANGE OF FORMULATION	FREQUENCY (MIN.)
1.8	Markings	Yes	No	Daily
3.4	Compression set	Yes	Yes	Monthly
4.2	Seal hardness	Yes	Yes	Daily
4.3	Joins	Yes	Yes	Each seal
4.4	Imperfections	Yes	Yes	Each seal

Demonstrate control of each process used (e.g. compression and injection moulding, and extrusion/joining) including as a minimum:

- Test to above table using random representative samples from each batch;
- Daily monitor engineering controls for mould temperatures and cure time to specified control limits;
- Confirmatory compression set test, at a sampling frequency evaluated from process data records and batch size.

SECTION SP19 COUPLINGS MECHANICAL NON-RESTRAINED

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of mechanical pipe couplings and associated components for water and wastewater applications, of nominal sizes DN 80 to DN 600, unrestrained, except for PE pipe use.

1.2 STANDARDS

MANUFACTURE: To Appendix A.

1.3 STORAGE AND TRANSPORT

REQUIREMENT: Pack to prevent damage during handling, transport and storage.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix C.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 400-12.

STEEL: To [AS 1594](#) Grade 250.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 STAINLESS STEEL

REQUIREMENT: To Section TR30.

3.2 ELASTOMERIC SEALS

REQUIREMENT: To Section SP15.

3.3 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.4 BOLTING (FASTENERS)

REQUIREMENT: Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Permanently mark each coupling with the following:

- Traceability code.
- Size range capability
- Manufacturer details (may be incorporated in traceability code).

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1594](#) - Hot rolled steel flat products
- [AS 1831](#) - Iron castings – Spheroidal or nodular graphite cast iron
- [AS 3855](#) - Suitability of plumbing and water distribution products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation servicing.

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals.

Section SP30: Protective Coatings for Valves.

Section TR 30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the coupling supplier.

Elastomeric Seals: One set for each coupling.

Coupling Bolting: One set of bolts, nuts and washers for each coupling.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

COUPLINGS MECHANICAL NON-RESTRAINED: To Section SP19 and the following:

INFORMATION TO BE SUPPLIED (See Appendix B)	PROJECT REQUIREMENTS (* See Practices Table of Section SP19)
Coupling Size (s)	
Materials: - Sleeve - End rings - PE pipe end liner inserts - PE pipe end gripping rings - Elastomeric seals	- - - - -
Coupling bolting selection (materials and grades)	
Coatings	
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP19	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP19	If no Aust. Std., manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	COATING		BOLTING (FASTENERS)				COUPLING LENGTH		
	AGENCY	Thermal Bonded	Bitumen	SS 316	SS 304	Galvanised	Coated Steel*	Short	Long
ACTEW Corporation	●	–	●	●	●	–	–	–	●
Barwon Water	●	●	●	–	●	●	●	●	●
Brisbane Water	●	–	●	–	–	–	–	–	●
Dept of Land & Water Conservation, NSW	–	●	●	–	◆	–	–	–	●
Dept of Natural Resources, Qld	●	●	●	●	●	–	–	–	–
Dept of Public Works & Services, NSW	–	●	●	–	◆	–	–	–	●
Hunter Water Corporation	●	–	●	–	–	–	–	–	●
Gold Coast Water	●	–	●	–	–	–	–	–	●
Melbourne Retail Water Companies	●	**	●	–	●	–	–	***	●
Power & Water Authority, NT	●	**	●	●	–	–	–	***	●
South Australian Water Corporation	●	**	●	–	**	●	–	***	●
Sydney Water Corporation	●	–	●	●	◆	●	–	–	●
Water Corporation, WA	●	**	●	–	**	●	–	–	●

* Thermal bonded coated

◆ In wrapped applications

** Being phased out

*** Limited application

APPENDIX A

SECTION A1 SCOPE AND GENERAL

A1.1 SCOPE This Appendix specifies requirements for mechanical couplings for waterworks purposes that, except for use on PE pipe, are un-restrained. This specification is applicable to couplings rated to an allowable operating pressure of 1600 and 3500 kPa from sizes DN 80 to DN 600 with a maximum working temperature of 60 °C.

The couplings are intended for the jointing of all common pipes in potable water or wastewater applications, either above or below ground.

NOTE: These couplings are primarily intended for pipe repair applications and not as alternative to integral joint sockets or couplings that are commonly part of new project pipe supply requirements.

A1.2 REFERENCED DOCUMENTS The following documents are referred to in this Appendix:

AS/NZS 1111	-	ISO metric hexagon commercial bolts and screws
AS/NZS 1112	-	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
AS 1199	-	Sampling procedures and tables for inspection by attributes
AS 1214	-	Hot-dip galvanised coatings on threaded fasteners.
AS 1237	-	Flat metal washers for general engineering purposes (metric series)
AS 1275	-	Metric screw threads for fasteners
AS 1349	-	Burdon tube pressure and vacuum gauges
AS 1554	-	Structural steel welding
.1	-	Welding of steel structures
.6	-	Welding stainless steel for structural purposes
AS 1565	-	Copper and copper alloys – Ingots and castings
AS/NZS 1594	-	Hot rolled steel flat products
AS 1627.4	-	Abrasive blast cleaning
AS 1646	-	Elastomeric seals for waterworks purposes
AS/NZS 1830	-	Iron castings – Grey cast iron
AS/NZS 1831	-	Iron castings – Spheroidal or nodular graphite cast iron
AS 2205	-	Methods of destructive testing of welds in metal
.10	-	Methods for destructive testing of welds in metal
.10.1	-	Corrosion test for welded austenitic stainless steels
AS/NZS 2536	-	Surface texture
AS/NZS 3518	-	ABS pipes and fittings for pressure applications
.1	-	Pipes
AS/NZS 3750	-	Paint for steel structures
.4	-	Bitumen paint

AS 3855	-	Suitability of plumbing and water distribution systems products for contact with potable water
AS/NZS 4089	-	Priming paint for steel – Single component – General purpose
AS/NZS 4020	-	Products for use in contact with drinking water
AS/NZS 4129 (Int)	-	Fittings for polyethylene (PE) pipes for pressure applications
AS/NZS 4130	-	Polyethylene (PE) pipes for pressure applications
ASN/ZS 4158	-	Thermal bonded polymeric coatings on valves and fittings for water industry purposes
AS B202	-	General purpose acme screw threads
SAA HB18 .28	-	Guidelines for third-party certification and accreditation Guide 28 – General rules for model third-party certification system for products
ASTM A276	-	Standard specification for stainless and heat resisting steel bars and shapes
WS-SPEC		
Section SP30	-	Protective Coatings for Valves

A1.3 DEFINITIONS For the purpose of this Standard, the definitions below apply:

- A1.3.1 Mechanical coupling – unrestrained.** A coupling that enables pipe of the same or dissimilar diameters and or pipe materials to be jointed but which provides no axial restraint.
- A1.3.2 Mechanical coupling - restrained.** A coupling that enables pipe of similar or dissimilar diameters and or pipe materials to be jointed and which provides a degree of axial restraint.
- A1.3.3 Mechanical coupling - restrained flanged adapted.** A coupling that enables a pipe to be jointed to a flanged fitting but which provides no longitudinal restraint.
- A1.3.4 Mechanical coupling - restrained flanged adapter.** A coupling that enables a pipe to be jointed to a flanged fitting and which provides a degree of longitudinal joint restraint.
- A1.3.5 Allowable operating pressure** The allowable internal pressure, excluding surge, that a component can safely withstand in service.
- A1.3.6 Allowable maximum operating pressure** Maximum internal pressure, including surge, that a component can safely withstand in service.
- A1.3.7 Allowable test pressure** The maximum internal hydrostatic pressure which can be applied on site to a component in a newly installed pipeline.
- A1.3.8 Coating** A corrosion-inhibiting medium applied to the surface of a coupling component.
- A1.3.9 Coating defect** A detectable weakness or discontinuity in a coating which renders suspect its ability to protect coupling component substrates from corrosion during normal coupling service life.
- A1.3.10 Design draw** the cumulative longitudinal movement of pipe in the axial direction as a result of thermal contraction of a 6m pipe length over 50°C and as a result of withdrawal by the nominal pipe gap and angular joint deflection as nominated in Table A3, when measured relative to a coupling.

A1.3.11 Sealing length The effective distance between the two elastomeric seals of a coupling or, in the case of a flanged adapter, the distance between the elastomeric seal and the flange face when the coupling or adapter is in the assembled condition with the bolts uniformly tightened to finger tightness.

A1.4 SIZE DESIGNATION Coupling size shall be designated by the nominal sizes as follows: DN 80, DN 100, DN 150, DN 200, DN 225, DN 250, DN 300, DN 375, DN 450, DN 525, DN 500, and DN 600. Other sizes may be manufactured by agreement between Supplier and Purchaser.

A1.5 PRESSURE RATING The allowable pressure ratings for the couplings are shown in Table A1.

**TABLE A1
PRESSURE RATINGS**

Allowable operating pressure kPa	Allowable maximum operating pressure kPa	Allowable test pressure kPa
1600	1900	2400
3500	4200	4700

**TABLE A2
STANDARD MATERIALS**

1	2	3	4	5	6	7
Component	Basic Material			Alternative Material		
	Material	Standard	Grade	Material	Standard	Grade
Sleeve	Spheroidal graphite iron	AS 1831	400-12 *	Steel**	AS/NZS 1594	250
				ABS	AS 3518.1	PN 16
				Stainless steel***	ASTM A276	316
End rings	Spheroidal graphite iron	AS 1831	400-12 *	Gunmetal	AS 1565	C83600
				Stainless steel***	ASTM A276	316
Liner inserts	Steel**	AS/NZS 1594	250	Acetal copolymer		
Gripping rings	Acetal copolymer			Stainless steel	ASTM A276	316
Elastomeric seals	EPDM	AS 1646		Nitrile	AS 1646	
Bolts Nuts and Washers	Stainless steel	ASTM A276	316	Stainless steel	ASTM A276	304
				Steel, thermo-plastic coated	AS/NZS 4158	
				Hot dipped galvanised	AS 1214	
				Gunmetal	AS 1565	C83600

* Higher strength grades to AS 1831 accepted.

** Welding to AS/NZS 1554 Part 1 category SP

*** Welding to AS/NZS 1554 Part 6 weld quality 2B, surface finish Grade II(a) and AS 2205.10.1

SECTION A2 MATERIAL AND COMPONENTS

A2.1 MATERIALS Coupling components shall be manufactured from materials complying with the minimum requirements of Table A2. Materials listed as basic under Columns 2, 3 and 4 are Standard materials.

Alternative materials may be considered provided that the performance and expected life of the couplings in service are equal to those of Standard materials and the materials are acceptable to the Purchaser. Some alternative material options are shown in Columns 5, 6 and 7.

- A2.2** **CONTAMINATION OF WATER** Components in contact with potable water shall comply with [AS 3855](#) or [AS/NZS 4020](#).

SECTION A3 DESIGN, MANUFACTURE AND OPERATIONAL LIMITATIONS

- A3.1** **DESIGN** Couplings shall be designed for installation on all common pipe materials of similar or dissimilar outside diameters. They shall be designed for service at the allowable maximum operating pressures and shall, with the exception of couplings for PE pipe, not require any provision for axial joint restraint but shall be designed to accommodate angular joint deflection within the coupling.

NOTE : The design criteria for couplings and fasteners should be based on a minimum service life expectancy of 50 years in a buried soil environment.

- A3.2** **DIMENSIONS** The minimum effective sealing lengths shall be as given in Table A3.

- A3.3** **JOINT DEFLECTION** Nominal joint deflections shall be as given in Table A3.

A3.4 COMPONENT JOINTING

- A3.4.1** **Connections** Surfaces forming connections between elastomeric seals shall provide a watertight joint. The joint shall be designed to withstand the test pressure given in Table A4.

A3.5 FASTENERS

Bolts, nuts and washers shall conform to the dimensional and other requirements of [AS/NZS 1111](#), [AS/NZS 1112](#) and [AS 1237](#) respectively and shall be designed to carry imposed torque tension loads without the use of applied lubricants. Bolt head contact with coupling end rings shall have a captive configuration that enables fastener tightening by means of a single spanner operation.

A3.6 OPERATIONAL PERFORMANCE

- A3.6.1** **General** Couplings shall be designed to fit over the ends of the pipes and shall provide a leak tight seal on the nominated pipe materials, surfaces and diameters, when installed. Typical coupling arrangements are shown below. Dimensional requirements for couplings are set out in Table A3.

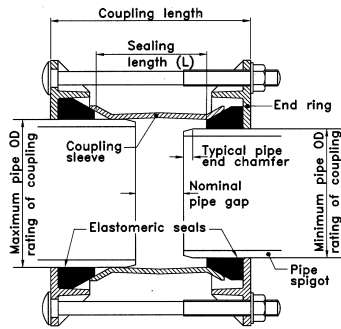


FIGURE A1: Typical unrestrained coupling for variable pipe types and diameters

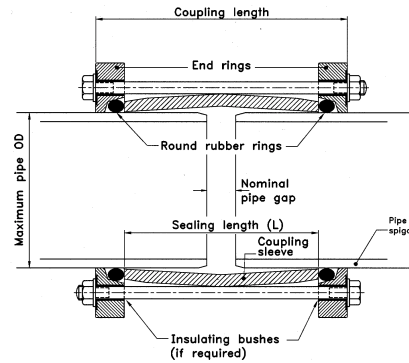


FIGURE A2: Typical traditional unrestrained gibault coupling

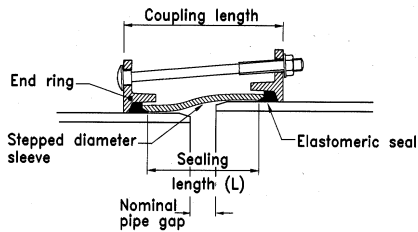


FIGURE A3: Typical unrestrained coupling for large pipe diameter variations

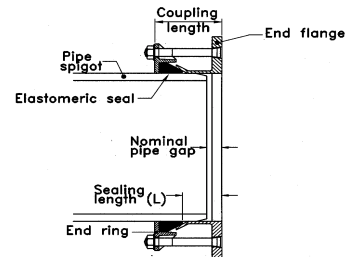


FIGURE A4: Typical unrestrained socket to flange adaptor

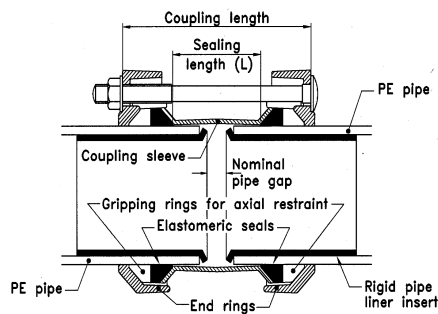


FIGURE A5:
Typical restrained coupling for PE pipe only

**TABLE A3
DIMENSIONAL REQUIREMENTS FOR MECHANICAL COUPLINGS**

Nominal size of coupling (DN)	Minimum Sealing Length in mm (L) (tolerance -2mm)			Nominal Joint Deflection in degrees	Nominal Pipe Gap in mm
	Coupling Short Series (1)	Coupling Long Series	Flanged Adaptor		
80	70	85	55	5 ^o	10
100	70	100	65	5 ^o	10
150	80	115	75	5 ^o	12
200	90	135	85	5 ^o	12
225	100	150	90	5 ^o	15
250	110	160	100	5 ^o	15
300	125	175	110	5 ^o	15
375	135	175	110	3 ^o	15
450	140	200	120	3 ^o	15
525	150	200	130	3 ^o	20
600	150	200	135	2 ^o	25

Other sizes may be manufactured by agreement between Supplier and Purchaser.

NOTES:

- (1) Long series couplings are preferred for use in conjunction with PVC pipe
- (2) Figures A1 and A2 are typical of couplings intended to join pipe of the same nominal size rating. The different features of a stepped coupling intended to join pipes that vary substantially in diameter are illustrated in Figure A3.
- (3) Minimum sealing lengths in Table A3 have been calculated for the design draw together with a combination of pipe end chamfering, field installation tolerance requirements for off-square pipe cutting and with nominal joint deflections and pipe gaps as stated in Table A3. Couplings with higher nominated joint deflections may need greater sealing lengths.
- (4) The joint configuration in Figure A5 is the preferred type for use with PE pipe. Minimum sealing lengths and joint deflections are not applicable to these joints.

SECTION A4 COATINGS

A4.1 Polymeric coatings Unless otherwise specified, the internal and external surfaces of ferrous coupling components shall be coated with a thermal –bonded polymeric coating in accordance with [AS/NZS 4158](#). The surface preparation shall be a minimum of a Class 3 grit blast to [AS 1627 Part 4](#).

A4.2 Bitumen or synthetic resin base coatings. Where specified, internal and external surfaces of ferrous components shall be coated with either bitumen coatings complying with the requirements of [AS/NZS 3750.4](#) or synthetic resin base coatings complying with the requirements of [AS 4089](#). The resistance to weathering and salt droplet tests of [AS/NZS 3750.4](#) and [AS 4089](#) shall not apply.

NOTE: Bitumen or synthetic resin based coatings are not recommended for couplings which require the sleeve to slip on the elastomeric seal to accommodate variations in pipe diameters. The traditional bitumen coating is not recommended for a long (> 10 years) service life expectancy in low resistivity soil environments without additional corrosion protection.

A4.3 DESIGN Coupling design shall be such that the corrosion protection system specified for internal component surfaces shall be effective for the nominated coupling service life. The structural materials of all components, whose surfaces cannot practicably be coated and tested, shall be corrosion resistant.

NOTE: Other surface protection systems may be applied by agreement between Supplier and Purchaser.

SECTION A5 TESTING**A5.1 PRODUCTION (BATCH RELEASE) TESTS**

A5.1.1 Materials. Materials used for the manufacture of components shall meet the mechanical and/or chemical requirements of those specified in Table A2.

A5.1.2 Finish. Components shall be manufactured to comply with specified dimensions and performance requirements.

A5.1.3 Defects. Minor surface defects in cast components may be rectified by fettling provided that the specified dimensions and performance requirements are attained. Small surface imperfections, inseparable from the method of manufacture and which are not detrimental to the functional quality of the castings shall be accepted, provided they do not prevent compliance with any other requirement of this Standard. Cracks and tears in the metal shall not be repaired.

A5.2 TYPE TESTS. Type tests shall be carried out in accordance with Clauses A5.2.1 to A5.2.5 for each nominal size, class and pipe material combination.

A5.2.1 General. Each coupling shall be tested in at least two joint alignment conditions including a baseline alignment condition without draw or angular joint deflection and the design draw condition. Where a manufacturer has nominated a higher angular joint deflection rating than nominated in Table A3, the alignment shall be at that higher joint deflection for test purposes. Bolting torque shall be at the minimum value recommended by the manufacturer. Joint testing shall be carried out at both minimum and maximum nominated pipe diameters, using combinations of pipe materials nominated as suitable by the manufacturer. Where couplings are rated for dissimilar sized pipes and pipe materials, testing shall be carried out with a combination of maximum and minimum diameter pipe rating for each pipe material.

**TABLE A4
HYDROSTATIC TEST PRESSURES**

Allowable operating Pressure, kPa	Test pressure, kPa	
	Coupling test	Minimum Test Duration min
1600	2400	120
3500	4700	120

A5.2.2 Joint hydrostatic pressure test. A joint hydrostatic pressure test shall be carried out on a joint assembly comprising one coupling and two pipe sections, each at least 0.25 metres long. The test apparatus shall be capable of providing suitable end and lateral restraints whether the joint is in the drawn and or deflected alignment. Test equipment shall include a pressure gauge complying with [AS 1349](#). The test shall be carried out at a temperature between 15 °C and 25 °C.

The joint assembly to be tested shall be filled with water and all air shall be vented. The pressure shall be raised steadily until it reaches the test pressure nominated in Table A4. The test pressure shall be maintained within $\pm 1\%$ for a minimum of 2 hours and shall be monitored every 15 minutes. The joint assembly shall exhibit no visible leakage.

A5.2.3 Joint infiltration test. Using the test assembly nominated in Clause A5.2.2 and with both pipe sections axially restrained to prevent movement towards each other, the test shall be carried out at temperatures between 15 °C and 25 °C. The assembly shall be evacuated to a negative pressure of minus 80 ± 5 kPa. The joint assembly shall then be isolated and a vacuum shall be maintained within the assembly which shall not change by more than 10% after a minimum of 2 hours.

A5.2.4 Joint hydrostatic test for couplings designed for use on polyethylene pipe. Using a test assembly as nominated in Clause A5.2.2 and using polyethylene pipe conforming to [AS/NZS 4130](#), the assembly shall be pressurised to 1.5 x PN (where PN is the nominal pressure rating of the polyethylene pipe) for a minimum period of 1000 hours. The test shall be carried out at a temperature of 20 ± 2 °C. The pressurisation equipment shall be capable of applying the required pressure and maintaining it constant to within +2 –1 % for the duration of the test.

During the test period the joints, coupling or pipes shall not leak or develop fractures, cracking or other failures within the joint assembly or in the pipe within a distance of DN from either joint seal, where DN corresponds to the nominal size of the pipe used in the assembly.

At the completion of the 1000-hour test, the joint assembly shall be tested to Clause A.5.2.3 without dismantling the assembly. The vacuum shall not change after a minimum of 2 hours by more than 10% of its initial value at test commencement.

A5.2.5 Joint pull-out test for couplings designed for use on polyethylene pipe Using polyethylene pipe conforming to [AS/NZS 4130](#), the pull-out strength of both ends of each coupling shall be tested in accordance with Clause 2.4.5 of [AS/NZS 4129](#).

A5.2.6 Type test certificate The type test certificate shall contain a statement confirming that the couplings have been tested in accordance with this Standard, and shall nominate full details of each test.

A5.3 COATING TESTS

A5.3.1 Polymeric coatings Thermal bonded polymeric coatings shall be tested in accordance with [AS/NZS 4158](#). Coating defects found during testing may be repaired, where allowable in accordance with Clause 3.5 of [AS/NZS 4158](#), or shall otherwise be rejected.

SECTION A6 MARKING AND PACKING

A6.1 BODY MARKINGS Each coupling shall be legibly and durably marked or cast with the following information:

- (a) Manufacturer's name or registered trademark.
- (b) Nominal size and pressure rating
- (c) Pipe types for which coupling is designed
- (d) Year of manufacture
- (e) Allowable operating pressure
- (f) Maximum angle of deflection

A6.2 PACKAGING Couplings shall be suitably packed to prevent damage to coatings or fasteners prior to receipt by the Purchaser.

A6.3 INSTALLATION INSTRUCTIONS Printed installation instructions shall be included with each coupling when supplied.

APPENDIX B

PURCHASING GUIDELINES

(Informative)

- B1 GENERAL** Joint Australian/New Zealand Standards are intended to include the technical provisions necessary for the supply of a product referred to in a particular Standard, but do not purport to contain all the necessary provisions of a contract. In a number of cases, the purchaser either is asked to state the requirements or is given a choice of optional requirements, and these are contractual matters to be agreed between the purchaser and the manufacturer.

This Appendix contains detailed explanation, advice and recommendations on the information to be supplied by the purchaser at the time of the enquiry or order. Its aims are to prevent misunderstanding and to result in satisfactory supply of products and service.

- B2 INFORMATION TO BE SUPPLIED BY THE PURCHASER** The following information should be supplied by the purchaser:

- (a) Nominal size of coupling and types of pipes which will be joined by the coupling.
- (b) Nominal length (short or long)
- (c) Operating pressure if this is more than the allowable operating pressure.
- (d) Type of materials that are required including type of coating.
- (e) Whether additional tests are required
- (f) Whether a production test certificate is required
- (g) Whether a type test certificate is required
- (h) Whether additional information or marking is required
- (i) Packing requirement for extended outdoor storage.

- B3 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER.** At the time of tendering, the coupling manufacturer should state the following:

- (a) The relevant standard and grade of materials to be used in the manufacture of each coupling component, if other than basic materials are used (see Table A2)
- (b) Protective coating material and performance specifications.

APPENDIX C

COMPLIANCE REQUIREMENTS

C1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

C2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause D4 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

C3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

C3.1 GENERAL Tables C1 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP19.

C3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Tables C1, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with Section SP19 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to Section SP19 shall be suspended until the cause of the failure has been identified and corrected.

C3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with Section SP19.

C3.4 COUPLING BATCH Schedule of couplings of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The coupling batch is defined by the coupling manufacturer.

C3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

C3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

C3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

C3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

C3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

C3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

C3.11 NEW FORMULATION [under preparation]

**TABLE C1
COUPLINGS TO SECTION SP19**

Characteristic	Clause	Requirement	Test Method	Frequency
Type Test				
Material properties	A2.2	Contamination of water	AS 3855 or AS/NZS 4020	At any new material formulation or design or every 5 years whichever occurs first
Performance	A5.2	Performance tests	A5.2.1 to A5.2.4	
Batch Release Tests				
Dimensions	A3.2	Effective length	Tape	One coupling per production batch
Material properties	A2.1	Conformance or test certificates	Relevant material Standard	Per material batch
Performance	A5.1.2	Finish	Visual	Each component
Coatings	A4.1	Surface preparation	AS 1627.4	Each component
	A4.1	Adhesion] AS/NZS 4158 Clause 3.4 and Section SP30	Each production shift
	A4.1	Continuity		Each sleeve
	A4.1	Thickness		Each component
A4.1	Cure	Each component		

SECTION SP20 SLUICE VALVES METAL SEATED

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of solid wedge, metal seated sluice valves, and associated components for water supply and sewerage applications of nominal sizes DN 80 to DN 750.

1.2 STANDARDS

MANUFACTURE: To [AS 2638.1](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A, [AS 2638.1](#).

Failures: Reject, do not repair.

TESTING: In [AS 2638.1](#), Table 5.1, adopt body test pressures of 2100, 2400, 3150 and 5250 respectively to replace listed values of 3500, 4000, 5250 and 8750.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grade T220.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D, and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Additional to [AS 2638.1](#), permanently mark each sluice valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 2638.1](#) - Sluice valves for waterworks purposes, Metal seated
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes

AS/NZS
ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing

AS/NZS
ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals.

Section SP30: Protective Coatings for Valves.

Section TR30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

SLUICE VALVES METAL SEATED: To Section SP20 and the following:

INFORMATION TO BE SUPPLIED (See AS 2638.1)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP20 & SP30)
Valve size(s), class(es) and flange class(es)	
Materials: - Body and bonnet - Seal retainer - Wedge core - Seating rings - Stem - Gear box housing	- - - - - -
Closure direction	*
Flanged joint bolting selection (fasteners)	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP20	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP20	If no Aust. Std., manufacturer to supply

WS-SPEC

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	APPLICATIONS (<i>CLOSURE DIRECTION</i>)		RETICULATION MIN. CLASS	VALVE BODY MATERIAL
	AGENCY	WATER SUPPLY		
ACTEW Corporation	● (AC)	● (CC)	14	DI/CI
Barwon Water	● (AC)	● (AC)	–	DI
Brisbane Water	● (AC)	● (AC)	**	DI/CI
Dept of Land & Water Conservation, NSW	> DN 300 (CC)	> DN 300 (AC)	14	DI/CI
Dept of Natural Resources, Qld	● (AC)	● (AC)	14	–
Dept of Public Works & Services, NSW	● (AC) (trunkmains)	● (CC) (rising mains)	14	DI/CI
Gold Coast Water	● (AC)	● (AC)	14	–
Hunter Water Corporation	≥ DN 600 (CC)	≥ DN600 (CC)		DI/CI
Melbourne Retail Water Companies	● (AC)	● (CC)	14	DI
Power & Water Authority, NT	● (CC)	● (CC)	16	DI
South Australian Water Corporation	≥ DN 600 (CC) ***	–	14 **	DI/CI
Sydney Water Corporation	● (AC)	● (AC)	14	DI
Water Corporation, WA	● (AC)	● (AC)	14	DI/CI

CC Clockwise closure
AC Anti-clockwise closure

* For treatment works and pumping stations (CC)
** Class 14 for ≤ DN 600 and Class 12 for > DN 600
*** Classes 21 and 35, all sizes

SECTION SP21 SLUICE VALVES RESILIENT SEATED**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of solid wedge, resilient seated sluice valves, and associated components for water supply and sewerage applications, of nominal sizes DN 100 to DN 750.

1.2 STANDARDS

MANUFACTURE: To [AS 2638.2](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A, [AS 2638.2](#) and Appendix A.

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

TYPE TESTS: Replace Clause 5.2.11(a) and (b), [AS 2638.2](#), with the following:

- (a) Install the second valve in rigid piping connected to a single pressure source providing a static head of 800 ± 20 kPa at the closed valve and *an average a-flow* velocity of 1.0 ± 0.1 m/s, or a *minimum flow rate of 100 l/s*, through the fully open test valve, against a downstream head of 100 ± 20 kPa. The setting of the valves controlling the flow rate shall remain unchanged throughout the test.
- (b) Fully open and close each valve to a *drop tight seal within the functional test torque* for the number of cycles given in Table 5.4.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D, and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Additional to [AS 2638.2](#), permanently mark each sluice valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 2638.2](#) - Sluice valves for waterworks purposes, Resilient seated
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products in use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes

AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing

AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals.

Section SP30: Protective Coatings for Valves.

Section TR30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

SLUICE VALVES RESILIENT SEATED: To Section SP21 and the following:

INFORMATION TO BE SUPPLIED (See AS 2638.2)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP21 & SP30)
Valve size(s), class(es) and flange class(es)	
Materials:	
- Body and bonnet	-
- Seal retainer	-
- Wedge core (and encapsulation)	-
- Stem	-
- Gear box housing	-
Closure direction	*
Flanged joint bolting selection (fasteners)	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP21	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP21	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PRACTICE (●)	APPLICATIONS (<i>CLOSURE DIRECTION</i>)	
	AGENCY	WATER SUPPLY
ACTEW Corporation	● (AC)	● (CC)
Barwon Water	● (AC)	● (AC)
Brisbane Water	● (AC)	● (AC)
Dept of Land & Water Conservation, NSW	≤ DN 300 (CC)	≤ DN 300 (AC)
Dept of Natural Resources, Qld	● (AC)	● (AC)
Dept of Public Works & Services, NSW	≤ DN 300 (AC) (trunkmains) *	≤ DN 300 (CC) (rising mains) *
Gold Coast Water	● (AC)	● (AC)
Hunter Water Corporation	● (CC)	● (CC)
Melbourne Retail Water Companies	● (AC)	● (CC)
Power & Water Authority, NT	≤ DN 300 (CC)	≤ DN 300 (CC)
South Australian Water Corporation	● (CC)	● (CC)
Sydney Water Corporation	≤ DN 300 (AC)	≤ DN 300 (AC)
Water Corporation, WA	● (AC)	● (AC)

CC Clockwise closure
AC Anti-clockwise closure

* For treatment works and pumping stations (CC)

SECTION SP22 BALL VALVES

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of metal bodied and plastic bodied ball valves, and associated components, for property service connections, of nominal sizes DN 15 to DN 50.

1.2 STANDARDS

MANUFACTURE: To [DR 99295 CP](#) [or AS 4593 when available].

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: Pack to prevent damage during handling, transport and storage. Flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 O-RINGS

REQUIREMENT: To [AS/NZS 3718](#) or [AS 1646](#).

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 PLASTICS

MATERIAL: To [AS/NZS 3718](#).

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: [To be determined].

4.2 MARKING

REQUIREMENT: Additional to [AS 2638](#), permanently mark each sluice valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 1646](#) - Elastomeric seals for waterworks purposes
- [AS 3496](#) - Authorization requirements for plumbing products - Metal-bodied and plastic bodied taps
- [AS/NZS 3718](#) - Water supply - Metal-bodied taps - Specified by performance
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products in use in contact with drinking water
- [AS 4593](#) - Water supply – Metal bodied and plastic bodied ball valves for property service connection (presently available in draft as [DR 99295 CP](#))
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation servicing

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

O-rings: One set for each valve.

Lubricant: For all O-rings.

5.3 PURCHASING SCHEDULE

[Note: Select from or add to the following and insert in project specifications.]

BALL VALVES: To Section SP22 and the following:

INFORMATION TO BE SUPPLIED (See DR 99295 CP or AS 4593)	PROJECT REQUIREMENTS (* See Practices Table of Section SP22)
Valve size(s)	
Application: above or below ground	
Materials: - Body - Ball - Stem - Level handle - Protection cover	- - - - -
Closure direction	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP22	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP22	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PRACTICE (●)	CLOSURE
AGENCY	DIRECTION
ACTEW Corporation	● (AC)
Barwon Water	● (AC)
Brisbane Water	● (AC)
Dept of Land & Water Conservation, NSW	● (CC)
Dept of Natural Resources, Qld	—
Dept of Public Works & Services, NSW	● (CC)
Gold Coast Water	● (CC)
Hunter Water Corporation	● (CC)
Melbourne Retail Water Companies	● (AC)
Power & Water Authority, NT	● (CC)
South Australian Water Corporation	● (CC)
Sydney Water Corporation	● (CC)
Water Corporation, WA	● (CC)

CC Clockwise closure
 AC Anti-clockwise closure

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

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

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

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to AS 4593.

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with AS 4593 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to AS 4593 shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with AS 4593.

A3.4 VALVE BATCH Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The valve batch is defined by the valve manufacturer.

A3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

A3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

A3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.11 NEW FORMULATION [under preparation]

**TABLE A1
VALVES TO AS 4593 ****

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	2.4	Effect on water	AS 3855 or AS/NZS 4020	At change in formulation or material composition or every 5 years
Performance	4.2	Bending moment	Appendix B	Each valve size, at 3 year intervals, or after any change in design, materials, suppliers or place of manufacture
	4.4	Water tightness	Appendix C	
	4.5	Strength (metal)	Appendix D	
	4.6	Strength (plastic)	Appendix E	
	4.7	Torque (connection)	Appendix F	
	4.8	Torque (operation)	Appendix G	
Batch release tests				
Dimensions	3.6		-	*
	4.3	Flow capability	-	*
Freedom from defects	-	Structural and surface defects	Visual	*
Material properties	2.1	Components	AS 3496	*
	2.5	Elastomers	AS/NZS 3718 or AS 1646	*

* To be determined

** DR 99295 CP until AS 4593 available

SECTION SP23 KNIFE GATE VALVES**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of wafer/lugged, rising/non-rising stem, uni/bi-directional knife gate valves, and associated components for waterworks applications, of nominal sizes DN 50 to 600.

1.2 STANDARDS

MANUFACTURE: To Appendix A.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. The flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix C.

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grade T220.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Additional to Appendix A, permanently mark each knife gate valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

Section TR30: Stainless Steel

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers, or selected alternatives, for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

KNIFE GATE VALVES: To Section SP23 and the following:

INFORMATION TO BE SUPPLIED (See Appendix B)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP23 & SP30)
Valve size(s), class(es) and flange class(es)	
Materials:	
- Body	-
- Gland	-
- Wedge facing rings	-
- Wedge	-
- Body seating rings	-
- Stem	-
- Gear box housing	-
Closure direction	*
Flanged joint bolting selection (fasteners)	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP23	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP23	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	APPLICATIONS (<i>CLOSURE DIRECTION</i>)	
	WATER SUPPLY	SEWERAGE
ACTEW Corporation	–	● (CC)
Barwon Water	● (AC)	● (AC)
Brisbane Water	● (AC)	● (AC)
Dept of Land & Water Conservation, NSW	≤ DN 300 (CC)	≤ DN 300 (AC)
Dept of Natural Resources, Qld	● (AC)	● (AC)
Dept of Public Works & Services, NSW	● (CC)	● (CC)
Hunter Water Corporation	● (CC)	● (CC)
Melbourne Retail Water Companies	Below ground (AC) Above ground (CC)	Treatment plants (AC) Pump stations (CC)
Power & Water Authority, NT	● (CC)	● (CC)
South Australian Water Corporation	● (CC) *	● (CC)
Sydney Water Corporation	● (AC)	● (AC)
Water Corporation, WA	● (AC)	● (AC)

CC Clockwise closure
AC Anti-clockwise closure

Note: Normally only used in treatment works
* Low head applications only, not common

APPENDIX A

SECTION A1 SCOPE AND GENERAL

A1.1 SCOPE This Appendix specifies requirements for wafer and lugged, rising and non-rising stem, uni-directional and bi-directional knife-gate valves for waterworks purposes. This specification is applicable to valves rated at 1000 kPa from sizes DN 50 to DN 600 with a maximum working temperature of 60 °C.

The valves are usually operated by manual handwheel, in raw sewerage applications, either above ground, or submerged with an extended spindle.

A1.2 REFERENCED DOCUMENTS The following documents are referred to in this Appendix:

- AS/NZS 1111 - ISO metric hexagon commercial bolts and screws
- AS/NZS 1112 - ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS 1237 - Flat metal washers for general engineering purposes (metric series)
- AS 1275 - Metric screw threads for fasteners
- AS 1399 - Guide to AS 1199 – Sampling procedures and tables for inspection by attributes
- AS 1565 - Copper and copper alloys – Ingots and castings
- AS 1627 - Metal finishing - Preparation and pretreatment of surfaces
- .4 - Abrasive blast cleaning
- AS/NZS 1830 - Iron castings – Grey cast iron
- AS/NZS 1831 - Iron castings – Spheroidal or nodular graphite cast iron
- AS 1939 - Degrees of protection provided by enclosures for electrical equipment (IP Code) (IEC 529:1989)
- AS 2345 - Dezincification resistance of copper alloys
- AS/NZS 2536 - Surface texture
- AS 2837 - Wrought alloy steels – Stainless steel bars and semi finished products
- AS 2938 - Gears – Spur and helical – Guide to specification and rating
- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
- AS 4087 - Metallic flanges for waterworks purposes
- AS/NZS 4020 - Products for use in contact with drinking water
- AS/NZS 4158 - Thermal bonded polymeric coatings on valves and fittings for water industry purposes
- AS B202 - General purpose acme screw threads
- SAA HB18 - Guidelines for third-party certification and accreditation
- .28 - Guide 28-General rules for model third-party certification system for products
- ASTM A276 - Standard specification for stainless and heat-resisting steel bars and shapes

- A1.3 DEFINITIONS** For the purpose of this Appendix, the definitions below apply:
- A1.3.1 Knife-gate valve** A valve that provides on/off control by means of a thin, parallel sliding gate and guide.
- A1.3.2 Allowable operating pressure** The allowable internal pressure, excluding surge, that a component can safely withstand in service.
- A1.3.3 Allowable maximum operating pressure** The allowable internal pressure, including surge, that a component can safely withstand in service.
- A1.3.4 Allowable test pressure** The maximum internal hydrostatic pressure which can be applied on site to a component in a newly installed pipeline.
- A1.3.5 Bulk head test** A test where the testing machine provides external restraint to make a water tight joint at each end of the valve.
- A1.3.6 Coating** A corrosion-inhibiting medium applied to the surface of a valve.
- A1.3.7 Coating defect** A detectable weakness or discontinuity in a coating which deems it to be suspect in its ability to protect the substrate from corrosion during its normal service life.
- A1.3.8 Face to face dimensions** The distance between the valve mating faces measured along the valve axis.
- A1.3.9 Free end test** A test where the valve ends are blanked off so that the axial hydraulic force is not externally restrained.
- A1.4 VALVE TYPE** Valves shall be of the wafer type for installation between flanges, or the lugged type for installation at a termination point, for use in either the horizontal or vertical position.
- A1.5 DESIGNATION OF SIZE** Valve size shall be designated by the nominal size as follows: DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250, DN 300, DN 400, DN 450, DN 500, and DN 600.
- A1.6 PRESSURE RATING** The allowable pressure ratings for the valves are shown in Table A1.1

**TABLE A1.1
PRESSURE RATINGS**

Allowable operating pressure kPa	Allowable maximum operating pressure * kPa	Allowable test pressure kPa
1000	1200	1500

* Seat leakage may occur at allowable maximum operating pressures; however, structural damage shall not be allowed.

SECTION A2 MATERIAL AND COMPONENTS

A2.1 MATERIALS Valve components shall be manufactured from materials complying with the minimum requirements of Table A2.1. Materials listed as basic under Columns 2, 3 and 4 are standard materials.

Alternative materials to those specified in Table A2.1 may be considered providing the performance and expected life of the valves are equivalent and the materials are approved by the Purchaser. Materials of alternative quality may be selected from Columns 5, 6 and 7.

Non-metallic bodies are not acceptable for use in this specification. Non-metallic materials shall exhibit dimensional stability after extended immersion in water.

- A2.2 DEZINCIFICATION-RESISTANT MATERIALS** Copper alloy valve components shall be dezincification resistant and shall comply with [AS 2345](#).
- A2.3 CONTAMINATION OF WATER** Components in contact with potable water shall comply with [AS 3855](#) or [AS/NZS 4020](#).
- A2.4 O-RINGS (ELASTOMERIC TOROIDAL SEALING RINGS)** O-rings shall be made of material that is not injuriously affected by the fluid, temperature or environmental conditions to which the O-ring will be subjected to in service.

**TABLE A2.1
STANDARD MATERIALS**

1	2	3	4	5	6	7
Component	Basic Material			Alternative Material		
	Material	Standard	Grade	Material	Standard	Grade
Wafer body and Gland box	Grey cast iron	AS/NZS 1830	T220	Spheroidal graphite cast iron	AS/NZS 1831	400-12 *
Lugged body	Spheroidal graphite cast iron	AS/NZS 1831	400-12 *	Stainless steel	ASTM A276	316
Gate	Stainless steel	ASTM A276	304	Stainless steel	ASTM A276	316
Gate guide	Stainless steel	ASTM A276	431	Stainless steel	ASTM A276	431
Seat	Viton™ Fluorel™			Reinforced PTFE		
Spindle	Stainless steel	ASTM A276	303	Stainless steel	ASTM A276	316
Gland packing	PTFE					
Bridge	Grey cast iron	AS/NZS 1830	T220	Spheroidal graphite cast iron	AS/NZS 1831	400-12 *
Pillar	Stainless steel	ASTM A276	304	Stainless steel	ASTM A276	316
Nut	Gunmetal	AS 1565	C83600			
Thrust washer	Nylon™					
Fasteners	Stainless steel	ASTM A276	316	Stainless steel	ASTM A276	316
Washers	Stainless steel	ASTM A276	304	Stainless steel	ASTM A276	316

* Higher strength grades to [AS 1831](#) accepted.

™ Trade mark

SECTION A3 DESIGN, MANUFACTURE, OPERATION AND INSTALLATION LIMITATIONS

- A3.1 DESIGN** Valves shall be designed for installation with the stem in the horizontal or vertical position unless otherwise specified. They shall be suitable for operation under full unbalanced allowable

operating pressures. Valves may be of the rising or non-rising spindle type as specifically requested by the Purchaser.

Valves shall be designed to withstand all torques and pressure conditions specified in this Appendix.

The design criteria of the valve and fasteners should be based on a minimum life expectancy of 50 years.

A3.2 END CONNECTIONS

A3.2.1 General Valves shall be supplied in either wafer style or lugged suitable for connection to flanges with dimensions in accordance with [AS 4087](#) Figure B2. Body and lug tapped holes shall be metric threads in accordance with [AS 1275](#).

A3.3 DIMENSIONS General valve dimensions shall be as given in Figure A3.1.

A3.4 GATE

A3.4.1 Gate The surface roughness of the gate in contact with the gland and resilient seal shall not exceed 3.2 μm Ra when measured in accordance with [AS 2536](#).

The gate leading edge shall be bevelled to provide a cutting edge during closing.

A3.4.2 Gate guides A guide system shall be provided on valves of all sizes to ensure alignment of the gate and to carry the loads imposed for all positions of the gate.

A3.4.3 Gate travel Gate travel shall be sufficient to ensure that the gate can be raised clear of the internal diameter of the valve. When the gate is in the closed position there shall be full engagement of the of the spindle nut.

A3.4.4 Gate gland sealing Sealing between the valve body and gate shall be by an adjustable packed gland. The gland box shall be of the self-aligning type.

A3.5 COMPONENT JOINTING

A3.5.3 Connections Surfaces forming connections between components shall provide a watertight joint. The joint shall be designed to withstand the body test pressure given in Table A5.1.

A3.6 VALVE SEATS

A3.6.3 Waterway The waterway shall be circular and of a diameter of not less than the nominal diameter of the valve.

A3.7 STEM

A3.7.1 Stem strength The stem shall be designed to withstand the minimum strength test torque specified in Table 5.3, without distortion.

A3.7.2 Stem thread The stem shall be screwed with an acme thread in accordance with [AS B202](#) Class 2G, or equivalent. The diameter and lead of the screw shall be designed to ensure that the valve shall remain in any position under static and dynamic operating conditions.

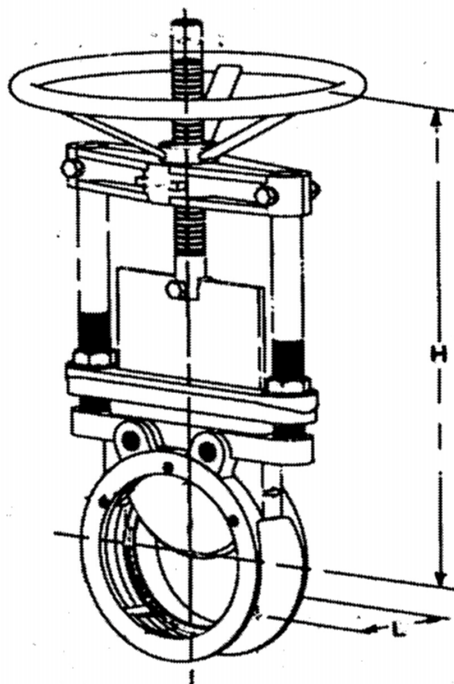
A3.8 LIFTING DEVICES Valves exceeding 25 kg shall be provided with a means for lifting either on the valve or actuator.

A3.9 FASTENERS Fasteners shall conform with [AS 1275](#).

Bolts and studs shall be sized so that excessive threads do not protrude past the nut after assembly. Bolts, nuts and washers shall conform to the dimensional and other requirements of AS/NZS 1111, AS/NZS 1112 and AS 1237 respectively.

A3.10 OPERATION

A3.10.1 General Valves shall be designed for operation by manual handwheel, with or without a gearbox, or by chain wheel, quick action lever, electric or pneumatic actuator as requested by the Purchaser.



Nominal size of valve DN	Maximum height from centre of waterway, H – mm (Closed)	Face to face dimension L - mm
80	350	51
100	350	51
150	500	57
200	600	70
250	710	70
300	810	76
400	950	89
450	1100	89
500	1200	114
600	1400	114

NOTES: Tolerance on L: Dn 80 to DN 300 ±2 mm, DN 400 to DN 600 ± 3 mm

**FIGURE A3.1
DIMENSIONS OF KNIFE-GATE VALVES**

A3.10.2 Handwheels Where handwheels are fitted they shall be of a diameter suitable for operation of the valve at the maximum torque referred to in Clause A3.10.4. The handwheel shall be secured in such a manner that it cannot be taken off unless the means of securing the handwheel is removed.

A3.10.3 Direction of closure Valves may be manufactured with either clockwise or anti-clockwise closure as requested by the Purchaser.

A3.10.4 Operating torque At its maximum working pressure, the maximum torque required to initially open a valve, under balanced conditions, must not exceed 135 Nm when applied to a valve handwheel and for continuous operation shall not exceed 70 Nm.

SECTION A4 COATINGS

A4.1 GENERAL Internal and external cast iron surfaces shall be coated with a protective coating in accordance with Section SP30.

The mechanical operator and, where supplied gearbox shall have the same protective coating as the valve.

A4.2 DESIGN The valve design shall be such that the corrosion protection system specified for the internal surfaces shall be fully effective. All surfaces, which cannot be coated and tested, shall be of corrosion resistant material.

SECTION A5 TESTING

A5.1 PRODUCTION TESTS Each valve shall be hydrostatically tested with water in accordance with Clauses A5.1.1 and A5.1.2. Valves of nominal sizes up to and including DN 300 shall be subjected to a bulkhead test. Valves larger than DN 300 shall be subjected to a free end test. Wafer type valves may be retained by a flange for the free end test.

**TABLE A5.1
HYDROSTATIC TEST PRESSURES**

Allowable operating pressure, kPa	Test pressure, kPa	
	Body test	Valve seat test
1000	1500	1000

A5.1.1 Body test With the gate in the open position the body test pressure shall be applied in accordance with Tables A5.1 and A5.2. No leakage shall be allowed.

**TABLE A5.2
TEST DURATION**

Nominal size of valve DN	Minimum duration, min		Permissible leakage rate ml/min
	Body test	Seat test	
50 - 300	1.0	1.0	2
350 - 500	2.0	2.0	5
600	2.0	2.0	10

A5.1.2 Valve seat test With the gate in the closed position, the valve seat test pressure shall be applied to one side of the valve in accordance with Tables A5.1 and A5.2, the other side of the valve being at

atmospheric pressure. The permissible leakage rate past the valve seats for metal seated valves shall be as specified in Table A5.2. There shall be no other visible leakage. There shall be no leakage past the seats for resilient seated valves.

The above procedure shall be repeated with the pressure applied to the other side of the valve, for bi-directional valves.

A5.2 TYPE TESTS Type tests shall be carried out in accordance with Clauses A5.2.1 to A5.2.7 for each nominal size, class and component material combination.

Before commencing the tests the number of turns of the operator to accomplish full gate travel, shall be recorded. At the completion of all tests the valves shall be dismantled and the components inspected to ensure there is no distortion of form or fit.

These tests shall be carried out in the sequence described in the following.

A5.2.1 Strength test (spindle and nut) With the gate in the closed position, the valve seat test pressure, as given in Table A5.1, shall be applied to one side of the valve, the other side of the valve being at atmospheric pressure. A torque shall be gradually applied to the valve operator in the closing direction until the minimum strength test torque, as given in Table A5.3 is achieved.

With the gate in the open position, the valve seat test pressure, as given in Table 5.1, shall be applied to the body of the valve. A torque shall be gradually applied to the operator in the opening direction until the minimum strength test torque, as given in Table A5.3, is achieved. After completion of the strength test the valve shall have the seat test pressure applied, and the number of turns of the stem re-checked and compared to that recorded prior to the test. The valve shall be required to operate through the same number of turns, plus or minus 1 turn, to verify that no damage to the components has occurred.

A5.2.2 Body pressure test With the wedge in the open position, a pressure equal to 1.5 times the valve seat test pressure, as given in Table A5.1, shall be applied to the body of the valve. There shall be no plastic deformation or distortion of the valve body or gland box.

A5.2.3 Gate strength test With the gate in the closed position the body test pressure shall be applied to one side of the valve in accordance with Tables A5.1 and A5.2, the other side of the valve being at atmospheric pressure. Leakage at the seat shall not be cause for failure of the test. The valve gate shall be inspected for deformation or distortion.

A5.2.4 Torque test The torque required to operate the valve and achieve sealing, with the allowable operating pressure applied to one side of the gate, shall be demonstrated to not exceed the maximum functional test torque, as given in Table A5.3.

A5.2.5 Valve seat test A valve seat test shall be carried out in accordance with Clause A5.1.2. Permissible leakage rate for metal seated valves shall not be greater than that specified in Table A5.2.

A5.2.6 Sensitivity test A valve seat test shall be carried out in accordance with Clause A5.1.2 except that the pressure applied shall be 70 kPa. The permissible leakage rate for metal seated valves shall not be greater than that specified in Table A5.2.

A5.2.7 Functional test With the valve seat test pressure applied, as given in Table A5.1, the valve shall be fully opened. It shall then be closed using the same number of turns plus or minus one, determined before the strength test. The torque shall not at any point in its travel exceed the maximum functional test torque, as given in Table A5.3.

The valve shall be dismantled and the components inspected for distortion of form or fit.

A5.2.8 Lug strength test Lugged valves shall be subject to a lug strength test. A bending moment in accordance with Table A5.4 shall be applied to one of the valve lugs. There shall be no permanent deformation of the lug or valve body after completion of this test. [under preparation].

A5.2.9 Type test certificate The type test certificate shall contain a statement confirming that the valves have been tested in accordance with this Appendix, and nominate full details of all tests.

A5.3 COATING TESTS

A5.3.1 Liquid applied coatings Liquid applied coatings shall be tested in accordance with Section SP30.

**TABLE A5.3
VALVE TEST TORQUES**

Nominal size of valve DN	Minimum strength test torque, Nm	Maximum functional test torque, Nm
80	150	45
100	200	60
150	275	90
200	350	120
250	450	150
300	525	180
400	550	200
450	750	250
500	1000	315
600	1600	480

**TABLE A5.4
LUG BENDING MOMENTS**

Nominal size of valve DN	Minimum strength bending moment Nm
80	
100	
150	
200	[under
250	preparation]
300	
400	
450	
500	
600	

SECTION 6 GEARBOXES

A6.1 DESIGN

A6.1.1 Gear ratios Where gearing is required, the operator input torques and gearbox ratios shall be matched to ensure the gearbox design rated output torque and thrust is not more than 125% of the maximum functional test torque given in Table A5.3. The relationship between input and output torques should take into account gearbox efficiencies as follows:

Single reduction spur gearboxes 0.90

Single reduction bevel gearboxes 0.85

All gears shall comply with [AS 2938](#).

A6.1.2 Geared valves Geared valves shall be designed to withstand an output torque equal to the minimum strength test torque given in Table A5.3

A6.1.3 Gearbox All gearbox components shall be designed to withstand the thrust generated by a torque equal to the minimum strength test torque given in Table A5.3.

The gearbox shall be grease lubricated and incorporate seals on the input and output shafts to prevent ingress of foreign matter and water. Gearboxes shall be manufactured in accordance with [AS 1939](#) with an enclosure rating of IP 67.

A6.2 COATINGS The gearbox casing shall be coated with a protective coating in accordance with Clause A4.1.

A6.3 MARKINGS Each gearbox shall have the following markings:

- (a) Manufacturer's name
- (b) Model No.
- (c) Date of manufacture.
- (d) Gear ratio.

SECTION A7 MARKING AND PACKING

A7.1 BODY MARKINGS Each valve shall have the following cast on the valve body:

- (a) Manufacturer's name or mark.
- (b) Nominal size.
- (c) Year of manufacture
- (d) Allowable operating pressure
- (e) Direction of flow
- (f) Section SP23
- (g) Mass of valve

A7.2 DIRECTION OF CLOSURE

A7.2.1 Handwheels Each handwheel shall be marked "CLOSE" with an arrow to indicate the direction of closure. In addition, for clockwise closing valves, the end of the stem shall be identified with a red coloured ink or paint.

A7.3 PACKAGING Valves shall be suitably packed to prevent damage to coatings whilst in transit. The gate shall be in the closed position for despatch.

APPENDIX B

PURCHASING GUIDELINES

(Informative)

B1 GENERAL Joint Australian/New Zealand Standards are intended to include the technical provisions necessary for the supply of a product referred to in a particular Standard, but do not purport to contain all the necessary provisions of a contract. In a number of cases, the purchaser either is asked to state the requirements or is given a choice of optional requirements, and these are contractual matters to be agreed between the purchaser and the manufacturer.

This Appendix contains detailed explanation, advice and recommendations on the information to be supplied by the purchaser at the time of the enquiry or order. Its aims are to prevent misunderstanding and to result in satisfactory supply of products and service.

B2 INFORMATION TO BE SUPPLIED BY THE PURCHASER The following information should be supplied by the purchaser:

- (a) Size of valve
- (b) Details of application of the valve and frequency of operation
- (c) Operating differential pressure for determining operating torque, if this is less than the allowable operating pressure.
- (d) Whether alternative materials are required.
- (e) Whether wafer or lugged style body is required.
- (f) Whether a gearbox is required
- (g) Type of operator required
- (h) Direction of closure of the operator handwheel.
- (i) Whether rising or non rising spindle is required
- (j) Whether unidirectional or bi-directional operation is required
- (k) Whether an extended spindle is required
- (l) Whether metal or resilient seating is required
- (m) Whether additional tests are required
- (n) Whether a production test certificate is required
- (o) Whether a type test certificate is required
- (p) Whether it is intended to witness hydrostatic tests and the extent thereof
- (q) Whether additional information or marking is required
- (r) The gate position for despatch if not fully closed.
- (s) Packing requirement for extended outdoor storage.
- (t) Whether valve is to be installed in a terminal position.

- (u) Type of medium to be handled.
- (v) Orientation of pipe and valve stem.

B3 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER At the time of tendering, the valve manufacturer should state the following:

- (a) The relevant standard and grade of all materials to be used in the manufacture of the valve if other than basic materials are used (see Table A2.1)
- (b) Operating torque required to operate the purchaser's nominated differential pressure, if such torque is in excess of 135 Nm.
- (c) Details of thrust bearing for valves with electric actuators or gearboxes.
- (d) Number of turns to fully raise the gate.
- (e) Details of protective coatings.

B4 MATTERS FOR AGREEMENT BETWEEN THE PURCHASE AND THE MANUFACTURER The purchase and the manufacturer should agree on the following matters where relevant:

- (a) Full details where an extended spindle is required including any intermediate support or support bearing requirements.

APPENDIX C

COMPLIANCE REQUIREMENTS

C1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

C2 RELEVANCE

The long term performance of pipeline systems is critical to the operating efficiency of water agencies in terms of operating licences and customer contracts. The long term performance of plumbing systems is similarly critical to the durability of building infrastructure, protection of public health and safety and protection of the environment.

C3 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#) (SANZ [HB18.28](#)) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause C4 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

C4 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

C4.1 GENERAL Table C1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP23.

C4.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Tables C1, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with Section SP23 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to Section SP23 shall be suspended until the cause of the failure has been identified and corrected.

- C4.3 REJECTION AFTER RETEST** In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with Section SP23.
- C4.4 VALVE BATCH** Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The valve batch is defined by the valve manufacturer.
- C4.5 PRODUCTION BATCH** A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.
- C4.6 LOT** A clearly identifiable sub-division of a batch for inspection purposes.
- C4.7 SAMPLE** One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)
- C4.8 SAMPLING PLAN** A specific plan which indicates the number of units of components or assemblies to be inspected.
- C4.9 BATCH RELEASE TEST (BRT)** A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.
- C4.10 TYPE TESTING (TT)** Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.
- C4.11 NEW FORMULATION** [under preparation]

**TABLE C1
VALVES TO SECTION SP23**

Characteristic	Clause	Requirement	Test Method	Frequency	
Type Tests					
Material properties	A2.3	Contamination of water	AS 3855 or AS/NZS 4020	At change in formulation or material composition or every 5 years	
Performance	A5.2	Performance tests	A5.2.1 to A5.2.8	Change in design	
Batch Release Tests					
Dimensions	A3.3	Effective length	Tape	One per batch	
	A3.3	Wafer body OD	Tape	One per batch	
	A3.2.1	Lugs:			
		- PCD	Tape	One per batch	
		- Thread	Screw gauge	One per batch	
A3.4.1	- Spacing	Tape	One per batch		
A3.4.1	Surface roughness	AS 2536	One per batch		
Freedom from defects	-	Structural and surface defects	Visual	Each valve	
Material properties	A2.1	Conformance or test certificates	Relevant material Standard	Per material batch	
Performance	A5.1	Body test	A5.1.1	Each valve	
	A5.1	Seat test	A5.1.2	Each valve	
Coatings	-	Surface preparation	AS 1627.4	Each component	
	A4.1	Compliance	Section SP 30	Each valve	

SECTION SP24 BUTTERFLY VALVES WATERWORKS PURPOSES**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of butterfly valves, and associated components for water supply applications for Classes 10, 16 and 21 in nominal sizes:

- Seal on disc: DN 300 to 2000
- Seal in body: DN 80 to 2000
- Seal on body: DN 80 to 1000

1.2 STANDARDS

MANUFACTURE: To Appendix A.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. The flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix B.

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grades T220 or T260.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Additional to Appendix A, permanently mark each valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing

AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

Section TR30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 AGENCY PRACTICES

PRACTICE (●)	APPLICATIONS (<i>CLOSURE DIRECTION</i>)	
	WATER SUPPLY	SEWERAGE
AGENCY		
ACTEW Corporation	≥ DN 500 (AC)	–
Barwon Water	● (AC)	● (AC)
Brisbane Water	● (AC)	–
Dept of Land & Water Conservation, NSW	● (CC)	–
Dept of Natural Resources, Qld	● (AC)	● (AC)
Dept of Public Works & Services, NSW	● (CC)	● (CC)
Gold Coast Water	–	< DN 150
Hunter Water Corporation	> DN 500 (CC)	–
Melbourne Retail Water Companies	≥ DN 600 (AC)	–
Power & Water Authority, NT	● (CC)	● (CC)
South Australian Water Corporation	● (CC) *	–
Sydney Water Corporation	● (AC)	● (AC)
Water Corporation, WA	● (AC)	● (AC)

CC Clockwise closure

AC Anti-clockwise closure

* For > DN 80, gear-box used

5.4 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

BUTTERFLY VALVES WATERWORKS PURPOSES: To Section SP24 and the following:

INFORMATION TO BE SUPPLIED (See Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP24 & SP30)
Valve size(s) and class(es)	
Materials: - Body - Blade (disc) - Shaft - Seal clamp ring (liner)	- - - -
Wafer type	
Flanged type	
Above or in-ground application	
Input shaft configuration **	
Flanged joint bolting selection (fasteners)	
Flange gaskets, O-rings and lubricant	
Bactericidal lubricant	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP24	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP24	If no Aust. Std., manufacturer to supply

** Example: facing horizontally upstream

APPENDIX A

SECTION A1 SCOPE AND GENERAL

A1.1 GENERAL This appendix outlines the requirements for double flanged, heavy duty manually operated butterfly valves suitable for above ground and buried service complete with mechanical operators, gear boxes and standard stem caps for use in water supply including potable water and recycled water as well as screened waste water. It is applicable for Classes 10, 16 and 21 in the following nominal sizes:

- Seal on Disc: DN 300, 350, 400, 450, 500, 600, 750, 900, 1000, 1200, 1400, 1600, 1800 and 2000.
- Seal in Body: DN 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 750, 900, 1000, 1200, 1400, 1600, 1800 and 2000.
- Seal on Body: DN 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 750, 900, 1000, 1200, 1400, 1600, 1800 and 2000.

All valves shall have the capability to be alternatively fitted with electric or pneumatic actuator.

A1.2 REFERENCED DOCUMENTS

The following documents are referred to in this draft Standard:

- AS/NZS 1111 - ISO metric hexagon commercial bolts and screws
- AS/NZS 1112 - ISO metric hexagon nuts
- AS 1210 - Unfired Pressure Vessels (known as the SAA Unfired Pressure Vessels Code)
- AS 1214 - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- AS 1217 - Determination of sound power level of noise sources
- AS/NZS 1554 - Structural steel welding
 - .1 - Welding of steel structures
 - .6 - Welding stainless steel for structural purposes
- AS 1565 - Copper and copper alloys - Ingots and castings
- AS/NZS 1567 - Copper and copper alloys - Wrought rods, bars and sections
- AS/NZS 1568 - Copper and copper alloys - Forging stock and forgings
- AS 1627 - Metal finishing – Preparation and pretreatment of surfaces
 - .4 - Abrasive blast cleaning
- AS 1646 - Elastomeric seals for waterworks purposes
- AS 1830 - Iron castings - Grey cast iron
- AS 1831 - Iron castings - Spheroidal or nodular graphite cast iron
- AS 1833 - Iron castings - Austenitic cast iron
- AS 1939 - Degrees of protection provided by enclosures for electrical equipment (IP Code)
- AS 2074 - Steel castings

- AS 2129 - Flanges for pipes, valves and fittings
- AS 2317 - Collared eyebolts
- AS 2345 - Dezincification resistance of copper alloys
- AS 2638 - Sluice valves for waterworks purposes
 - .1 - Metal seated
- AS 2738 - Copper and copper alloys – Compositions and designations
 - .2 - Wrought products
- AS 2837 - Wrought alloy steel - Stainless steel bars and semi-finished products
- AS 2842 - Fluid power - O-rings and housings - inch series, metric conversion
- AS 2938 - Gears - Spur and helical - Guide to specification and rating
- AS 3678 - Structural steel - Hot rolled plates, floor - plates and slabs
- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
- AS/NZS 4020 - Products for use in contact with drinking water
- AS/NZS 4158 - Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
- AS/NZS 4680 - Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
- BS 903 - Physical testing of rubber
 - .A26 - Method for determination of hardness (hardness between 10 IRHD and 100 IRHD)
- SAA HB18 - Guidelines for third-party certification and accreditation
 - .28 - Guide 28 – General rules for model third-party certification system for products
- BS 5292 - Specification for jointing materials and compounds for installations using water, low pressure steam or 1st, 2nd and 3rd family gases
- ISO 5210 - Industrial valves – Multi-turn actuator attachments
- ISO 5211 - Part-turn valve actuator attachment
 - .1 - Flange dimensions
 - .2 - Flange and coupling performance characteristics
 - .3 - Dimensions of driving components
- ISO 5752 - Metal valves for use in flanged pipe systems - Face-to-face and centre-to-face dimensions
- ASTM A276 - Standard specification for stainless and heat-resisting steel bars and shapes
- ASTM A313 - Specification for chromium-nickel stainless and heat-resisting steel spring wire
- ASTM A351 - Austenitic and duplex stainless steels, pressure containing
- ASTM A480 - Standard specification for general requirements for flat-rolled stainless and heat-resisting steel plate, sheet and strip

- ASTM B127 - Specification for nickel-copper alloy (UNS N04400) plate, sheet and strip
- ASTM B163 - Specification for seamless nickel and nickel alloy condenser and heat-exchanger tubes
- ASTM B164 - Specification for nickel-copper alloy rod, bar, and wire
- ASTM B165 - Specification for nickel-copper alloy (UNS N04400) seamless pipe and tube

WS-SPEC SECTIONS

- Section SP30 - Protective Coatings for Valves

A1.5 CLASSIFICATION AND RATING Butterfly valves shall be classified according to maximum working pressure as given in Table A1.

**TABLE A1
CLASSIFICATION AND RATING**

Class	Maximum Working Pressure (kPa)	Maximum Working Temperature (°C)	Flow Velocity (m/s)	
			Rated	Emergency
10	1000	60	5	7.5
16	1600	60	5	7.5
21	2100	60	5	7.5

The velocities given are determined by dividing the volume flow rate in cubic metres per second by the cross sectional area in square metres of a pipe having bore diameter equal to the nominal size of the valve.

SECTION A2 MATERIALS AND COMPONENTS

A2.1 GENERAL Valve components shall be manufactured from materials complying with the minimum requirements specified in Table A2. Materials listed as basic under Columns 2, 3 and 4 of the tables are minimum acceptable standard materials. Materials may be selected from Columns 5, 6 and 7. Alternative materials may be considered provided that the performance and expected life of the valves are equivalent.

A2.2 CORROSION RESISTANT MATERIAL For the purposes of this specification, the following materials are deemed to be corrosion-resistant:

- (a) Copper alloys complying with [AS 1565](#), [AS/NZS 1567](#) or [AS/NZS 1568](#) and complying with [AS 2345](#).
- (b) Austenitic stainless steel complying with ASTM A276, series 300, containing not less than 8% nickel, except that Grade 303 is not permitted, and duplex (ferritic-austenitic) stainless steels UNS S32750, S32304, S31803 and S31500.
- (c) Stainless steel complying with ASTM A 313.
- (d) Phosphor bronze complying with [AS 2738.2 Alloy 518](#).
- (e) Nickel-copper-iron alloys complying with [AS 2738.2 Alloy 713](#) or ASTM B 127, ASTM B 163, ASTM B 164 and ASTM B 165.

- (f) Copper nickel alloy complying with [AS 2738.2](#) Alloy 706 or Alloy 715.

Other materials may be considered based on demonstrated corrosion resistance data.

A2.3 CONTAMINATION OF WATER Components in contact with potable water shall comply with [AS 3855](#) or [AS/NZS 4020](#).

A2.4 O-RINGS (ELASTOMERIC TOROIDAL SEALING RINGS) O-rings should be made of material that is not injuriously affected by the fluid, temperature or environmental conditions to which the O-ring will be subjected in service. The hardness of the moulded rubber material shall be in the range 71 to 80 when determined by Method N described in BS 903, Part A26. O-rings for water supply purposes should comply with [AS 1646](#).

A2.5 RESISTANCE TO DISINFECTION PRODUCTS [To be determined].

SECTION A3 DESIGN

A3.1 DESIGN Butterfly valves shall be of standard and proven design and sized to give optimum performance in meeting the specified operating conditions. All valve components and spare parts shall be interchangeable between valves of the same size, type or manufacture. Valves shall be designed for:

- (a) Installation with the shafts horizontal for use as stop valves in water mains with the disc opening in the direction of the flow from the bottom.
- (b) A minimum operating life of 50 years in buried installations.
- (c) Operation under full unbalanced head (maximum differential head) and opening and closing against maximum specified flows, including emergency flows in either direction. Also be suitable for operation by hand held portable actuators which may impose torques on the stem or gearbox input shaft as described in Clause A3.3.13.
- (d) Drop tight in the closed position.
- (e) Calculations showing the stresses and deformations of valve components occurring under the most adverse conditions specified shall be provided if requested in Appendix C.
- (f) The Loss Coefficient, K_v shall not be greater than 0.8 when calculated by:

$$K_v = \frac{\Delta H}{V^2 / 2g} \quad \text{where} \quad \begin{array}{l} \Delta H = \text{total head loss (metres)} \\ V = \text{velocity of flow (m/sec)} \\ g = \text{acceleration due to gravity (m/sec}^2\text{)} \end{array}$$

- (e) and shall be based on hydraulic model or prototype testing. Details of the testing and calculation of the coefficient shall be provided if requested.

A3.2 END CONNECTIONS Butterfly valves shall be supplied flanged in accordance with [AS 4087](#) (\leq DN 750) and [AS 2129](#) ($>$ DN 750) with flanges at right angles to and concentric with the axis of the internal diameter. The backs of all flanges shall be machined or spot faced to provide a satisfactory bearing for bolt heads and nuts. Flanges shall be suitable for full face gaskets, except for seal on body. Tapped holes may be used where through bolting is not possible.

A3.3 COMPONENT DESIGN

A3.3.1 Welding and Post Weld Heat Treatment All construction welding of steel or cast steel valve components shall be in accordance with [AS 1554.1](#), Category SP. All welded valve bodies and machined internal parts shall be given post weld heat treatment in accordance with [AS 1210](#), Clause 4.2.17. No welding shall be permitted on cast iron components.

**TABLE A2
MATERIALS FOR BUTTERFLY VALVES**

1	2	3	4	5	6	7
Component	Basic Material			Alternative Material		
	Material	Standard	Grade	Material	Standard	Grade
Body	Ductile Cast Iron	AS 1831	500 - 7	Grey Cast Iron	AS 1830	T 220
			400-12	Flake Graphite Austenitic CI	AS 1833	L-Ni Cr 202 L-Ni Cr 1563
				Steel (Cast) Steel (Fabric'td)	AS 2074 AS 3678	250
Disc (Seal on Body, Seal on Disc)	Ductile Cast Iron	AS 1831	500-7	Grey Cast Iron	AS 1830	T220
			400-12	Flake Graphite Austenitic CI	AS 1833	L-NiCr202 L-NiCr1563
				Aluminium Bronze	AS 1565	C95810**
				Steel (Cast) Steel (Fabric'td)	AS 2074 AS 3678	250
Disc (Seal on Body)	Aluminium Bronze	AS 1565	C95810			
	Stainless Steel	ASTM A351	316			
Shaft and Shaft Extension	Stainless Steel ♦	ASTM A276	431	Stainless Steel ♦	ASTM A276	304, 316
	Monel™	ASTM B164				
Internal Seal Clamp Ring	Stainless Steel	ASTM A480	316	Gunmetal	AS 1565	C92410 **
Seals and O-rings	Elastomer	AS 1646	NR, IR, CR, SBR, NBR EPDM			
Flat Gasket	Reinforced Elastomer	BS 5292 *				
Fasteners	Stainless Steel	ASTM A480	316			
Shear Pins	Stainless Steel	ASTM A276	431 Hard Chrome Plated	Stainless Steel 316 ♦	ASTM A276	316
External Spindle Tube	Hot-dip Galv Steel	AS/NZS 4680				
Ext Fasteners and Eyebolts	Hot-dip Galv Steel	AS 1214				

Note: * Above Class 14 materials other than those in BS 5292 may be used

** Maximum lead content shall be 4.5%

♦ Refer to Clause A2.2(b)

™ Trade mark

A3.3.2 Castings Castings shall be, in all respects, sound and free from laps, blowholes and pitting. External and internal surfaces shall be clean and free from sand. Structural defects in cast iron valve components shall not be repaired.

A3.3.3 Drainage Holes Drainage holes shall be provided in any external pockets on the valve body or associated equipment, when necessary, to prevent moisture ponding.

A3.3.4 Face to Face Dimensions The face to face dimensions for double flanged valves shall be in accordance with [ISO 5752](#), Table 4 as follows:

- Classes 10, 16 and 21 Short Series
- Valve sizes DN 750 shall be in accordance with Table A3.

**TABLE A3
FACE TO FACE DIMENSIONS**

Size DN	Class of Valve		
	10	16	21
750	305	305	450

Tolerances shall be in accordance with [ISO 5752](#), Table 11.

A3.3.5 Supports Unless otherwise specified, the valves shall be supplied with mounting feet and drilled holes to accommodate anchor bolts.

A3.3.6 Seal Options One of the following sealing arrangements may be specified by the Purchaser:

- a) **Seal on Disc** The resilient seal shall be held in place by a clamp ring with socketed or countersunk retaining screws with positive mechanical locking.

For sizes DN 750 and above the clamp ring shall be in sections to facilitate seal replacement without removing the valve from the pipeline.

The edge of the disc adjoining the seal recess shall be protected by a corrosion and erosion resistant material having properties equivalent to or better than stainless steel Grade 316, to ensure continuing support for the resilient seal over the life of the valve. The fasteners securing the body seat ring or disc clamping ring in ductile or cast iron components shall be protected against the ingress of water with a sealant or thread seal.

- b) **Seal on Body** The resilient seal shall be replaceable, retained by a bed groove and of the envelope type which forms the entire wetted surface of the bore and wraps around the flange faces incorporating integral O-rings for sealing against mating flanges.

- c) **Seal in Body** The resilient seal shall be held in place, in the body of the valve, by a clamp ring with socketed or countersunk retaining screws with positive mechanical locking.

The edge of the disc adjoining the seal recess and the body adjoining the seal facing ring shall be protected by a corrosion and erosion resistant material having properties equivalent to or better than stainless steel Grade 316, to ensure continuing support for the resilient seal over the life of the valve.

For sizes DN 750 and above the clamp ring shall be in sections to facilitate seal replacement without removing the valve from the pipeline.

A3.3.7 Shaft Valve shafts shall be of the “stub” type or “through” type. The Purchaser should indicate requirements in Appendix “C”.

-
- A3.3.8 Shaft Seal** The external shaft seals shall be lip type or O-ring, or gland packing [to be reviewed] where accepted, clamped in the body, and be replaceable without removal of the shaft from the valve. The mechanical operator may be removed for this purpose.
- A3.3.9 Bearings** Trunnion bearings shall be of the self-lubricating sleeve type with corrosion resistant metal backing.
- A3.3.10 End Thrust** Valves are to be provided with suitable end thrust arrangements to keep the disc in a central position and to counter any side axial forces during the operation of the valve.
- A3.3.11 Position Indicator** Except when valves are requested for buried installation, they shall be fitted with a position indicator (to show the degree of opening) which can be clearly read from the local operating position.
- A3.3.12 Mechanical Operators and Gearboxes** Mechanical operators and gearboxes shall be grease lubricated and be provided with seals on input and output shafts, to prevent ingress of foreign matter and water in the event of flooding, be suitable for continuous immersion of a depth of 5 metres [to be reviewed] above the base, and be constructed to enclosure rating as specified in [AS 1939](#), IP67.

For buried service valves or above ground service valves which are fitted with an extended spindle (generally > 1m) an indicator which is gear driven from the extension spindle may be fitted at the top of the extension tube.

Primary manual gearbox actuators shall be of the worm and wheel, or worm and yoke type [to be reviewed]. All gears shall comply with [AS 2938](#) and the input and output bushes shall be of a corrosion resistant material.

Mechanical operators shall be self locking in all positions of the valve disc and located such that rotation of the input spindles of the operator shall be anti-clockwise for closing the valves when viewed from the operating position.

Mounting flanges for mechanical operators or direct drive actuators shall comply with [ISO 5211](#) using an adaptor piece if necessary.

Mounting flanges on mechanical operators for power actuators shall comply with [ISO 5210](#).

Mechanical operators and gearboxes for buried installation shall be suitable for key operation via an extended spindle assembly. An extension spindle and tube shall be provided with a stem cap as per [AS 2638](#) (>DN 200 size).

- A3.3.13 Portable Actuators** The mechanical operator and gearboxes, when applicable, shall be suitable for operation using a portable power actuator applied to the spindle end with a turning speed of 18 - 50 RPM rated operating torque of 203 Nm and stall torque of 400 Nm.
- A3.3.14 Stops** Position stops shall be provided where input stops are not included or torque limiting devices are required.
- a) **Actuator Output Travel Stops** Travel stops may be provided on the output shaft of the actuator and adjusted to correctly position the valve blade in the “open” and “closed” positions. This type of Travel Limiting Device requires that all of the actuator components shall withstand, without damage, the Mechanical Operator Test (Refer Clause A5.2) unless the Purchaser requests a “Torque Limiting Device” in Appendix “C”.
 - b) **Actuator Input Stops** Proprietary Input Stops may be provided which shall withstand, without damage, the Mechanical Operator Test (Refer Clause A5.2). These stops are adjustable to correctly position the blade in the “open” and “closed” positions and the actuator is only required to transmit the normal operating torque for the valve.

A3.3.15 Torque Limiting Devices If requested by the Purchaser a torque limiting device shall be incorporated in the input shaft of the valve actuator to limit the input to a valve nominated by the Purchaser. Adjustable travel limit stops on the output of the valve actuator are adjusted to set the “open” and “closed” positions of the valve.

The torque limiting device shall be fully enclosed, adjustable and set by the Manufacturer to the torque shown in “Appendix C”.

A3.3.16 Handwheels and Caps When required, valves shall be provided with as handwheel fitted to the square end of the operator input spindle. The handwheel diameter shall be 600 mm maximum diameter and shall be marked “open” with an arrow to indicate the direction of closing, ie anti-clockwise. For normal supply, the spindle end shall be protected by a removable stem cap in compliance with [AS 2638](#).

A3.3.17 Operating Torque The total torque required to operate the valve under the worst conditions of differential head, unseating force, or emergency flow shall be in the range 70 to 100 Nm.

A3.4 OPERATION

A3.4.1 Mechanical Operator Orientation Unless otherwise specified, the mechanical operator shall be located on the left hand side of the valve when facing downstream, with the operator input shaft vertically upward. Options which may be requested at time of ordering are:

- a) Operator input shaft facing horizontally upstream
- b) Operator input shaft facing horizontally downstream
- c) Mechanical operator located on the right hand side of the valve when facing downstream, with the input shaft vertically upward
- d) Option (c) with input shaft facing horizontally upstream.
- e) Option (c) with input shaft facing horizontally downstream.

Tolerances shall be in accordance with [ISO 5752](#), Table 11.

A3.5 LIFTING DEVICES A lifting attachment, suitable for lifting the completely assembled valve, shall be incorporated on the body of the valve. Eyebolts shall comply with [AS 2317](#).

A3.6 EXTENDED SPINDLE ASSEMBLY An extended spindle assembly, where specified by the Purchaser, shall comprise a rigid shaft capable of transmitting the torque requirement of the valve, enclosed in a rigid tube connected to the gearbox.

A3.7 FASTENERS Fasteners shall comply with [AS/NZS 1111](#) and [AS/NZS 1112](#).

SECTION 4 PROTECTIVE COATINGS

A4.1 GENERAL Internal and external surfaces shall be coated with a protective coating in accordance with [AS/NZS 4158](#) or where agreed with the Purchaser, use protective coatings in accordance with Section SP30. The valve design shall be such that the corrosion protection system specified for the internal surfaces shall be fully effective for all internally wetted surfaces up to and including the valve stem seals. All surfaces which cannot be coated and tested shall be of corrosion resistant material.

For mating surfaces where tolerances or fits prevent application of the specified coating a solvent borne inorganic zinc silicate undercoat with a minimum thickness of 40 microns or equivalent to APAS specifications for erosion and aggressive environments may be applied to these surfaces. The shaft bore of the disc does not require coating.

A4.2 COMPONENTS The mechanical operator and, where supplied, gearboxes shall have the same protective coating as the valve.

SECTION A5 TESTING

A5.1 PRODUCTION (BATCH RELEASE) TESTS AND TYPE TESTS

A5.1.1 General Each fully assembled and coated valve including the operating equipment and travel stops, shall be tested using the methods and procedures described in the following paragraphs. All tests shall be performed using clean cold water, maximum 20°C. Provide seven days notice in writing for nominate witness testing.

A5.1.2 Test Procedure Follow the sequence listed hereunder:

Test 1	Mechanical Operator Test (does not apply to direct lever operated valves)
Test 2 - 6	Hydrostatic Tests
Test 7	Operating Tests

A5.1.3 Type Tests [These remain to be determined though some are included within the batch release tests.]

A5.2 MECHANICAL OPERATOR TEST (TEST 1) Open and close the valve fully three times, applying a test torque of 400 Nm or lower value requested by the Purchaser in Appendix "C" against each of the travel stops. Check to ensure that the blade is 90 degrees to the flange mating face. The input shaft shall be free to turn in the opposite direction following each application of the test torque.

A5.3 HYDROSTATIC TESTS

A5.3.1 Disc Strength Test (Test 2) Close the valve against the travel limiting device and with one end of the valve blanked off, the other end open and unrestrained, subject the valve to a water pressure of 1.5 times the maximum working pressure for a minimum of 5 minutes.

Note: Provided the specified test pressure can be maintained, some leakage past the seat is acceptable. The disc shall be dry to permit examination and shall show porosity [leakage through the blade material] or deformation.

A5.3.2 Seat Test (Test 3) Upon completion of the disc strength test (Test 2), the seal may be adjusted. The seat shall be tested at two pressures, each test for a minimum of 5 minutes, at 20 kPa and at 1.1 times the maximum working pressure each for 5 minutes; there shall be no leakage past the seat.

A5.3.3 Body Test (Test 4) With both ends of the valve blanked off and the disc unseated so as to equalise pressure on both sides of the blade, the valve shall be subjected to a hydrostatic pressure of 1.5 times the maximum working pressure for a minimum of 15 minutes.

During the body test there shall be no visible leakage through the shaft seal or any other part of the whole body and the exterior of the valve shall remain completely dry throughout the test.

A5.3.4 Disc Strength Test (Test 5) For bi-directional valves, proceed as for Test 2 but on this occasion apply the pressure to that end of the valve which was open during Test 2.

A5.3.5 Seat Test (Test 6) For bi-directional valves proceed as for Test 3 but on this occasion apply the pressure to that end of the valve which was open during Test 2.

A5.4 FUNCTIONAL TEST (TEST 7) After all hydrostatic tests are completed the valve shall be given a functional test by opening and closing the valve three times to ensure that all parts fit correctly and operate freely.

SECTION A6 MARKING

A6.1 VALVE BODY MARKINGS The following information shall be cast on the body of the valve.

- a) Manufacturer's name or mark
- b) Nominal valve size
- c) Year of manufacture

- d) Class of valve
- e) An arrow denoting essential flow direction if applicable

The lettering shall be legible block type letters not less than 25 mm high and projecting not less than 3 mm.

Where, owing to size, casting of the above lettering is not practicable, such information shall be shown on an engraved stainless steel nameplate, this nameplate to be securely attached to a raised pad on the body of the valve casting [using stainless steel fixings] and be clearly visible after installation.

A product identifier (Fig No. / Model No. etc) shall also be applied to each valve by way of a permanent mark or an affixed tag to indicate that the valve complies with this specification.

A6.2 GEARBOX MARKINGS Gearboxes shall have the following markings:

- a) Manufacturer's name or mark
- b) Model series No
- c) Year of manufacture
- d) Gear ratio
- e) Direction to close
- f) Maximum allowable gearbox input torque

A6.3 NAMEPLATES The following information shall be shown on an engraved stainless steel nameplate, to be securely attached to a raised pad on the body of the valve casting, using stainless steel fixings, and be clearly visible after installation:

- a) The number of turns to fully open or close the valve
- b) Manufacturer's model number or other reference

APPENDIX B
COMPLIANCE REQUIREMENTS

B1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

B2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of Section SP24.

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

The frequency of the sampling and testing plan as detailed in Clause B3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

B3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

B3.1 GENERAL Table B1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP24.

B3.2 RETESTING In the event of a test failure, the products within the batch shall be 100% tested and only those items found to comply may be claimed and/or marked as complying with Section SP24.

B3.3 VALVE BATCH Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The valve batch is defined by the valve manufacturer.

B3.4 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

B3.5 LOT A clearly identifiable sub-division of a batch for inspection purposes.

B3.6 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

B3.7 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

B3.8 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

B3.9 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

B3.10 NEW FORMULATION [under preparation]

**TABLE B1
VALVES TO SECTION SP24**

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material Properties	A2.3	Effect on water	AS 3855 or AS/NZS 4020	At change in formulation or material composition or every 5 years
Performance	A5.1.3	Strength Pressure Functional	*	Each valve size, at 3 year intervals, or after any change in design, materials, suppliers or place of manufacture
	*		*	
	*		*	
Batch Release Tests				
Dimensions	A3			
Freedom from Defects	-	Structural and surface defects	Visual	Each valve
Materials	A2.1	Components	*	*
	A2.4	Elastomers	AS 1646	*
Performance	A5.2	Operator	Test 1	Each valve
	A5.3	Hydro-static Tests		
	A5.3.1	- Disc strength	Test 2	Each valve
	A5.3.2	- Seat	Test 3	Each valve
	A5.3.3	- Body	Test 4	Each valve
	A5.3.4	- Disc(reverse)	Test 5	Each valve
	A5.3.5	- Seat (reverse)	Test 6	Each valve
	A5.4	Functional	Test 7	Each valve
Coatings	A4	Surface preparation	AS 1627.4	Each valve
		Coatings	AS/NZS 4158	Each valve

* To be determined

APPENDIX C

PURCHASER REQUIREMENTS

Size DN

Class PN

- Seal**
- Seal on disc
 - Seal in Body (Elastomer Lined)
 - Seal Retained in Body
 - Optional

- Shaft**
- Stub
 - Through
 - Optional

- Service**
- Shut off
 - Throttling
 - Regulating
 - One directional
 - Bi-directional

Operation Frequency of Operation

Opening time Minutes

Closing time Minutes

End Connection

- Double Flanged
 - Flanges to suit full face gasket
 - Flanges to have O-ring Groove
 - Flange drilling if not to [AS 4087](#). Specify

END OF PIPE ISOLATION

Is disassembly of downstream piping with valve closed against rated pressure required? Yes No

- Actuation**
- Manual
 - Hand lever and quadrant
 - Gear
 - Power
 - Electric Actuator
 - Pneumatic Actuator
 - Hydraulic Actuator
 - Operator Orientation select from Part 6.2
 - (a)
 - (b)
 - (c)
 - (d)
 - (e)

Actuation Enclosure

- Manufacturer's standard
 - Immersion
- Give details

Energy Supply

- Electric Power
415v 3ph 50Hz
- Limit switches
 - Open
 - Close
 - Intermediate
 - Other

Required for Buried Service?

Yes
No

- Extension spindle (nominate length from centreline of valve to top of spindle)
- Indicator (to purchaser's requirements)

Height from Centre-line to Ground Levelmm

Height from Centre-line to Overall Top of Valvemm
(including operating device)

Stops (refer to Clause A3.3.14) Actuator Output Travel
 Actuator Input Travel

Torque Limiting Device and Position Stops Yes
(refer to Clause A3.3.15) No

Max Torque SettingNm

Mechanical Operator Test TorqueNm
(If other than 400 Nm, refer to Clause A5.2)

Additional Position Indicator Yes → Give Details
No

Handwheel Yes
No

Witness Production (Batch Release) Testing Yes
No

Special Packaging Yes → Give Details

Loss Coefficient Value Required Yes/No
Details on Derivation Required Yes/No

Test Certificates Required Yes → Give Details
No

Other Requirements:

SECTION SP25 NON-RETURN VALVES

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of non-return valves, swing check and tilting disc, and associated components for water supply and sewerage applications, of nominal sizes DN 80 to DN 750.

1.2 STANDARDS

MANUFACTURE: To [DR 99004 CP](#) [or AS/NZS 4592 when available].

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix D of [DR 99004 CP](#) [or AS/NZS 4592 when available].

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grade T220.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

3.4 HINGE PIN & HINGE TO DISC CONNECTION

REQUIREMENT: For sewerage applications, use stainless steel 316 to ASTM A276.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: To Section SP30.

4.2 MARKING

REQUIREMENT: Additional to Appendix [DR 99004 CP](#) [or AS/NZS 4592 when available], permanently mark each non-return valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1628](#) - Water Supply - Copper alloy gate, globe and non-return valves.
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes

- AS/NZS 4592 - Non-return valves, swing check and tilting disc [under preparation]
(Presently available in draft as [DR 99004 CP](#))
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing
- ASTM A276 - Standard specification for stainless and heat-resisting steel bars and shapes

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals

Section SP30: Protective Coatings for Valves

Section TR30: Stainless Steel

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

NON-RETURN VALVES: To Section SP25 and the following:

INFORMATION TO BE SUPPLIED (See DR 99004 CP [or AS/NZS 4592])	PROJECT REQUIREMENTS (* See Practices Table of Sections SP25 & SP30)
Valve size(s), class(es) and flange class(es)	
Materials: - Body - Disc - Body seat ring - Disc facing rings - Hinge - Bolting - Plug	- - - - - - -
Counter weight(s) and lever(s)	
Flanged joint bolting selection (fasteners)	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, Section SP25	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP25	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PRACTICE (●)	WATER			SEWERAGE		
	AGENCY	AS 1628	AS/NZS 4592		AS/NZS 4592	
		*	Swing Check**	Tilting Disc	Swing Check**	Tilting Disc
ACTEW Corporation	< DN 100	≥ DN 100	–	≥ DN 100	–	
Barwon Water	–	●	–	●	–	
Brisbane Water	< DN 100	≥ DN 100	–	≥ DN 100	–	
Dept of Land & Water Conservation, NSW	< DN 100	≥ DN 100	–	●	–	
Dept of Natural Resources, Qld	–	–	–	–	–	
Dept of Public Works & Services, NSW	< DN 100	≥ DN 80	≥ DN 200	≥ DN 100	–	
Gold Coast Water	–	DN 100 to 600	DN 300 to 750			
Hunter Water Corporation	< DN 100	≥ DN 100	–	●	–	
Melbourne Retail Water Companies	–	≥ DN 100	–	≥ DN 100 ***	–	
Power & Water Authority, NT	< DN 100	≥ DN 100	≥ DN 100	≥ DN 100	–	
South Australian Water Corporation	< DN 100	≥ DN 100	≥ DN 100	●	–	
Sydney Water Corporation	< DN 100	≥ DN 100	≥ DN 100	●	–	
Water Corporation, WA	< DN 100	≥ DN 80	≥ DN 300	≥ DN 80		

- * Copper Alloy Gate, Globe and Non-return Valves
 ** Full bodied swing check (not vertical lines)
 *** Ball check valves also used

SECTION SP27 AIR VALVES

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of air release, air and vacuum, and combination air valves, and associated components for waterworks applications, of nominal sizes DN 80 to DN 200.

1.2 STANDARDS

MANUFACTURE: To Appendix A.

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: [AS/NZS 2566.2](#), Section 2 [under preparation]. The flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix B.

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grade T220.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To Section SP15 and [AS 4087](#), Appendix D.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: Thermal bonded to Section SP30.

4.2 MARKING

REQUIREMENT: Additional to Appendix A, permanently mark each air valve with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water.
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 4087](#) - Metallic flanges for waterworks purposes.
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing.

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals.

Section SP30: Protective Coatings for Valves.

Section TR30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

AIR VALVES: To Section SP27 and the following:

INFORMATION TO BE SUPPLIED (See Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP27 & SP30)
Valve size(s) and class(es)	
Materials: - Body - Cover - Float - Seats, rigid - Levers (small orifice valves) - Float guide (double air valves)	- - - - - -
Flanged joint bolting selection (fasteners)	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	
Bactericidal lubricant	
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP27	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP27	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PIPELINE PRACTICE (●)	WATER: SEPARATE ISOLATING VALVE TYPES
AGENCY	
ACTEW Corporation	Sluice
Barwon Water	Gate/Sluice
Brisbane Water	***
Dept of Land & Water Conservation, NSW	Sluice
Dept of Natural Resources, Qld	—
Dept of Public Works & Services, NSW	Varies
Gold Coast Water	Sluice
Hunter Water Corporation	**
Melbourne Retail Water Companies	Sluice
Power & Water Authority, NT	Sluice
South Australian Water Corporation	Ball valves
Sydney Water Corporation	*
Water Corporation, WA	Sluice/Butterfly

* “Air valve isolator”, special design

** [DN 100 - 300, no air valve
DN 375 - 750, sluice valve

*** [< DN 375, no air valve
≥ DN 375, butterfly valve

APPENDIX A

SECTION A1 SCOPE AND GENERAL

A1.1 SCOPE This appendix outlines the requirements for air valves for water supply purposes for Classes 14, 16 and 21 and the following size ranges:

- Large Orifice Valves with nominal inlet size of DN 50, DN 80, DN 100 and DN150.
- Small Orifice or Air Release Valves - nominal inlet sizes DN 15, DN 20 and DN 25.
- Combination units providing both large and small orifice functions. When required small orifice valves may be connected to the body of a large orifice valves to form a combination unit. Alternatively, they may be supplied as an integral unit incorporating the large and small orifice valves. Sizes of combination valves will be determined by the inlet sizes of the large orifice valves. Sizes shall include DN 80, DN 100 and DN 150 for this specification.

A1.2 REFERENCED DOCUMENTS

- AS 1199 - Sampling procedures and tables for inspection by attributes
- AS/NZS 1111 - ISO metric hexagon commercial bolts and screws
- AS/NZS 1112 - ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
- AS 1217 - Determination of sound power level of noise sources
- AS 1565 - Copper and copper alloys - Ingots and castings
- AS 1567 - Copper and copper alloys - Wrought rods, bars and sections
- AS/NZS 1568 - Copper and copper alloys – Forging stock and forgings
- AS 1627 - Metal finishing – Preparation and pretreatment of surfaces
- .4 - Abrasive blast cleaning
- AS 1646 - Rubber joint rings for water supply, sewerage and drainage purposes
- AS 1830 - Iron castings - Grey cast iron
- AS 1831 - Iron castings - Spheroidal or nodular graphite cast iron
- AS 2074 - Steel castings
- AS 2317 - Collared eyebolts
- AS 2345 - Dezincification resistance of copper alloys
- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
- AS/NZS 4020 - Products for use in contact with drinking water
- AS 4087 - Metallic flanges for waterworks purposes
- AS/NZS 4158 - Thermal bonded polymeric coatings on valves and fittings for water industry purposes
- SAA HB18 - Guidelines for third-part certification and accreditation
- .28 - Guide 28 – General rules for model third-party certification system for products

- ASTM A276 - Standard specification for stainless and heat resisting steel bars and shapes
- BS 5292 - Specification for jointing materials and compounds for installations using water, low pressure steam or 1st, 2nd and 3rd family gases

A1.3 DEFINITIONS

- A1.3.1 Large Orifice Valve** A valve with a large orifice nominally of the same size as the inlet of the valve which allows automatic air intake into a pipeline during draining and releases air to atmosphere from the pipeline during filling.
- A1.3.2 Small Orifice Valve** A valve with a small orifice which will allow any air accumulated in the high points of the pipeline to escape automatically to atmosphere under normal operation while the pipeline is under pressure.
- A1.3.3 Combination Air Valve** A valve which combines the large orifice and small orifice valve functions in one valve.
- A1.3.4 Maximum Working Pressure** The maximum internal working pressure at which the valve may be subjected to either as a continuous or transient peak pressure.
- A1.3.5 Nominal Size (DN)** Considered here as the inlet diameter of the valve.
- A1.3.6 Classification and Rating** Air valves shall be classified according to maximum working pressures and maximum working temperatures as given in Table A1.

**TABLE A1
CLASSIFICATION AND RATING**

Class of Valve	Maximum Working Pressure kPa	Maximum Working Temperature °C
14	1 400	60
16	1 600	60
21	2 100	60

SECTION A2 MATERIALS AND COMPONENTS

- A2.1 GENERAL** Valve components shall be manufactured from materials complying with the requirements given in Table A2.

Materials described in Table A2, columns 2, 3 and 4 and “Basic Materials” are the minimum acceptable standard for materials. Alternative materials may be selected from those listed in columns 5, 6 and 7. Other material may be considered if the performance and expected life of the valves are at least equivalent.
- A2.2 DEZINCIFICATION-RESISTANT COPPER ALLOYS** Copper alloy valve components shall be dezincification-resistant to [AS 2345](#).
- A2.3 CONTAMINATION OF WATER** Components in contact with potable water shall comply with [AS 3855](#) or [AS/NZS 4020](#).

**TABLE A2
MATERIALS FOR LARGE ORIFICE AND SMALL ORIFICE AIR VALVES**

1	2	3	4	5	6	7
Component	Basic Material			Alternative Material		
	Material	Number	Grade	Material	Number	Grade
Body and cover Class 14	Grey Cast Iron	AS 1830	T220	Ductile Cast Iron	AS 1831	500-7 or 400-12
				Gunmetal	AS 1565	C83600 or C92410
				Brass	AS 1565	C85210 ***
Body and Cover Classes 16 and 21	Ductile Cast Iron	AS 1831	500-7 400-12	Gunmetal	AS 1565	C83600 C92410
				Brass	AS 1565	C85210***
Floats	Stainless Steel	ASTM A276	304 or 316	Polypropylene		**
				ABS		
				Polycarbonate		**
				Aluminium Nylon Coated		**
Seats - Rigid	Gunmetal	AS 1565	C83600	Stainless Steel	AS 2074 ASTM A276	H6C 316
				Gunmetal	AS 1565	C92410
				Brass	AS 1565	C85210***
Seats - Resilient	Rubber	BS 5292*	**			**
Levers, Linkages, etc for Float Mechanism	Stainless Steel	AS 2074 ASTM A276	H6C 316	Gunmetal	AS 1565	C92410
				Brass	AS 1565	C85210***
Float Guides/Support Separate from Body	Gunmetal	AS 1565	C83600	Polypropylene		**
	Stainless Steel	ASTM A276	316 or 431	Polycarbonate		**
	Brass	AS 1565	C85210***			
	Arsenical Brass	AS 1568	259 or 486			
Fasteners and Gland Bolts	Stainless Steel	ASTM A276	304 or 316			
Flat gaskets	Reinforced rubber	BS 5292*	**	Moulded Rubber	BS 5292*	**
O-rings	Rubber	AS 1646	**			
Joint rings	Rubber	AS 1646	Durometer Hardness 60 to 80**			
Screws, roller axles and similar items	USE THE SAME MATERIAL AS THE ITEMS BEING FIXED.					

* Above Class 14, materials other than those in BS 5292 may be used.

** Material specification shall be provided with application for appraisal.

*** Arsenic inhibited.

Note: Air release valves with bodies manufactured from fibreglass reinforced nylon, shall be accepted, provided the hydraulic pressure test is passed at the rate of 2 times the maximum working pressure shown in Table A1, and all other tests or criteria are met. See Clauses 5.3.4, 5.4.2 (Test 4) and 5.5.1 (Test 9).

A2.4 O-RINGS (ELASTOMERIC TOROIDAL SEALING RINGS) O-rings shall be made of material that is not injuriously affected by the fluid, temperature or environmental conditions to which the O-Ring will be subjected in service. O-rings shall comply with AS 1646. The hardness of the moulded sealing rings shall be in the range 71 to 80 when determined in accordance with Appendix B of AS 1646.

A2.5 RESISTANCE TO DISINFECTION PRODUCTS [To be determined].

SECTION A3 DESIGN

A3.1 GENERAL The structure of all valve bodies and floats shall ensure free movement of the float within the valve body to avoid the possibility of the float being arrested in any intermediate positions within its travel length. All seats, seals, floats shall be field replaceable without the need for any special tools.

A3.2 LARGE ORIFICE VALVE The large orifice float shall not close prematurely and shall remain open with the air pressure inside pipeline of up to 20 kPa when the pipeline is being filled with water. It shall allow air inflow/outflow automatically when there exists a pressure differential across the orifice. The valve shall be drip tight at a minimum pressure of 80 kPa and floats shall not to be coated.

A3.3 SMALL ORIFICE VALVE The valve shall not close under air pressure alone. While there is no water in the valve body the valve should remain in the fully open position. Small orifice valve with a ball sealing against an orifice, shall have an orifice diameter of not less than 2mm.

A3.4 END CONNECTIONS Inlet flange of the valve shall be drilled in accordance with Table A3. Flanges shall be at right angles to and concentric with the axis of the internal diameter. Bolt holes shall not be tapped.

**TABLE A3
FLANGES**

Class of Valve	Grey Cast Iron		Ductile Cast Iron	
	Raised or Flat	AS 4087 Flange table	Raised or Flat	AS 4087 Flange table
14	Flat	Figure B2	-	-
16	-	Figure B5	Raised	
21	Flat			Figure B3

A3.5 COMPONENT DESIGN

A3.5.1 Body and Cover Valve body and cover wall thickness of grey or ductile iron valves for all Classes and sizes of valves shall be designed to pass the valve tests under pressures specified in Table A4.

A3.5.2 Body to Cover Connection Surfaces forming the body-to-cover connection shall provide a watertight joint. The joint shall be made with either a gasket or O-ring.

Connections shall be designed to withstand the pressures given in Table A1 and Table A4 and shall be able to be disassembled and reassembled in the field at any time during the life of the valve.

A3.5.3 Jointing Material Jointing material used between component parts of the valve shall withstand the test pressures specified in Table A1 and Table A4.

A3.5.4 Small Orifice Valve The small orifice outlet shall be adequately protected from any possible external contamination.

**TABLE A4
HYDROSTATIC TEST PRESSURES**

Class of Valve	Test Pressure, kPa			
	Body Test *	Valve Seat Test	High Temperature Test	Sensitivity Test
14	2100	1400	980	80
16	2400	1600	1120	80
21	3150	2100	1470	80

* For fibreglass reinforced nylon bodies, see note at bottom of Table A2.

A3.5.5 Drain Valve On the body of the large orifice valve, a hole shall be drilled and tapped and a DN 20 lever operated, stainless steel ball valve shall be connected to it. The position of the hole shall be such that, with the isolating valve (the valve between the air valve and the watermain) closed, the water underneath the float can be drained completely by opening the ball valve. The operating level shall not interfere with any other components of the air valve when the lever is operated to operate the ball valve from its fully closed to fully open position.

A3.5.6 Valve Cover The valve shall be supplied with a removable metal cover of corrosion resistant material or alternatively a cast metal cover provided with protective coating in accordance with [AS/NZS 4158](#).

The cover shall be securely fixed above the large orifice and shall be designed to prevent dirt or other material falling onto the float and seal area and also to shield the float from direct sunlight.

Design of the cover shall permit air to move freely into or out of the valve without affecting its kinetic performance.

A3.5.7 Floats All floats shall be capable of withstanding the impact due to sudden closure without any deformation. The external surface shall be free from burrs, fins and sharp edges.

A3.5.8 Finish Valves and valve components shall comply with the following:

- (a) Castings shall in all respects be sound and free from laps, blowholes, and pitting. Minor surface defects may be rectified by fettling provided that the specified dimensions and performance requirements are achieved. Small surface imperfections inseparable from the method of manufacture, which are not detrimental to the functional quality of the castings or do not make them non-complying with any other aspects of the specification will be acceptable. Cracks and tears in the metal shall not be repaired.
- (b) Components made by processes other than casting shall be sound and suitable for the specified purposes.
- (c) Body, cover and other parts shall be manufactured so that when assembled the parts shall be coaxial.
- (d) All valve components shall be interchangeable between units of the same size and class from any one manufacturer.
- (e) The internal and external surfaces shall be free from burrs, fins and sharp edges. The minimum radius of un-machined edges to be protective coated shall be 3mm.

A3.6 FASTENERS Fasteners shall comply with [AS/NZS 1111](#) and [AS/NZS 1112](#).

SECTION A4 COATINGS

A4.1 GENERAL Internal and external cast iron surfaces shall be coated with a protective coating in accordance with [AS/NZS 4158](#). Other coating systems may be considered by the Purchaser providing the applicator can demonstrate process control to ensure compliance with [AS/NZS 4158](#).

A4.2 DESIGN The design of all components shall be such that the coating can be applied and tested fully for conformity with [AS/NZS 4158](#). This requirement precludes the use of simple tapped connections for small orifice valves. Waterway coating must be continuous across the full width of all joint gaskets and seals.

SECTION A5 TESTING

A5.1 GENERAL Both type tests and production tests shall be conducted on both large and small orifice valves, to the conditions and tests given below:

- a) For the purpose of the tests, all air valves will be mounted in the test apparatus with the air valves in a vertical position, with an allowable deviation of not greater than 2°.
- b) Unless otherwise specified, all tests shall be conducted with clean water within a temperature range of 10°C to 30°C.
- c) The apparatus used for measuring the various parameters shall enable measurement with a permissible error of up to ± 2% of the measured value.

A5.2 TYPE TESTS These are once only set of tests and shall be carried out on each type and size of valve. Type tests shall be conducted for both large and small orifice valves. The test specimens shall be taken at random by the test laboratory representative from a quantity of at least 10 valves of the same type and size. Three (3) test specimens are required for each size.

A5.3 TYPE TEST - LARGE ORIFICE VALVES The tests shall be performed for each combination of the valve features:

- Nominal Size
- Class
- Seat Configuration
- Waterway Configuration

A5.3.1 Flow Capacity Test: Air Outflow (Test 1) Mount the valve vertically on a branch and isolating sluice valve, each of the nominal size of the valve, with the float unrestrained. Pass dry air at 20°C from a reservoir through the valve for a minimum of 60 seconds. Measure and record the volume of air passed through the valve with a pressure of 114 kPa (absolute) maintained in the reservoir during the test. Determine the flow rate of air flow rate in litres per second and record the results in Table A5.

**TABLE A5
PERFORMANCE**

Diameter	Minimum Flow Rate of Dry Air, l/sec	
	Inflow at 87 kPa (absolute)	Outflow at P = 114 kPa (absolute)
DN 50		
DN 80		
DN 100		
DN 150		

A5.3.2 Flow Capacity Test: Air Inflow (Test 2) Again, measure the air inflow rate by maintaining a pressure of 87 kPa (absolute) at the inlet of the valve. Results of the tests shall be shown in the test certificate. Details of the test rig shall be made available with application for acceptance.

Alternatively, graphs showing “Change in Pressure” Vs “Flow Rate” (inflow and outflow), previously produced by the manufacturer may be included for consideration by the purchaser. However, in this

case, the details of the test rig, test procedures and measurement techniques and the authority which conducted the tests shall be included.

A5.3.3 Flow Test: Closure (Test 3) With the test rig maintained as for Tests 1 and 2 increase the pressure in the reservoir to 120 kPa (absolute) and hold for a minimum of 30 seconds at or above 120 kPa (absolute). The valve shall remain open during this test and the float shall not leave from the fully open position. Flow rate achieved under this test shall be specified in the Test Certificate.

A5.3.4 Body Test and Float Strength Test (Test 4) With the float in the closed position, the body test pressure shall be applied to the body of the valve in accordance with Table A4 and held for a minimum of 60 seconds. There shall be no visible leakage through the body or float material. On completion of the test, the valve shall be completely dis-assembled and the valve body, float and components checked to ensure no distortion or damage to any components or seating surfaces.

A5.3.5 High Temperature Test (Test 5) Connect the air release valve to the test apparatus and immerse the valve in a hot water bath with a temperature of 60°C. Increase the water pressure in the valve up to the test pressure shown in Table A4, while taking care to ensure that no air remains in the system. Maintain these test conditions for a continuous period of 10 hours. There shall be no leakage from the air release valve during this test.

After the 10 hour period, dismantle the valve and examine the parts visually. The sealing component of the float assembly shall not adhere to the sealing seat. There shall be no indication in the valve or its components of deformation or other defects: neither shall there be any deformation nor defects in the plastics or elastomer parts.

A5.3.6 Noise Level (Test 6) Noise level during air inflow and outflow at P = 87 kPa (absolute) and 114 kPa (absolute) respectively shall be measured and recorded in accordance with [AS 1217](#). The procedure of noise measurement and the Standards which the measurements procedure complies shall be presented in a tabulated form.

A5.3.7 Long Term Unseating Test (Test 7) This is an accelerated test to ensure that the floats will release after being under pressure for a long time. The test shall be carried out on a valve in its delivery condition, mounted vertically, at a temperature of 60°C (+0°/-5°), and kept at maximum working pressure for 5 days. Following pressure release, check that the valve operates normally to the valve seat test (Test 10) Clause A5.5.2. Multi-function valves shall be tested, without separating the parts, for the different functions.

A5.4 TYPE TEST - SMALL ORIFICE VALVES Type tests for small orifice valve shall be as specified below.

A5.4.1 Operational Test (Test 8) Mount the valve on a vertical test spool, greater than its nominal size, with an air connection near its top and a pressure water connection and bleed near its bottom. A separate pressure gauge connection is required together with adequate pressure regulated supplies of air and water.

Start with the valve filled with water at rated pressure then introduce air and bleed water to maintain rated pressure until the valve opens. Maintain rated pressure by admitting air for a minimum of 60 seconds then close air supply and maintain pressure by admitting water until valve has closed. Repeat the cycle three further times.

During this test the valve should open at each air admission cycle then close completely and show no leakage between air discharges.

A5.4.2 Body Test and Float Strength Test (Test 4) As detailed in Clause A5.3.4.

A5.4.3 Long Term Unseating Test (Test 7) As detailed in Clause A5.3.6.

A5.5 PRODUCTION (BATCH RELEASE) TESTS

Production Tests shall be conducted on each of both large and small orifice valves.

Production tests shall include the following tests:

- Body and Float Strength Test
- Valve Seat Test
- Valve Seat sensitivity Test
- Protective Coating Test

A5.5.1 Body Test and Float Strength Test (Test 9) With the float in the closed position, the body test pressure shall be applied to the body of the valve in accordance with Table A4 and held for a minimum of 60 seconds. There shall be no visible leakage.

A5.5.2 Valve Seat Test (Test 10) With the valve completely filled with water holding the float in the closed position, the valve seat test pressure shall be applied to the valve in accordance with Table A4 and held for a minimum of 60 seconds. There shall be no visible leakage through the body or float material.

A5.5.3 Valve Seat Sensitivity Test (Test 11)

- (a) Reduce the pressure in the valve from the valve seat test value to the valve seat sensitivity test value (Table A4) and hold for a minimum of 60 seconds. There shall be no visible leakage.
- (b) Empty the valve then refill completely causing the float to close. Increase the pressure to the valve seat sensitivity test value (Table A4) and hold for a minimum of 60 seconds. There shall be no visible leakage.

A5.5.4 Protective Coating Test (Test 12) Each valve shall be tested for protective coating in the way detailed in [AS/NZS 4158](#) and shall satisfy the requirements of that Standard.

A5.6 TEST CERTIFICATES

The test certificate shall contain the following information:

- (a) A statement confirming that both large and small orifice valves have been tested in accordance with this specification.
- (b) Results of the visual examination during and after the completion of the body and float strength tests.
- (c) Confirmation that there was no leakage during the seat and sensitivity tests for both large and small orifice valves.
- (d) The air flow rate in l/sec through the large orifice valve at a reservoir pressure of 114 kPa (absolute).
- (e) Air inflow rate in l/sec through the large orifice valve at a pressure of 87 kPa (absolute) inside the valve.
- (f) Confirmation of no premature closure of the large orifice float at 120 kPa (absolute).
- (g) Manufacturers guaranteed air discharge rate through the large orifice at a pipeline pressure of 114 kPa (absolute).
- (h) Confirmation of compliance with the requirements of [AS/NZS 4158](#).
- (i) Confirmation that the small orifice valve opened for air discharge at rated pressure, and closed leak free, during all cycles of operation described under "Operational Test for Small Orifice Valve". Include the size of the small orifice.

- (j) A separate certificate detailing the procedures used for measuring noise, the Standard to which the measurement procedures complies, and the results of the test.
- (k) Flow rate achieved under "Flow Test - Closure".

SECTION A6 MARKING

Each valve shall have the following information cast on the body of the valve:

- i) Manufacturer's Name or Mark
- ii) Valve Type and Size
- iii) Year of Manufacture
- iv) Working Pressure (kPa)
- v) Body Test Pressures (kPa)

The lettering shall be in legible block type and shall not be less than 15mm high and projected not less than 3mm.

Where, owing to the size or any other reason, casting of the above lettering is not practicable, such information may be shown on a stainless steel nameplate to be screwed on the valve body using stainless steel fasteners.

APPENDIX B

COMPLIANCE REQUIREMENTS

B1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

B2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

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

B3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

B3.1 GENERAL Table B1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP27.

B3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table B1, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with Section SP27 for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to Section SP27 shall be suspended until the cause of the failure has been identified and corrected.

B3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with Section SP27.

B3.4 VALVE BATCH Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The valve batch is defined by the valve manufacturer.

B3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

B3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

B3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

B3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

B3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

B3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

B3.11 NEW FORMULATION [under preparation]

**TABLE B1
VALVES TO SECTION SP27**

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	A2.3	Effect on water	AS 3855 or AS/NZS 4020	At change in formulation or material composition or every 5 years
Performance - Large Orifice - Large & Small - Small Orifice	A5.3.1	Air outflow	Test 1	Each valve size, at 3 year intervals, or after any change in design, materials, suppliers or place of manufacture
	A5.3.2	Air inflow	Test 2	
	A5.3.3	Closure	Test 3	
	A5.3.5	High temperature	Test 5	
	A5.3.6	Noise level	Test 6	
	A5.3.4	Body and float	Test 4	
	A5.3.7	Long Term Unseating	Test 7	
	A5.4	Operational	Test 8	
Batch Release Tests				
Dimensions	A3			
Freedom from defects	-	Structural and surface defects	Visual	Each valve
Material properties	A2.1	*	*	*
	A2.4	Elastomers	AS 1646	*
Performance	A5.5.1	Body and float	Test 9	Each valve
	A5.5.2	Valve seat	Test 10	Each valve
	A5.5.3	Seat sensitivity	Test 11	Each valve
Coating	A4 and	Surface preparation	AS 1627.4	Each component
	A5.5.4	Coatings	Test 12	Each valve

* To be determined

SECTION SP28 SPRING HYDRANT VALVES

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of DN 80 spring hydrant valves, and associated components for water supply applications.

1.2 STANDARDS

MANUFACTURE: To [AS 3952](#).

1.3 TRANSPORTATION, HANDLING AND STORAGE

REQUIREMENT: To [AS/NZS 2566.2](#), Section 2 [under preparation]. Flexible packaging materials to have an expected life for outside storage of at least 1 year.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A.

Failures: Reject, do not repair.

DUCTILE IRON QUALITY TEST: To [AS 1831](#) Grades 500-7 or 400-12.

GREY CAST IRON QUALITY TEST: To [AS 1830](#) Grade T220.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 FLANGE GASKETS AND O-RINGS

REQUIREMENT: To [AS 4087](#), Appendix D and Section SP15.

3.2 LUBRICANTS

MATERIAL: To meet requirements of [AS 3855](#) or [AS/NZS 4020](#) for potable water.

Bactericide: [For potable water, requirement to be determined].

3.3 FLANGED JOINT BOLTING

REQUIREMENT: Selection to [AS 4087](#), Appendix C. Hot dipped galvanised to [AS 1214](#) and stainless steel to Section TR30.

3.4 RESILIENT SEAL

REQUIREMENT: - Elastomeric seals to [AS 1646](#)
- Leather, tanned and neatsfoot oil soaked, impregnated either through pressurisation or extended soaking.

4 MANUFACTURE

4.1 INTERNAL AND EXTERNAL COATINGS

REQUIREMENT: Thermal bonded to Section SP30.

4.2 MARKING

REQUIREMENT: Additional to [AS 3952](#), permanently mark each hydrant with the following:

- Traceability code.
- Place of manufacture (may be incorporated in traceability code).

4.3 FLANGED JOINTS

FLANGES: Drill to [AS 4087](#).

Raised to flat face: Manufacturer to recommend maximum torque to be applied.

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
- [AS 1830](#) - Iron castings - Grey cast iron
- [AS 1831](#) - Iron castings - Spheroidal or nodular graphite cast iron
- [AS/NZS 2566.2](#) - Buried flexible pipelines, Part 2: Installation [under preparation]
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS 3952](#) - Water supply - DN80 spring hydrant valve for general purposes
- [AS 4087](#) - Metallic flanges for waterworks purposes

AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, development, production, installation and servicing

AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP15: Elastomeric Seals.

Section SP30: Protective Coatings for Valves.

Section TR30: Stainless Steel.

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the valve supplier.

Flange Gaskets and O-rings: One set for each valve.

Lubricant: For all flange gaskets and O-rings.

Flanged Joint Bolting: One set of bolts, nuts and washers for each valve.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

SPRING HYDRANT VALVES: To Section SP28 and the following:

INFORMATION TO BE SUPPLIED (See AS 3952)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP28 & SP30)
Class(es) and flange class(es)	
Materials:	
- Body	-
- Yoke	-
- Dome	-
- Resilient seal	-
Flanged joint bolting selection (fasteners)	
Flange gaskets, O-rings and lubricant	
Bactericidal lubricant	
Coatings	*
Additional testing	
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP28	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP28	If no Aust. Std., manufacturer to supply

5.4 AGENCY PRACTICES

PRACTICE (●)	HYDRANT TYPES		
	SPRING	SCREW	SWAB
ACTEW Corporation	●	—	—
Barwon Water	●	●	●
Brisbane Water	●	—	—
Dept of Land & Water Conservation, NSW	●	—	—
Dept of Natural Resources, Qld	●	—	—
Dept of Public Works & Services, NSW	●	—	—
Gold Coast Water	●	—	●
Hunter Water Corporation	DN 80, Class 16	—	—
Melbourne Retail Water Companies	●	—	—
Power & Water Authority, NT	—	●	—
South Australian Water Corporation	—	DN 80	—
Sydney Water Corporation	●	●	—
Water Corporation, WA	—	●	—

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

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

The frequency of the sampling and testing plan as detailed in Clause A3 shall be used by the certifying body for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 3952](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1, shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 2.5 and an inspection level of S3 unless otherwise specified. If the retest requirements are met, the batch may be released and compliance with [AS 3952](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 3952](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 3952](#).

A3.4 VALVE BATCH Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The valve batch is defined by the valve manufacturer.

A3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

A3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

A3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.11 NEW FORMULATION [under preparation]

**TABLE A1
VALVES TO AS 3952**

Characteristic	Clause	Requirement	Test method	Frequency
Type Tests				
Material properties	2.3	Effect on water	AS 3855 or AS/NZS 4020	At change in formulation or material composition or every 5 years
Performance	4.5.2	Body	Table 4.1	Each valve size, at 3 year intervals, or after any change in design, materials, suppliers or place of manufacture
	4.5.3	Valve seat	Table 4.1	
	4.7.1	Flow	*	
Batch Release Tests				
Dimensions	3	Figs 3.1, 3.2 & 3.3	Tape/calipers	*
Freedom from defects	-	Structural and surface defects	Visual	Each valve
Material properties	2.1	Components	*	*
	*	Elastomers	AS 1646	*
Performance	4.5.2	Body	Tables 4.1 & 4.2	Each valve
	4.5.3	Valve seat	Tables 4.1 & 4.2	Each valve
Coatings	4.6.1	Interior and exterior surfaces	AS/NZS 4158 and Section SP30	Each valve

* To be determined

SECTION SP30 PROTECTIVE COATINGS FOR VALVES
1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for factory-applied protective coating systems for valves, and associated components. The systems protect internal and external surfaces in above and below ground installations, for water supply and sewerage applications.

1.2 STANDARDS

THERMAL-BONDED COATINGS: To [AS/NZS 4158](#). [APAS (Australian Paint Approval Scheme) specification not yet available]

LIQUID APPLIED COATINGS: To APAS specification GPC-C-29/7P Type 4.

TRANSIT COATING: To [AS/NZS 2280](#).

GENERAL: Film thicknesses are expressed in micrometres.

GLOSSARY: To [AS/NZS 2310](#).

1.3 SYSTEMS AND APPLICATIONS SUMMARY

GENERAL CLASSIFICATION	PROTECTIVE COATING SYSTEMS		APPLICATION		
			VALVE INTERNAL SURFACES	EXTERNAL SURFACES	
				BELOW GROUND	ABOVE** GROUND
Liquid Applied	A	Epoxy High Build, 2-pack solventless	✓	✓ ¹	✓ ²
Thermal	B	Thermosetting Epoxy *	✓	✓ ¹	✓ ²
Bonded	C	Thermoplastic *	✓	✓ ¹	✓ ^{1, 2}
Transit Coat	D	Cold Applied Bituminous	-	✓ ³	✓

¹ Potential for limited life if not tested or is damaged.

² Limited colour range.

³ For use with field applied tape wrap or polyethylene sleeving or in chemically inactive soils.

* Required to be used on both internal and external surfaces.

** If specific colour required, use decorative topcoat.

2 QUALITY

2.1 GENERAL

INSPECTION PERSONNEL: Personnel responsible for certification of coating application to be qualified to [AS/NZS 2312](#), Clause 11.2.

APPLICATORS: To be certified by materials manufacturer or supplier.

2.2 THERMAL BONDED COATING COMPLIANCE

REQUIREMENT: To Appendix A and [AS/NZS 4158](#), Table 3.1. Record inspection details. For resilient seated sluice valves also refer to [AS 2638.2](#)

2.3 LIQUID APPLIED COATING COMPLIANCE

PROPRIETARY MATERIALS: Advise proposed brand of coating and coating line. Provide manufacturer's certificate certifying that coating materials to be used for the work conform to the requirements of the Specification.

CONTACT WITH POTABLE WATER: Provide manufacturer's certificate to [AS 3855](#) or [AS/NZS 4020](#), certifying that coating material to be used is suitable for contact with potable water.

SUBSTRATE INSPECTION

Blast cleaned surfaces: Check for compliance with *SURFACE PREPARATION - CLAUSE 4.1* as follows:

- Class of finish: Visually compare surface with colour prints in [AS 1627.9](#).
- Profile height: To [AS/NZS 3894.5](#).

WET FILM: To [AS 3894.3](#), Appendix C.

Requirement: Measure wet thickness to enable modification of the rate of application before the coating has hardened.

DRY FILM: To [AS 3894.3](#), Method B.

Calibration: To [AS 3894.3](#), Appendix D.

CONTINUITY TESTING: After curing test entire surface using a fully variable DC high voltage holiday detector to [AS 3894.1](#). No defects, rectify any defects to manufacturer's technical literature.

3 MATERIALS

3.1 LIQUID APPLIED COATINGS

COMBINATIONS: Systems to have all components made by the same manufacturer.

THINNERS: Not permitted.

TINTING BY MANUFACTURER: Colour tinting by the manufacturer unless otherwise specified.

COLOUR: To [AS 2700](#).

4 WORK EXECUTION (LIQUID APPLIED COATINGS)

4.1 SUBSTRATE PREPARATION

STANDARDS: To [AS 1627](#) and [AS 2312](#), Section 5 as applicable.

REQUIREMENT: Prepare substrates to receive the systems specified by compliance with the following general requirements.

- Drying: Ensure that surfaces are dry before commencing liquid coating applications.

- Recontamination: Apply first coat within 4 hours of cleaning surface and before any flash corrosion or other recontamination occurs.

DEGREASING: Clean the entire surface using an aqueous alkaline oil emulsifier to [AS 1627.1](#).

GRINDING: Remove all surface irregularities, sharp edges and grind to a curvature with a radius not less than 3.0 mm.

BLAST CLEANING: Blast clean the surfaces to [AS 1627.4](#). Remove any holding primer or other coating and comply with a dry abrasive blast cleaning system. Keep air free from oil and moisture. Use alluvial garnet or steel grit, both free of chlorides.

ADDITIONAL GRINDING: If grinding is required after abrasive blast cleaning, re-blast the ground areas before painting.

SURFACE PROFILE: Produce an angular surface profile to that specified.

4.2 APPLICATION

REQUIREMENT: To [AS 2311](#), Section 6 and [AS/NZS 2312](#), Section 8 as applicable.

PAINTING CONDITIONS: Do not paint when:

- Surface temperature is less than 3°C above the dew point.
- Surface temperature is greater than 55°C.
- Surface temperature is less than 10°C.
- Relative humidity is greater than 85%.
- Surface is in direct strong sunlight.
- Weather is deteriorating or is unfavourable for application or curing.
- Pot life of the paint has been exceeded.
- Shelf life of the paint has been exceeded.

CURING: Before top-coating, check level of cure meets manufacturers requirements, and before placing into service, check coating is fully cured to [AS/NZS 3894.4](#).

5 PROTECTIVE COATING SYSTEMS

5.1 LIQUID APPLIED COATINGS

"EPOXY HIGH BUILD, 2-PACK SOLVENTLESS" SYSTEM

Prepared Surface: Class 2½ with surface profile 38 micrometres.

First Coat: Epoxy high build, 2-pack solventless (GPC-C-29/7P Type 4). Apply stripe coat of the epoxy to all surface irregularities before first coat.

Finish Coat(s): As for first coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
First Coat:	250	300
Finish Coat:	250	300
TOTAL:	500	

Continuity Testing: 5000 volts DC.

6 DECORATIVE TOPCOAT

6.1 PREPARATION

REQUIREMENT: Where a protective coating has been applied but a specific colour is required, adopt the following for both factory and site applications:

- Epoxy high build, 2-pack solventless: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.
- Thermosetting epoxy: As above.
- Thermoplastic nylon and PE: As above.
- Cold applied bituminous: Clean to [AS 1627.1](#).

6.2 TOPCOAT

REQUIREMENT: Apply two coats of pigmented acrylic to GPC-L-28 or GPC-L-29/1A and allow to cure, to manufacturer's technical literature.

7 SCHEDULES

7.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1580](#) - Paints and related materials - Methods of test
- [AS/NZS 1580.107.3](#) - Determination of wet film thickness by gauge
- [AS/NZS 1580.108.1](#) - Determination of dry film thickness on metallic substrates - Non-destructive methods
- [AS 1580.408.2](#) - Adhesion-Knife test

- [AS 1627](#) - Metal finishing - Preparation and pre-treatment of surfaces
 - .1 - Cleaning using liquid solvents and alkaline solutions
 - .4 - Abrasive blast cleaning
 - .9 - Pictorial surface preparation for painting steel surfaces

- [AS/NZS 2280](#) - Ductile iron pressure pipes and fittings

- [AS/NZS 2310](#) - Glossary of paint and painting terms

- [AS 2311](#) - The painting of buildings

- [AS/NZS 2312](#) - Guide to the protection of iron and steel against exterior atmospheric corrosion

- [AS 2638.2](#) - Sluice valves for waterworks purposes, Part 2: Resilient seated

- [AS 2700](#) - Colour standards for general purpose

- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water.

- [AS 3894](#) - Site testing of protective coatings
 - .1 - Non-conductive coatings - Continuity testing - High voltage (brush) method
 - .2 - Non-conductive coatings - Continuity testing - Wet sponge method
 - .3 - Determination of dry film thickness

- .4 - Assessment of degree of cure
- AS/NZS 3894.5 - Determination of surface profile
- AS/NZS 3894.6 - Determination of residual contaminants
- AS/NZS 3894.7 - Determination of surface temperature

- AS/NZS 4020 - Products for use in contact with drinking water

- AS/NZS 4158 - Thermal bonded polymeric coatings on valves and fittings for water industry purposes

- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

- ASTM D1238 - Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer

- ASTM D2565 - Practice for Operating Xenon Arc-Type Light-Exposure Apparatus With and Without Water for Exposure of Plastics

- ASTM D4060 - Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

- ASTM G14 - Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)

APAS SPECIFICATIONS:

- GPC-L-28 - Gloss exterior latex paint (building)

- GPC-L-29/1A - Latex coating for protection of steel in the atmosphere

- GPC-C-29/7P - Coating, long life protective, for steel structures, catalysed epoxy, suitable for potable water immersion

7.2 PROJECT SPECIFICS

[Note: Insert the following in project specifications].

PROTECTIVE COATINGS FOR VALVES: Prepare the surfaces and apply protective coatings and topcoats in compliance with the Section SP30 and to the following:

ITEM	COATING SYSTEM	COLOUR
DECORATIVE TOPCOAT: Yes/No: Factory / Site Applied; Colour		

7.3 NATIONAL PRACTICES

STATE/TERRITORY	QUALITY SYSTEM CERTIFICATION
ACT NEW SOUTH WALES TASMANIA	CLASS 3 PCCP* (PREFERRED) OR ISO 9002
NORTHERN TERRITORY QUEENSLAND SOUTH AUSTRALIA WESTERN AUSTRALIA VICTORIA	AS ABOVE OR DOCUMENTARY EVIDENCE THAT CERTIFICATION TO PCCP IS WELL ADVANCED

* PCCP Painting Contractor Certification Program.

7.4 PROTECTIVE COATING SYSTEM OPTIONS

SP SECTION		PROTECTIVE COATING SYSTEM			
SP NO.	TITLE (& SCOPE)	EPOXY HIGH BUILD, 2-PACK SOLVENTLESS	THERMO-SETTING EPOXY	THERMO-PLASTIC	
20	SLUICE VALVES METAL SEATED (DN 80 TO 750)	-	✓	✓	
21	SLUICE VALVES RESILIENT SEATED (DN 100 TO 750)	-	✓	✓	
22	BALL VALVES METAL & PLASTIC BODIED (DN 15 TO 50)	-	-	-	
23	KNIFE GATE VALVES (DN 50 TO 600)	✓	-	-	
24	BUTTERFLY VALVES (DN 80 TO 2000)	SEAL ON DISC SEAL IN BODY	✓	≤ DN 750	≤ DN 750
		SEAL ON BODY	✓	-	-
25	NON-RETURN VALVES (DN 80 TO 750)	-	✓	✓	
27	AIR VALVES (DN 80 TO 200)	-	✓	✓	
28	SPRING HYDRANT VALVES (DN 80)	-	✓	✓	

Note: - Thermal bonded coatings may not be available from all manufacturers for all the valve sizes indicated and liquid applied coatings may be unsuitable for some small valves.

- For abrasive resistance applications, alternative coatings may be required (eg. filler polymer such as ceramic filler, glass flake filler)

APPENDIX A

COMPLIANCE REQUIREMENTS

A1 SCOPE

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

- (a) The use of a product certification scheme.
- (b) The use of a minimum sampling and testing frequency plan.

A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

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

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Tables A1 and A2 set out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to Section SP30 and [AS/NZS 4158](#).

A3.2 RETESTING In the event of a test failure, the products shall be 100% tested.

**TABLE A1
LIQUID APPLIED COATINGS TO SECTION SP30**

Clause	Requirement	Test Method	Frequency
Batch Release Tests			
2.3	Substrate - class of finish - profile height	AS 1627.9 AS 1627.4 , Clause C4	Each product Each product
2.3	Wet film - thickness	AS 1580 , Method 107.3	To suit operator's skill
2.3	Dry film - thickness - continuity	AS 1580 , Method 108.1 AS 3894.1	Each product Each product

TABLE A2
THERMAL-BONDED POLYMERIC COATINGS TO AS/NZS 4158

Clause	Requirement	Test Method	Frequency
Type Tests			
2.3.1	Hot water immersion	AS 3862/AS 1580.408.2	Every 5 years or at change in formulation or supplier
2.3.2	Water absorption	AS 3862	
2.3.3	Flexibility	AS 3862	
2.3.4	Impact resistance	ASTM G14	
2.3.5	Penetration resistance	See Appendix B	
2.3.6	Abrasion resistance	ASTM D4060	
2.3.7	Cathodic disbondment	AS 3862	
2.3.8	Thermal stability	AS 3862/ASTM D1238	
2.3.9	Ultraviolet radiation	ASTM D2565	
Production Procedure Qualification			
3.3.2.1	Thickness	AS 3894.3 Method B	Change of formulation and/or substrate and/or coating procedure
3.3.2.2	Continuity	AS 3894.2/Visual	
3.3.2.4	Adhesion	AS 1580 Method 408.2	
3.3.2.6	Visual appearance		
3.3.2.7	Hot water immersion	AS1580 Method 408.2	Change in coating system and/or procedure
3.3.2.3	Foaming	AS 3862	
3.3.2.5	Cure	AS 3894.4 Method C: MEK rub test	
Batch Release Tests			
Table 3.2	Thickness	AS 3894.3 Method B	Each product
	Continuity	AS 3894.2/Visual	Each product
	Adhesion	AS 1580 Method 408.2	One per 8 hours
	Cure	AS 3894.4 Method C: MEK rub test	One per 8 hours
-	Visual	-	Each product

A3.3 MATERIAL OR COMPOUND BATCH A clearly identifiable quantity of a particular material or compound.

A3.4 VALVE BATCH Schedule of valves of the same type, identical dimensional characteristics, all the same nominal diameter and wall thickness, from the same compound. The fitting batch is defined by the valve manufacturer.

A3.5 PRODUCTION BATCH A clearly identifiable collection of units, manufactured consecutively or continuously under the same conditions, using material or compound to the same specification.

A3.6 LOT A clearly identifiable sub-division of a batch for inspection purposes.

A3.7 SAMPLE One or more units of product drawn from a batch or lot, selected at random without regard to quality. (Note: The number of units of product in the sample is the sample size.)

A3.8 SAMPLING PLAN A specific plan which indicates the number of units of components or assemblies to be inspected.

A3.9 BATCH RELEASE TEST (BRT) A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

A3.10 TYPE TESTING (TT) Testing performed to prove that the material, component, joint or assembly is capable of conforming to the requirements given in the relevant standard.

A3.11 NEW FORMULATION [under preparation]

SECTION SP35 WATER METERS DOMESTIC**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of domestic water meters (DN 20) for a nominal continuous flow rate of 2.5 kL per hour, and associated components for cold potable water supply applications.

1.2 STANDARDS

MANUFACTURE: To [AS 3565.1](#) [and National Standards Commission specifications and transition arrangements, when available].

TERMINOLOGIES:

Reverse Flow: See [AS 3565.1](#), Clauses 3.6 and 3.7.

Backflow: See [AS/NZS 3500.0](#).

Pattern Approval: A decision taken by a competent state authority, generally the national service of legal metrology, recognizing that the pattern of a measuring instrument conforms to the mandatory requirements. [See Vocabulary of Legal Metrology].

Type Test: A test or series of tests directed towards approval of a design conducted to determine whether a product is capable of meeting the requirements of the product specification. [See [AS/NZS 3500.0](#)].

1.3 STORAGE AND TRANSPORT

REQUIREMENT: Handle, store and transport to avoid damage.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To Appendix A and the following.

PRESSURE LOSS:

Meters without backflow prevention devices: When the meter assembly (including any non-reversing device fitted) is tested in accordance with Test 7 of Table 4.1 and Clause 3.8 of [AS 3565.1](#) the pressure loss not to exceed 25 kPa at q_n .

Meters fitted with backflow prevention devices: When the meter assembly (including any backflow device fitted) is tested in accordance with Test 5 of Table 4.1 and Clause 3.6 of [AS 3565.3](#), the pressure loss not to exceed 75 kPa at q_n .

REVERSE FLOW & BACKFLOW OPTIONS (Fitted to Meter)		MAX PRESSURE LOSS (At q_n of Each Meter)
NON-REVERSING DEVICE	Check, flap, disc or other reverse flow restrictor	25 kPa
BACKFLOW PREVENTION	Dual check valves	75 kPa

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 NON-REVERSING DEVICE

REQUIREMENT: To [AS 3565.1](#).

3.2 INTEGRAL NON-RETURN VALVES

REQUIREMENT: To [AS 3565.3](#), Clauses 2.9 and 2.10.

3.3 BACKFLOW PREVENTION

REQUIREMENT: To [AS 3565.3](#), Clauses 3.8, 3.9 and 3.11 and *AGENCY PRACTICES - CLAUSE 5.4*.

3.4 CONTACT WITH POTABLE WATER

REQUIREMENT: To [AS 3855](#) or [AS/NZS 4020](#).

3.5 ELASTOMERIC SEALS

REQUIREMENT: For contact with potable water, to [AS 1646](#). [Under review].
For others, internal, to AS 3718, Table 2.2 [Under review].

3.6 PLASTIC BODIES

REQUIREMENT: To [AS 3496](#) [Under review].

4 MANUFACTURE

4.1 EXTERNAL COATINGS

REQUIREMENT: If nominated in *AGENCY PRACTICES - CLAUSE 5.4*, coat all metal surfaces (except threads) with a system of 7 years minimum life expectancy. Performance of coatings on existing meters may be accepted (deemed-to-comply) or alternative coatings and assessment methods may be offered.

4.2 MARKING

REQUIREMENT: Additional to [AS 3565.1](#), serial number to be indelibly marked (i.e. for the life of the meter), in the body or register cover (excluding lid) and be traceable back to place and date of manufacture.

4.3 JOINTS

THREAD FORMS: To [AS 1722.2](#).

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1199](#) - Sampling procedures and tables for inspection by attributes
- [AS 1646](#) - Elastomeric seals for waterworks purposes
- [AS 1722](#) - Pipe threads of Whitworth form
- [.2](#) - Fastening pipe threads
- [AS 3496-](#) Authorization requirements for plumbing products - Metal-bodied and plastic bodied taps
- [AS/NZS 3500](#) - National Plumbing and Drainage Code
- [.0](#) - Glossary of Terms
- [AS 3565](#) - Meters for cold potable water
- [.1](#) - Volumetric chamber and turbine meters
- [.3](#) - Water meters with integral dual check valves
- [AS/NZS 3718](#) - Water supply - Metal-bodied taps - Specified by performance
- [AS 3855](#) - Suitability of plumbing and water distribution systems products for contact with potable water
- [AS/NZS 4020](#) - Products for use in contact with drinking water
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing.
- [SAA HB 18](#) - Guidelines for third-party certification and accreditation
- [.28](#) Guide 28 - General rules for model third-party certification system for products

5.2 COMPONENT SUPPLY

REQUIREMENT: To be sourced from the main supplier.

Couplings: As required.

5.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

WATER METERS DOMESTIC: To Section SP35 and the following:

INFORMATION TO BE SUPPLIED (See AS 3565.1 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Section SP35)
Meter type	
Measurement class	*
Serial numbers	
Couplings	
End connections (include special threads)	*
Meter length	*
Non-reversing device	*
Backflow prevention	*
External coating and colour	*
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance to Section SP35	Manufacturer to supply
Period for which maximum permissible error is warranted	Manufacturer to nominate

WS-SPEC

5.4 AGENCY PRACTICES

PRACTICE (●)	MEASURE -MENT CLASS	END CONNECTIONS	METER LENGTH (+0, -2 mm)	NON- REVERSING DEVICE	BACKFLOW PREVENTION	EXTERNAL COATING	FOR ABOVE OR BELOW GROUND	ADDIT. TESTING REQ'D.
AGENCY								
ACTEW Corporation	3	20mm ball seat	154	—	●	●	B	—
Barwon Water	3	20mm gasket	154	●	—	—	A *	***
Brisbane Water	2	1 inch BSP	154	●	●	—	B	
Dept of Land and Water Conservation, NSW	3	20 mm ball seat	154	●	—	—	A *	
Dept of Natural Resources, QLD	3	—	154	●	—	—	A & B	—
Dept of Public Works and Services, NSW	3	20 mm ball seat	154	●	—	—	A *	
Gold Coast Water	3	1 inch BSP	154	●	—	—	B	—
Hunter Water Corporation	3	20 mm ball seat	154	●	●	●	A	***
Melbourne Retail Water Companies	3	20 mm coupling	154	●	—	—	A	***
Power and Water Authority, NT	3	1 inch BSP	154	●	—	●	A & B	—
South Australian Water Corporation	3	1¼ inch BSP	140	●	—	—	A	
Sydney Water Corporation	3	20 mm ball seat	154	●	Under review	●	A *	**
Water Corporation, WA	3	Modified G1B 14 tpi, AS 1722.2	154	●	—	—	A	***

* In frost areas, protection required

** Prior to purchase, additional in-house accuracy tests used

*** Pre-qualification requirement prior to purchasing, and accuracy testing prior to acceptance.

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COMPLIANCE REQUIREMENTS

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A2 PRODUCT CERTIFICATION

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

The certification scheme shall meet the criteria described in SAA [HB18.28](#)/SANZ [HB18.28](#) (ISO/IEC Guide 28) in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard(s).

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

The frequency of the sampling and testing plan as detailed in Clause A3 may be used by the certifying body as a guide for product compliance auditing. However, where the manufacturer can demonstrate adequate process control to the certifying body, the frequency of sampling and testing nominated in the manufacturer's quality plan and/or documented procedures shall take precedence for the purpose of product certification.

A3 MINIMUM SAMPLING AND TESTING FREQUENCY PLAN

A3.1 GENERAL Table A1 sets out the minimum sampling and testing frequency plan for a manufacturer to demonstrate compliance of product(s) to [AS 3565.1](#).

A3.2 RETESTING In the event of a test failure, the products manufactured since the previous test(s) conforming to the requirements outlined in Table A1 shall be quarantined as a batch. A further set of samples shall be selected randomly from the quarantined batch using a sampling plan to [AS 1199](#) for an acceptable quality level (AQL) of 1.0 and an inspection level of S3, unless others specified. If the retest requirements are met, the batch may be released and compliance with [AS 3565.1](#) for the quarantined batch may be claimed.

Should a failure on retesting occur, then the quarantined batch shall be rejected and claims and/or marking indicating compliance to [AS 3565.1](#) shall be suspended until the cause of the failure has been identified and corrected.

A3.3 REJECTION AFTER RETEST In the event of a quarantined batch being rejected after retesting, it may be 100% retested for the failed requirement(s) and only those items found to comply may be claimed and/or marked as complying with [AS 3565.1](#).

A3.4 CHANGE IN COMPOSITION (NEW FORMULATION) [under preparation]

A3.5 BATCH [under preparation]

TABLE A1

CLAUSES	REQUIREMENT	TYPE TEST	FINAL INSPECTION & TESTING MINIMUM FREQUENCY
AS 3565.1			
1.7	Markings	●	Weekly
2.1	Materials	—	—
2.1.1	Metals and plastics	●	At any change in materials
2.1.2	Contamination of Water	●	At any change in materials
2.1.3	Copper Alloys	●	At any change in composition
2.2	End Connections	—	—
2.2.1	Threaded end connections	●	Weekly or at change of equipment
2.2.2	Flanged end connections	—	—
2.3	Register	●	—
2.3.1	Register record	—	Annually
2.3.2	Register design	—	Annually
2.3.3	Number of decades	—	Annually
2.3.4	Indicators	—	Annually
2.3.5	Verification scale	—	Annually
2.4	Electronic Output Device	●	—
2.4.3	Performance	—	Annually
2.4.4	SMT output	—	Annually
2.6	Protective Devices	●	One sample per batch
2.7	Frost Protection	●	One sample per 6 months
2.9	Strainers	●	Weekly
3.5	Watertightness	—	Each meter
3.9	Maximum Permissible Error	—	Each meter *
4.1	Tests and Sequence **	●	At any change of design or materials and annually for Clauses 3.6 and 3.8
AS 3565.3			
3.9	Non-return valve closing pressure	●	Annually
3.11	Endurance	●	At any change of design or materials

● Test required

* Flow rate(s) to be tested as specified in the Type Test Certificate of Compliance (see Clause A3.1).

** For AS 3565.1, Clause 3.8, refer to **PRODUCT COMPLIANCE - CLAUSE 2.2**

SECTION SP40 STEEL PLATE

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the manufacture and supply of steel plate for water supply reservoirs.

1.2 CROSS REFERENCES

RELATED SECTIONS: Refer to *STEEL RESERVOIR COATINGS - SECTION TR21*.

1.3 STANDARDS

MANUFACTURE: To [AS/NZS 3678](#).

1.4 STORAGE AND TRANSPORT

STANDARD: To manufacturer's recommendations.

REQUIREMENT: Handle, store and transport to avoid damage.

2 QUALITY

2.1 PRODUCT CERTIFICATION

REQUIREMENT: Product Certification acceptable to WSAA-QAN,
OR

Acceptable Product Verification Report by an auditor, with demonstrated specialist product knowledge, and acceptable to WSAA-QAN, conducted at least once per year or on a project-by-project basis.

2.2 PRODUCT COMPLIANCE

REQUIREMENT: To [AS/NZS 3678](#), Appendix B, Clause B5.

2.3 QUALITY SYSTEM

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate, and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 COMPONENTS AND MATERIALS

3.1 STEEL GRADE

REQUIREMENT: Grade 250.

4 MANUFACTURE

4.1 STEEL

REQUIREMENT: To [AS/NZS 3678](#).

4.2 PROTECTIVE COATINGS

SURFACE PREPARATION: Class 2½ with surface profile 25 to 40 micrometers.

PLATE MANUFACTURER APPLIED:

- (a) Epoxy primer, for use with coating systems:
 - Alkyd - MIO
 - Alkyd Gloss
 - Epoxy, 2-pack-MIO
 - Polyurethane, 2-pack solvent borne
- (b) Inorganic zinc silicate to GPC-P-14 for use with coating systems:
 - Acrylic Latex - MIO
 - Acrylic Latex

5 SCHEDULES

5.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS/NZS 3678](#) - Structural steel - Hot-rolled plates, floor-plates and slabs
- [AS/NZS ISO 9001](#) - Quality systems: Model for quality assurance in design, development, production, installation and servicing
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

APAS SPECIFICATIONS:

- GPC-P-14 - Zinc rich preconstruction primer

5.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

STEEL PLATE: To Section SP40 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 3678 , Appendix A)	PROJECT REQUIREMENTS
Product form	Plate
Designation of grade	Grade 250
Prime plate required	Contractor to advise
Primer type	Contractor to advise
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP40	Manufacturer to supply

SECTION SP44 CONCRETE SUPPLY STANDARD CLASS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the supply of Standard Class pre-mixed concrete, for the construction of works generally.

1.2 STANDARDS

SUPPLY: To [AS 1379](#).

2 QUALITY

2.1 ASSESSMENT

PRODUCTION: To [AS 1379](#).

PROJECT: Required to the following.

Project sampling: On site at discharge point.

AUTHORITY AND PERSONNEL: The organisation(s) responsible for sampling and testing of concrete to have relevant NATA laboratory accreditation, and use trained, competent personnel for the taking of samples and specimens and the preparation of materials and work for testing.

BATCH: Defined as the quantity of concrete mixed in one mixer load, or delivered in one truck or agitator.

SLUMP:

Standard: To [AS 1012.3, Method 1](#).

Sampling and testing frequency: Test first three batches and then every fourth. Re-commence with receipt of non-conforming batch.

Acceptance criteria: Slump to be within the permissible tolerances in [AS 1379](#) for nominal slump specified.

Batches failing to conform, to be identified, and not incorporated in the work.

AIR CONTENT:

Application: With air-entraining admixtures.

Standard: To [AS 1012.4](#).

Sampling and testing frequency: As for compressive strength.

Acceptance criteria: To the value (%) specified ± 1.5 (%).

COMPRESSIVE STRENGTH:

Requirement: To [AS 1379](#), Clause 6.5, except that the frequency of sampling to be as nominated in the project specifics.

2.2 QUALITY SYSTEM

STANDARD: To [ISO 9002](#) and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 MATERIALS

3.1 GENERAL

REQUIREMENT: To conform to this clause and *MATERIALS CERTIFICATION – CLAUSE 6.4*.

CONCRETE:

Batch tolerances: To [AS 1379](#), Section 4.

Definition: Cement is portland or blended cement complying with [AS 3972](#) alone or in combination with one or more supplementary cementitious materials complying with the applicable part(s) of [AS 3582](#) (ie. fly ash, ground granulated iron blast-furnace slag or silica fume).

PORTLAND AND BLENDED CEMENTS: To [AS 3972](#).

FLY ASH: To [AS 3582.1](#), “Fine grade” only.

SLAG: Ground granulated iron blast-furnace slag to [AS 3582.2](#).

SILICA FUME: To [AS 3582.3](#).

Requirement: Use only when specified. Alternative mix designs with silica fume will be considered, provided the cementitious material meets the performance requirements of the cement type specified.

AGGREGATE:

Standard: To [AS 2758.1](#), except that slag aggregates not accepted.

CHEMICAL ADMIXTURES: To [AS 1478](#).

3.2 STORAGE

CEMENT AND FLY ASH: Store in silos, bins or sheds designed to keep the contents dry and free from contamination. Do not use bagged cement, fly ash and bulk cement more than 3 months old. Use in chronological order and reject any cement containing lumps or signs of moisture absorption.

AGGREGATES: Store in separate bins or stockpiles designed to avoid contamination of products.

4 MANUFACTURE AND SUPPLY

4.1 DELIVERY

ADDITION OF WATER TO A MIXED BATCH: To [AS 1379](#), Clause 4.2.3 and the following:

- Addition of water by manufacturer only accepted.
- Provide details of concrete class, grade and type, and period when addition of water is required.

- Provide procedure to ensure accurate measurement of addition of water and that nominated water cement ratio and slump of mix is not exceeded.

DURATION: Reject concrete if the duration of delivery between the wetting of the mix and discharge at the site exceeds that given in [AS 1379](#), Clauses 4.2.4 and 4.4.

DELIVERY DOCKET: For each batch of Standard Class concrete, supply a docket listing the information required by [AS 1379](#), Clause 1.8.3.

5 WORKMANSHIP

5.1 COLD WEATHER PLACING

REQUIREMENT: When air temperature is below 10°C at time of mixing, or is expected during the following 48 hours, provide details of freeze prevention and provisions made for increased setting times.

The temperature of any batch of concrete not to be less than 5°C at the time of discharge, when air temperatures are 10°C or above, and not less than 10°C at the time of discharge, when air temperatures are below 10°C.

ANTI FREEZE ADDITIVES: Prohibited.

FROZEN MATERIALS: Frozen materials or materials containing ice not accepted in the mixer. Keep forms, materials and equipment coming in contact with the concrete free of frost and ice.

HEATED INGREDIENTS:

Water: Maximum 80°C when added to mixer.

Aggregate: 80°C maximum.

CEMENT: Add cement last after temperature of the other ingredients is below 38°C.

5.2 HOT WEATHER PLACING

PLACING: At the time of placing, the temperature of the concrete not to exceed 35°C.

HANDLING: Take precautions to prevent premature stiffening of the fresh mix and to reduce water absorption and evaporation losses.

TEMPERATURE CONTROL METHODS: Advise methods of maintaining the specified temperature of the placed concrete.

6 SCHEDULES

6.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1012](#) - Methods of testing concrete, Parts 2 to 6, 8, 9, 12 to 14 and 20
- [AS 1141](#) - Methods for sampling and testing aggregates, Parts 4 to 6, 11 to 14, 22 to 24, 31, 32, 34 and 35
- [AS 1379](#) - Specification and supply of concrete
- [AS 1478](#) - Chemical admixtures for use in concrete

- AS 2758 - Aggregates and rock for engineering purposes
 - .1 - Concrete aggregate

- AS 3582 - Supplementary cementitious materials for use with portland and blended cements
 - .1 - Fly ash
 - .2 - Slag - Ground granulated iron blast-furnace
 - .3 - Silica fume

- AS 3972 - Portland and blended cements

- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

6.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Concrete supply, Standard Class, to Section SP44 and the following:

INFORMATION TO BE SUPPLIED		CONCRETE MIX TYPE				
SECTION SP44		CLAUSE				
Class and Grade						
MATERIALS and MIX	Max. aggregate size	-				
STRENGTH	f 'c at 28 days (MPa)	2.1				
GRADE	Test frequency *					
OTHER	Nominal Slump (mm)	2.1				
	Air Content %	2.1				
	Pumped Concrete Accepted Yes/No	-				

* For structural elements, a higher frequency than that given in [AS 1379](#), Clause 6.5.2(b) may be required.

6.3 AGENCY PRACTICES

SYDNEY WATER CORPORATION: Slag aggregates to [AS 2758.1](#) accepted.

6.4 MATERIALS CERTIFICATION

REQUIREMENT: Prior to supplying concrete, obtain test certificates based on samples from the most recent production or from stockpiles for the project, for the materials and properties listed in the following table.

AGGREGATES Description of Test	AS 2758.1 Clause No.	Test Method	Minimum Test Frequency
General Requirements	7		
Particle density (F/C) *	7.1	AS 1141.5/6	6 Monthly
Bulk density *	7.2	AS 1141.4	6 Monthly
Water absorption (F/C) *	7.3	AS 1141.5/6	6 Monthly
Dimensional Requirements	8		
Grading (particle size distribution)	8.1		
Coarse aggregate *	8.1.2	AS 1141.11	Weekly
Fine aggregate *	8.1.3	AS 1141.11	Weekly
Material finer than 75 um	8.2		
Coarse and fine aggregate *	8.2.1	AS 1141.11/12	Monthly
Material finer than 2 um	8.2.2	AS 1141.13	6 Monthly
Particle shape *	8.3	AS 1141.14	Monthly
Durability	9		
Wet strength and wet/dry strength variation * or	9.3.2	AS 1141.22	6 Monthly
Los Angeles value and sodium sulphate soundness *	9.3.3	AS 1141.23 AS 1141.24	6 Monthly 6 Monthly
Alkali - Reactive Materials	10	*	
Weak Particles	11	AS 1141.32	Monthly
Light Particles	12	AS 1141.31	Yearly
Drying Shrinkage	13	AS 1012.13	1 per trial mix
Impurities	14		
Organic impurities	14.1	AS 1141.34	3 Monthly
Sugar	14.2	AS 1141.35	1 per source
Soluble salts	14.3	AS 1012.20	1 per source

* See *MATERIALS - CLAUSE 3*

SECTION SP45 CONCRETE SUPPLY SPECIAL CLASS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the supply of Special Class pre-mixed concrete, for the construction of civil engineering works such as liquid-retaining and marine structures.

1.2 STANDARDS

SUPPLY: To [AS 1379](#).

2 QUALITY

2.1 ASSESSMENT

PRODUCTION: To [AS 1379](#).

PROJECT: Required to the following.

Project sampling: On site at discharge point.

AUTHORITY AND PERSONNEL: The organisation(s) responsible for sampling and testing of concrete to have relevant NATA laboratory accreditation, and use trained, competent personnel for the taking of samples and specimens and the preparation of materials and work for testing.

BATCH: Defined as the quantity of concrete mixed in one mixer load, or delivered in one truck or agitator.

SLUMP:

Standard: To [AS 1012.3, Method 1](#).

Sampling and testing frequency: Test each batch.

Acceptance criteria: Slump to be within the permissible tolerances in [AS 1379](#) for nominal slump specified.

Batches failing to conform, to be identified, and not incorporated in the work.

AIR CONTENT:

Application: With air-entraining admixtures.

Standard: To [AS 1012.4](#).

Sampling and testing frequency: As for compressive strength.

Acceptance criteria: To the value (%) specified ± 1.5 (%).

Where no value specified to value determined by trial mix ± 1.5 (%).

BLEEDING:

Standard: To [AS 1012.6](#).

Sampling and testing frequency - initial for trial mix.

Acceptance criteria: Maximum 5%.

COMPRESSIVE STRENGTH:

Standard: To [AS 1012.8](#) and [1012.9](#). When testing 100 mm cylinders, rubber capping accepted.

Sample: Prepare minimum two cylinder specimens for each sample.

Representation: Each sample represents all concrete supplied since the previous sample.

Sampling and testing frequency:

No. of Batches per Day	No. of Samples (min)
1 to 4	One (1) per batch
5 to 10	5
11 to 20	7
Each extra 10 batches	+2
(eg. 31 to 40 the number of samples is $7 + 2 + 2 = 11$)	

Note: First and last batch per day to be sampled, the others to be at random.

- Prestressed precast elements: From elements being produced in a permanent casting yard, sample and test at whichever is the greater rate:
 - One sample per 5 cubic metres of concrete;
 - One sample from each casting line (pretensioned) or each member (post-tensioned).

Additional records: [AS 1012.12](#), [Method 1](#), record mass per unit volume.

Acceptance criteria: To [AS 1379](#), Clause 6.5.2 except that the sampling and testing frequency to be as shown in the table above.

Concrete failing to comply with the Acceptance Criteria to be assessed to [AS 3600](#) Clause 21.4.3. Correction factors in [AS 1012.14](#), Table 1 to be used and the cores wet-conditioned. For concrete over 28 days old, divide tested value of specimens by appropriate strength gain factor, obtained from the table below and/or from trial mixes, to calculate the equivalent 28 day strength. For non-compliances, adopt [AS 1379](#), Clause 5.3.4.

Age of Specimen at Time of Test (days)	Age Factor	
	Portland Cement	Blended Cement
28	1.00	1.00
56	1.08	1.19
112	1.14	1.33
224	1.22	1.42
365 or greater	1.25	1.45

DRYING SHRINKAGE:

Standard: To [AS 1012.13](#).

Sampling and testing frequency: Test trial mix for each grade where a drying shrinkage limit is specified.

Acceptance criteria: Average strain of three specimens from each sample not to exceed the value specified.

2.2 QUALITY SYSTEM

STANDARD: To [ISO 9002](#) and as referenced below.

- Traceability required from receipt (Clause 4.8).
- Delivery required (Clause 4.15.6) with protection extended to include delivery to destination.
- Customer verification required (Clause 4.6.4.2).
- Quality records required (Clause 4.16).

3 MATERIALS

3.1 GENERAL

REQUIREMENT: To conform to this clause and *MATERIALS CERTIFICATION - CLAUSE 6.3*.

CONCRETE:

Batch tolerances: To [AS 1379](#), Section 4.

Definition: Cement is portland or blended cement complying with [AS 3972](#) alone or in combination with one or more supplementary cementitious materials complying with the applicable part(s) of [AS 3582](#) (ie. fly ash, ground granulated iron blast-furnace slag or silica fume).

Low heat and sulfate resistance: To the following:

- Type GP, Type SR or Type SL cement with 25 to 30% total fly ash (by weight as cement replacement) either as a blended cement or mixed at the batching plant, OR
- High slag cement, containing 65 to 70% ground granulated blast furnace slag (with a glass content in excess of 90% and complying with [AS 3582, Part 2](#)).
- Provide certificate of compliance to [AS 2350.7](#) and [AS 2350.14](#) respectively.

Chloride and other chemical resistance: Specialist advice required.

Water retention: To [AS 3735](#).

Aggregate reactivity: When tests indicate potential alkali aggregate reactivity, the total alkali from all sources expressed as Na₂O equivalent (calculated as Na₂O +0.658 K₂O from the cement plus sodium chloride and other alkali sources) not to exceed 3.0 kg/m³. This limit is not applicable where the specification provides for the use of either a high slag cement conforming to [AS 3582.2](#), or a cementitious material comprising not less than 20% fly ash.

PORTLAND AND BLENDED CEMENTS: To [AS 3972](#).

FLY ASH: To [AS 3582.1](#), "Fine grade" only.

SLAG: Ground granulated iron blast-furnace slag to [AS 3582.2](#).

SILICA FUME: To [AS 3582.3](#).

Requirement: Use only when specified. Alternative mix designs with silica fume will be considered, provided the cementitious material meets the performance requirements of the cement type specified.

AGGREGATE:

Standard: To [AS 2758.1](#), except that slag aggregates not accepted.

Fine aggregate: Dense, naturally occurring sand or rock, crushed or uncrushed, and either single sourced or blended, conforming to grading requirements of Table 3, uncrushed fine aggregate of [AS 2758.1](#).

Coarse aggregate: Clean, hard, durable particles of dense, naturally occurring gravel or rock, crushed or uncrushed, and either single sourced or blended, conforming to grading requirements of Table 1, 20mm graded aggregate of [AS 2758.1](#).

Particle density: To [AS 2758.1](#) Clause 7.1(b).

Water absorption: To [AS 2758.1](#) Clause 7.3.

Durability: To [AS 2758.1](#) Clause 9, Concrete Exposure Classification - "C".

Alkali reactivity: To [AS 2758.1](#) Clause 10 and submit test documentation.

Separate testing required on each single sourced aggregate.

Particle shape: To [AS 2758.1](#) Clause 8.3, and the proportion of mis-shapen particles using a 2:1 ratio, not to exceed 35% when determined in accordance with [AS 1141](#), Section 14.

WATER: From a town potable water supply.

CHEMICAL ADMIXTURES: To [AS 1478](#). Use in accordance with [AS 1478](#) and manufacturer's directions. Admixtures containing chlorides prohibited.

Requirement: Where the proposed admixture is not specified, provide the following information:

- Description of admixture;
- Reasons for its use;
- Method of use, including stage of batching or mixing operation for adding admixture, dosage rate and details of dispensing equipment;
- Certified results of uniformity tests to [AS 1478](#).

3.2 STORAGE

CEMENT AND FLY ASH: Store in silos, bins or sheds designed to keep the contents dry and free from contamination. Do not use bagged cement, fly ash and bulk cement more than 3 months old. Use in chronological order and reject any cement containing lumps or signs of moisture absorption.

AGGREGATES: Store in separate bins or stockpiles designed to avoid contamination of products.

4 MANUFACTURE AND SUPPLY

4.1 DELIVERY

ADDITION OF WATER TO A MIXED BATCH: To [AS 1379](#), Clause 4.2.3 and the following:

- Addition of water by manufacturer only accepted.
- Provide details of concrete class, grade and type, and period when addition of water is required.
- Provide procedure to ensure accurate measurement of addition of water, and that nominated water cement ratio and slump of mix is not exceeded.

Materials to conform to this clause and **MATERIALS CERTIFICATION - CLAUSE 6.3**.

DURATION: Reject concrete if the duration of delivery between the wetting of the mix and discharge at the site exceeds that given in [AS 1379](#), Clauses 4.2.4 and 4.4.

DELIVERY DOCKET: For each batch of Special Class concrete, supply a docket listing the information required by [AS 1379](#), Clause 1.8.3 and the following additional information:

- Concrete element or part of the Works for which the concrete was ordered;
- Cement and supplementary cementitious material quantity (kg/m^3) and types;
- Total amount of water added at the manufacturing plant, including free moisture in the aggregates;
- Admixture type, brand name and total quantity used.

4.2 TRIAL MIXES

REQUIREMENT: 2 weeks before supply of concrete, provide details of; each proposed mix, source of supply, test certificates for trial mixes where required in **PROJECT SPECIFICS - CLAUSE 6.2**.

Trial mixes to be batched and tested for compliance in a laboratory with relevant NATA registration. Laboratory trial mixes to use mix proportions as proposed, with additional water to achieve a slump at the upper permissible tolerance limit in [AS 1379](#) of the nominal slump specified. Aggregates to be used in saturated surface dry condition or slightly above. Oven dried aggregates, not accepted. Repeat trial mix if requirements are not met or where changes to mix proportions or materials are made. Determine particle size distribution by dry sieving of aggregates used in the trial mix. Test certificate to include details of the trial mix as required in [AS 1012.2](#), Clause 14 and a statement that the proposed mix complies at a slump at the upper tolerance limit of the nominal slump. Test certificate to include batch proportions set out in accordance with [AS 1012.2](#), Appendix B. Test certificate for trial mix tested up to 12 months before supply of concrete accepted, provided mix proportions, source of materials and aggregate properties and gradings are identical to proposed mix.

STANDARD: Concrete trial mixes to [AS 1012](#), Parts 2 to 6, 8, 9, 12 and 13. Aggregate particle size distribution by dry sieving to [AS 1141.11](#).

5 WORKMANSHIP

5.1 COLD WEATHER PLACING

REQUIREMENT: When air temperature is below 10°C at time of mixing, or is expected during the following 48 hours, provide details of freeze prevention and provisions made for increased setting times.

The temperature of any batch of concrete not to be less than 5°C at the time of discharge, when air temperatures are 10°C or above, and not less than 10°C at the time of discharge, when air temperatures are below 10°C.

ANTI FREEZE ADDITIVES: Prohibited.

FROZEN MATERIALS: Frozen materials or materials containing ice not accepted in the mixer. Keep forms, materials and equipment coming in contact with the concrete free of frost and ice.

HEATED INGREDIENTS:

Water: Maximum 80°C when added to mixer.

Aggregate: 80°C maximum.

CEMENT: Add cement last after temperature of the other ingredients is below 38°C.

5.2 HOT WEATHER PLACING

PLACING: At the time of placing the temperature of the concrete not to exceed 35°C.

HANDLING: Take precautions to prevent premature stiffening of the fresh mix and to reduce water absorption and evaporation losses.

TEMPERATURE CONTROL METHODS: Advise methods of maintaining the specified temperature of the placed concrete.

6 SCHEDULES

6.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1012 - Methods of testing concrete, Parts 2 to 6, 8, 9, 12 to 14 and 20
- AS 1141 - Methods for sampling and testing aggregates
Parts 4 to 6, 11 to 14, 22 to 24, 31, 32, 34 and 35
- AS 1379 - Specification and supply of concrete
- AS 1478 - Chemical admixtures for use in concrete
- AS 2758 - Aggregates and rock for engineering purposes
.1 - Concrete aggregate
- AS 3582 - Supplementary cementitious materials for use with portland cement
.1 - Fly ash
.2 - Slag - Ground granulated iron blast-furnace
.3 - Silica fume
- AS 3600 - Concrete structures
- AS 3735 - Concrete structures for retaining liquids
- AS 3972 - Portland and blended cements
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing
- BS 1881 - Testing concrete
.116 - Methods for testing concrete cubes

6.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Concrete supply, Special Class, to Section SP45 and the following:

INFORMATION TO BE SUPPLIED			CONCRETE MIX TYPE			
SECTION SP45		CLAUSE				
Class and Grade						
MATERIALS and MIX	Cement Type	3.1				
	Minimum Cementitious Material (kg/m ³)					
	Maximum Cementitious Material (kg/m ³)					
	W/C Ratio Maximum					
	Laboratory Trial Mix Required Yes/No	4.2				
STRENGTH GRADE	f 'c at 28 days (MPa)	2.1				
OTHER	Nominal Slump (mm)	2.1				
	Drying Shrinkage (strain x 10 ⁻⁶) at 3 weeks OR {8 weeks}	2.1	{ }	{ }	{ }	{ }
	Air Content %	2.1				
	Pumped Concrete Accepted Yes/No					

6.3 MATERIALS CERTIFICATION

REQUIREMENT: Prior to supplying concrete, obtain test certificates based on samples from the most recent production or from stockpiles for the project, for the materials and properties listed in the following tables. Certify at the scheduled frequency during the course of the Works.

AGGREGATES Description of Test	AS 2758.1 Clause No.	Test Method	Minimum Test Frequency
General Requirements	7		
Particle density (F/C) *	7.1	AS 1141.5/6	6 Monthly
Bulk density *	7.2	AS 1141.4	6 Monthly
Water absorption (F/C) *	7.3	AS 1141.5/6	6 Monthly
Dimensional Requirements	8		
Grading (particle size distribution)	8.1		
Coarse aggregate *	8.1.2	AS 1141.11	Weekly
Fine aggregate *	8.1.3	AS 1141.11	Weekly
Material finer than 75 um	8.2		
Coarse and fine aggregate *	8.2.1	AS 1141.11/12	Monthly
Material finer than 2 um	8.2.2	AS 1141.13	6 Monthly
Particle shape *	8.3	AS 1141.14	Monthly
Durability	9		
Wet strength and wet/dry strength variation * or	9.3.2	AS 1141.22	6 Monthly
Los Angeles value and sodium sulphate soundness *	9.3.3	AS 1141.23 AS 1141.24	6 Monthly 6 Monthly
Alkali - Reactive Materials	10	*	
Weak Particles	11	AS 1141.32	Monthly
Light Particles	12	AS 1141.31	Yearly
Drying Shrinkage	13	AS 1012.13	If limits specified, 1 per trial mix
Impurities	14		
Organic impurities	14.1	AS 1141.34	3 Monthly
Sugar	14.2	AS 1141.35	1 per source
Soluble salts	14.3	AS 1012.20	1 per source

* See *MATERIALS - CLAUSE 3*

MATERIAL (Each Type Used)	TEST METHOD	MINIMUM TEST FREQUENCY
PORTLAND AND BLENDED CEMENT	To AS 3972	Each Delivery
FLY ASH	To AS 3582.1	Each Delivery
SILICA FUME	To AS 3582.3	Each Delivery
ADMIXTURES	To AS 1478 Uniformity test to Clause 2.1.3.	Each Delivery
AGGREGATE	SEE ABOVE	

6.4 WATER AGENCIES PRACTICES

STATE/TERRITORY	CEMENT & CONCRETE - ASSESSMENT METHOD
ACT	Specific Project Requirements
QUEENSLAND	Specific Project Requirements
NEW SOUTH WALES *	NSW Gov. Cement and Concrete Users Review Group OR Specific Project Requirements
NORTHERN TERRITORY	Specific Project Requirements
SOUTH AUSTRALIA	Specific Project Requirements
TASMANIA	Specific Project Requirements
WESTERN AUSTRALIA	Specific Project Requirements
VICTORIA	Specific Project Requirements

* Cementitious materials: Use only cements and supplementary cementitious materials registered under the NSW Government Cement and Concrete Users Review Group. The source of supply of any type of cement not to be changed without prior notification of conformance by NATA endorsed test certificates.

SECTION TR1 GENERAL TECHNICAL

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the general technical requirements for construction of water industry Works.

1.2 TECHNICAL DOCUMENTATION

PREAMBLE: WS-SPEC (Water Services Specification) is a master specification system which addresses strategic manufactured products (SP-Sections) and other technical requirements (TR-Sections). Sections from it may be referenced in project specifications.

FORMAT AND STYLE: The imperative language and also a similar format and style to that of NATSPEC - Reference are used, but the documents are in no other way connected. Sections from the latter may also be referenced from project specifications.

MIXED LANGUAGE: Directions and the like given in WS-SPEC and/or contract specifics, whether or not they include the expression “the contractor shall” or equivalent, are deemed to be given to and accepted by the Contractor, unless otherwise stated in the contract.

1.3 PROJECT MANAGEMENT PLAN (PMP)

GENERAL: The scope of the PMP extends beyond the technical requirements and may be either elsewhere defined, or separately addressed as:

- Quality Plan, to [ISO 9002](#);
- Site Safety Plan, to DR 98326 (or [AS 4801](#) when available);
- Environmental Plan, to [ISO 14001](#).

1.4 INCONSISTENCIES

PRECEDENCE: In the event of inconsistency between technical documents, the following order of precedence apply:

- Project specific clauses and drawings;
- WS-SPEC;
- Agency Standard Technical Specifications and Standard Drawings;
- NATSPEC - Reference
- WSAA Codes;
- Australian Standards and Codes;
- International Standards.

1.5 DEFINITIONS AND INTERPRETATIONS

HOLD POINT (MANDATORY): A point beyond which an activity may not proceed without the approval of a designated organization or authority.

WITNESS POINT (OPTIONAL): A point in the work process at which an activity is to be observed.

LENGTH: Unless the context or subject matter otherwise indicates or requires, the “effective length” of the pipe or fitting is defined as the overall length less the length of any lap or laps.

2 QUALITY

2.1 STRATEGIC PRODUCTS

REQUIREMENT: Take delivery on-site and inspect all strategic products to [AS/NZS 2566.2](#) [under preparation].

DOCUMENTATION:

Delivery Dockets: For each strategic manufactured product, include the following:

- Contract number
- Name of manufacturer
- A product identification and traceability list for all strategic products, enabling direct or indirect identification of the manufacturing site.

Compliance Certification: For each strategic manufactured product, prior to commencement of delivery, obtain and submit a certificate of compliance to the SP-Section of WS-SPEC, including any “Acceptable Product Verification Reports”. Following completion of delivery, provide a summary listing of all delivery dockets included in the contract.

SURVEILLANCE: When a strategic manufactured product is found to be not complying with the contract requirements, notify the manufacturer within 5 days of the discovery and request a written response to a Customer Improvement Request as outlined in Appendix A.

Provide a copy each of such notification and response to the nominated agency representative.

TESTS: Submit test results required in each SP-Section.

2.2 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#), and to individual agency or project specific requirements.

REQUIREMENT: Obtain Principal’s agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for

- | | | |
|---|---|---|
| • | Manufacturer’s certification of compliance to SP-Sections | H |
| • | Test certificate(s) required for each SP-Section | H |
| • | Latent (unforeseen) conditions | H |

INSPECTIONS: Give minimum of 4 hours notice for on-site personnel and 2 working days for off-site personnel.

3 MATERIALS AND COMPONENTS

3.1 MANUFACTURED PRODUCTS

REQUIREMENT: Purchase/supply all strategic manufactured products and components to SP-Sections of WS-SPEC, as available.

ON-SITE: Transportation, handling and storage to [AS/NZS 2566.2](#) [under preparation].

3.2 MANUFACTURER’S WARRANTY

GENERAL: To individual agency requirements or to individual manufacturer’s provisions.

Note: [A standard warranty, for all strategic products, linked to product cycle life, is under preparation].

4 CONSTRUCTION

4.1 EXECUTION

REQUIREMENT: Carry out the work to the TR-Sections of WS-SPEC, as available.

4.2 SUB-CONTRACTOR'S WARRANTY

GENERAL: To individual agency requirements.

4.3 WASTE AND CONTAMINATION CONTROL

WASTE DISPOSAL: After assessment for recycling, all waste, including construction and demolition materials and clean fill, to be transported to legal landfill sites in accordance with State/Territory legislation and local government regulations. Obtain and retain from the transporter, documented evidence of legal disposal.

IMPORTED FILL: Only materials validated and/or certified as virgin excavated natural materials, that are not contaminated or mixed with other types of waste, to be accepted. Obtain any necessary development consent from local government for fill operations.

CONTAMINATED SITES: If contaminated ground is encountered, advise, record for verification and provide assessment and advice of remedial options, generally to the responsible Environmental Protection Agency's guidelines, from a person registered on the National Professional Engineers Register (NPER) in Environmental (general) or a Chartered Professional Engineer (CPEng) or other person providing satisfactory evidence that they have the necessary qualifications and experience.

4.4 SERVICES

REQUIREMENT: Verify the location of existing services as some may not be identified in the information supplied.

4.5 SURVEY

REQUIREMENT: Refer to the site survey plan for site survey details and site survey control.

PRESERVATION OF SURVEY MARKS: Protect existing survey marks placed in connection with property boundaries (eg, pegs, reference marks, etc), and permanent survey control [(State Survey Marks (SSM) and Permanent Marks (PM)]. Carry out a search to establish the nature and location of survey marks likely to be disturbed by the work. Engage a Registered Surveyor to 'recover' the position of any marks under threat and arrange for an appropriate plan of survey showing the new recovery marks, to be lodged in the State/Territory Land Titles Office as a 'Plan for Survey Information Only'.

5 COMPLETION

5.1 REQUIREMENT

[Note: For future preparation].

5.2 TECHNICAL RECORDS

REQUIREMENT: Progressively hand-over technical records, either as requested or as they become available. The records may include any or all of the following:

- Specifications
- Shop drawings
- Design drawings
- Structural and design calculations

- Work-as-executed (As-constructed) plans
- Copies of reports undertaken as part of the work
- Maintenance plans
- Technical quality records

5.3 WORK-AS-EXECUTED PLANS

AS-CONSTRUCTED INFORMATION: Progressively produce work-as-executed drawings to the required accuracy of detail. When work for which a construction document is required has been completed, within 28 days of its completion, submit an original of each drawing showing the work as completed. Drawings required may include updated construction documents. Submit the drawing on heavy weight (minimum 110 g/m²) tracing paper or equivalent plastic based material. Endorse each drawing certifying accuracy and correctness. Drawings prepared for works-as-executed status, in electronic format and also so marked up, may be supplied as one paper print and electronic copy in DXF format.

SURVEY: Engage a Registered Surveyor to locate the built position of structures and utilities on sites and within roads, relative to the State Control Network.

5.4 OPERATION AND MAINTENANCE MANUALS

5.5 TRAINING

5.6 COMMISSIONING

5.7 CLEANING

5.8 MAINTENANCE

[Note: For future preparation]

7 SCHEDULES

7.1 REFERENCED DOCUMENTS

STANDARDS:

- | | | |
|---------------------------------|---|---|
| AS/NZS 2566.2 | - | Buried flexible pipelines, Part 2: Installation [under preparation] |
| AS/NZS 3905.2 | - | Guide to AS/NZS ISO 9001 , AS/NZS ISO 9002 , and AS/NZS ISO 9003 for construction |
| AS 4801- | | Occupation, health and safety management systems - Specification with guidance for use (Presently available in draft as DR 98326) |
| AS/NZS ISO 9002 | - | Quality systems: Model for quality assurance in production, installation and servicing |

AS/NZS - Environmental management systems - Specification with guidance for use
 ISO 14001

7.2 AGENCY PRACTICES

[Not yet available]

7.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Construct the Works in compliance with the specification and to the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS
SECTION TR1	DETAILS
Strategic products surveillance: - Nominated agency representative	- Agency to provide
Waste disposal certificate	
Site survey plan	Agency to provide
Work-as-executed plans	
Maintenance instructions/records	
Manufacturer's warranty	Manufacturer may supply
Technical records	

APPENDIX A
STRATEGIC MANUFACTURED PRODUCTS
CUSTOMER IMPROVEMENT REQUEST

CONTRACT NO.:

PROJECT DETAILS:

- Name:

- Address:

- Tel:

Fax:

MANUFACTURER'S DETAILS:

- Name:

- Address:

- Tel:

Fax:

STRATEGIC PRODUCT DETAILS AND DELIVERY DATE:

DETAILS OF NON-CONFORMANCE:

MANUFACTURER'S RESPONSE:

- (i) Proposed action to deal with non-complying product
- (ii) Result of investigation of underlying cause of non-conformance
- (iii) Preventative action or proposed change to prevent re-occurrence

CLOSE OUT: Manufacturer's signature:

Contractor's signature:

Date:

SECTION TR2 SITE PREPARATION AND RESTORATION
1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the requirements for preparing and restoring construction sites for pipelines, pumping stations, reservoirs and similar water projects.

1.2 CROSS REFERENCES

RELATED SECTION: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 DEFINITIONS

EXISTING SERVICE: Any buried or above ground pipe, conduit or cable including associated pits, poles, structures or appurtenances, which have not been abandoned.

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLANS(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for

- | | |
|---|---|
| • Contractor's submissions for site management | H |
| • Protection of trees, flora, fauna and other items | H |
| • Completion of restoration and its certification from public authorities and private property owners | H |
| • Latent (unforeseen) conditions | H |

2.2 CERTIFICATION AND CLEARANCES

PUBLIC AUTHORITIES: Obtain certificate(s) and clearance(s) from relevant controlling authorities and private property owners, that restoration has been satisfactorily completed.

SERVICES: Obtain printed advice from "Dial Before You Dig", telephone number 1100, on the location of all existing underground services.

3 SITE MANAGEMENT

3.1 GENERAL

REQUIREMENT: Include the following items in the Project Management Plan (PMP) and any project specific provisions:

- Traffic control
- Ground water and surface water control and disposal
- Erosion and sedimentation control
- Site waste and control of contaminated material(s)
- Dust and noise control

- Protection of survey marks
- Protection of nominated items (services, trees and vegetation separately included)
- Waste minimisation and recycling of surplus material(s)
- Control measures for health, safety and environmental hazards

4 EXISTING SERVICES

4.1 GENERAL

LOCATION: Details of services shown on the Drawings and information received from “Dial Before You Dig” are indicative only and may not include all existing underground and overhead services. Verify the exact location of all services which may be affected by construction activities. If services are located which are not shown on the Drawings or are not in the location shown on the Drawings, give notice at least three (3) working days prior to commencement of any construction activity that may affect those services.

PROTECTION AND MAINTENANCE: Protect and maintain existing services to the satisfaction of the relevant authority or owner. This may include relocation, temporary diversion or structural support of the service(s).

REPAIR: If a service is damaged during construction, advise, record for verification and provide assessment and advise of remedial options. If repairs are directed, obtain from the authority or owner, written confirmation that the repair has been carried out to their satisfaction. If the owner cannot be contacted within a reasonable time, report the damage, and effect its repair to industry standard, and leave accessible until acceptance can be obtained.

5 CLEARING

5.1 GENERAL

EXTENT: Do not destroy, remove or clear vegetation or surface improvements to an extent greater than necessary for the execution of works. Clear along pipeline installation routes to a maximum width of four (4) metres or to the “Project Management Plan” requirements.

TREES: Obtain written approval for the removal of trees. Mark and protect those that are to be retained. Any injury to protected trees is to be treated and healed by a qualified “tree surgeon”. Tree trunks to be kept clear of excavated material.

TOPSOIL: Excavate and stockpile all topsoil and use for restoration, after completing backfilling operations. Use equivalent imported material to make up shortfall, or recycle any surplus.

DISPOSAL: Topsoil, cleared vegetation, old works, rubbish and excavated material, not required for restoration work and suitable for recycling, to be removed from site and disposed in an acceptable manner.

6 RESTORATION

6.1 GENERAL

REQUIREMENT: Restore services, improvements, kerb and gutter, pavements including sub-base, lawns and other surfaces as near as practicable to the condition and appearance existing prior to commencement of work. Improvements include, but are not restricted to, shrubs, gardens and other vegetation, retaining walls, fences, fixtures and other structures.

TIMING: Backfill and restore progressively as pipeline installation or other work proceeds. Complete temporary restoration of pavements and other restoration within 5 days of backfilling. Complete final pavement restoration as required, or at least within one month of backfilling.

6.2 IMPROVEMENTS

HARD SURFACES: Where excavation involves breaking through a rigid or semi-rigid surface, such as concrete, or kerb and gutter, sawcut to a 50 mm minimum depth to form straight finishing edges. Other surfaces to local authority's requirement.

PAVEMENTS: Immediately after backfilling of a trench excavated through a pavement, temporarily restore the surface and maintain it in a trafficable condition until final restoration is completed. Where the original pavement was bitumen or asphalt use a pre-mixed asphaltic or other suitable material accepted by the road authority for the temporary restoration. Otherwise use crushed metal or gravel.

TURF AREAS: Re-turf all areas originally grassed and subsequently disturbed by construction activities, using original or similar species of grass, top-dress and maintain to re-establish original condition.

GRASSED AREAS: Re-place topsoil to a minimum thickness of 75 mm, seed to match original species and maintain to establish re-growth. Re-seed as necessary.

TREES: Where required, supply, plant and maintain replacement trees of accepted size and species.

6.3 SETTLEMENT

REQUIREMENT: Make good any settlement, including restored and improved surfaces.

NATURAL SURFACES: Heap replaced topsoil to allow for expected future settlement. Obtain agreement with property owner.

6.4 TUNNELLING

REQUIREMENT: Where used in lieu of trenching, construct so as to restore full support to the ground surface and make good any settlement.

6.5 FINISHED SURFACE TOLERANCES

ACCESS AND CONTROL STRUCTURES: Surface finish to meet the following criteria:

- a) Vertical tolerance for items in trafficable areas and pedestrian thoroughfares } ± 5mm
- b) Vertical tolerance for items in all other areas } + 50mm
- 20mm

7 SCHEDULES

7.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS/NZS 3905.2](#) - Guide to [AS/NZS ISO 9001](#), [AS/NZS ISO 9002](#) and [AS/NZS 9003](#) for construction
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

7.2 AGENCY PRACTICES

[To be prepared]

7.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Prepare the site and restore in compliance with Section TR2 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR2	CLAUSE	DETAILS
Project Management Plan		
- Site management provisions	3.1	-
- Environmental provisions	5.1	-
Existing services	4	
Clearing and tree retention	5.1	

SECTION TR7 EARTHWORKS**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for excavation, engineered fill and the preparation of foundations for pumping stations, reservoirs and similar water projects.

1.2 CROSS REFERENCES

RELATED SECTION: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

REQUIREMENTS: To [AS 3798](#).

1.4 DEFINITIONS

ROCK: Material too hard to be broken up or dislodged by pneumatic spade and volume greater than 0.5m³.

OTR (OTHER THAN ROCK): Any excavated material not classified as rock.

COHESIONLESS SOIL: Sand and gravel size mixtures of durable particles generally with less than 5% fines (ie. material finer than 75 microns) which are non-plastic and do not exhibit a well defined moisture-density relationship when tested in accordance with [AS 1289.5.1.1](#), [AS 1289.5.2.1](#) and [AS 1289.5.7.1](#).

COHESIVE SOIL: Those materials which have a defined moisture - density relationship when tested in accordance with the above methods.

NATIVE SOIL: Cohesive or cohesionless soils, and weathered rock which can be ripped and broken down by compaction with maximum particle size within the layer after compaction not exceeding two-thirds of the compacted layer thickness.

“BAD GROUND”: Ground unsuitable for the purposes of the Works, including filling liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances including oil, cement, chemicals, or ground which is or becomes soft, wet, and unstable, and the like.

DEWATERING SYSTEM: May be external and/or internal.

External Dewatering: Essential, continuously operated system of wells, well points or similar, sunk near or in an excavation.

Internal Dewatering: Removal of seepage, rainwater and incidental flows from an excavation, usually by sump pumps.

GEOTEXTILE: Proprietary fabrics with particular properties suitable to act as a filter, drainage layer or physical separator to allow water flow whilst avoiding migration of soil particles, or as a tensile reinforcement layer.

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(S) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

INSPECTION PERSONNEL: Personnel responsible for structural certification to be a qualified and practicing geotechnical engineer or engineering geologist.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions and qualifications of inspection personnel | H |
| • Availability of relevant current referenced Standards | H |
| • Services located/exposed | W |
| • Width, and depth to design level | W |
| • Shoring and/or shielding | W |
| • Drainage | W |
| • Foundation, minimum bearing capacity | W |
| • Latent conditions | H |

2.2 SOIL TESTS

REQUIREMENT: Unless given in soil investigation reports, provide the following information at least two weeks before starting fill operation:

- Source of material;
- Particle size distribution curves;
- Atterberg limits for cohesive soils;
- Emerson Class Number for cohesive soils (for water retaining structures).

Testing to be carried out by a NATA registered laboratory.

2.3 INSPECTION

REQUIREMENT: Have all permanent cut batters and temporary batters more than 4 metres high and areas prepared for footings, slabs or like, inspected and certified as suitable for the intended purpose.

3 EXCAVATION

3.1 EXTENT

REQUIREMENT: Excavate to specified depths, levels and slopes.

3.2 "BAD GROUND"

REQUIREMENT: If bad ground is encountered, advise, record for verification, and provide documented remedial assessment from a qualified and practicing geotechnical engineer or engineering geologist.

3.3 OVER-EXCAVATION

RECTIFICATION: Fill to nominated level with concrete, or other filling and compact to **MATERIALS AND PLACEMENT - CLAUSE 4**.

3.4 SUPPORT SYSTEMS

REQUIREMENT: Where required, provide support system designed by a practicing geotechnical/structural engineer.

3.5 DRAINAGE

SURFACE DRAINAGE: Keep groundworks free of surface water. Provide and maintain slopes, crowns and drains on excavations and embankments to ensure satisfactory drainage. Place construction including filling, paving, structures, services, and the like on ground from which surface water has been removed. Protect freshly laid work from water damage.

DEWATERING SYSTEM: Keep system operating during excavation and until compaction of any backfilling is complete.

3.6 SPOIL STOCKPILE

REQUIREMENTS: Keep excavated material clear of the excavation and away from fences and access tracks/walkways. Do not load cut face and fill slopes, and slopes supported by retaining walls, by spoil stockpile unless assessment of the slope stability has been made and included allowance for the particular loads.

4 MATERIALS AND PLACEMENT

4.1 PREPARATION

GENERALLY: Prepare the ground surface under slabs, paving and embankments by compaction to achieve the densities specified for these locations. If necessary, loosen the ground to a depth of 200 mm and adjust the moisture content before compaction.

ROCK LEDGES: Remove any overhanging rock ledges.

BENCHING: If filling is to be placed against a ground surface which slopes more than 1V:4H, bench the ground surface to form a key for the filling. As each layer of filling is placed, cut the existing ground surface progressively as the filling is placed, to form a series of horizontal steps at least 1m in width. Recompact the material thus excavated as part of the filling.

4.2 GEOTEXTILE

MATERIAL TYPE: As specified.

PROTECTION: Provide protective covering. Store clear of the ground and out of direct sunlight. During installation do not expose to sunlight for more than 14 days.

PREPARATION: Before placing, trim the ground to a smooth surface free from cavities and projecting rocks.

PLACING: Lay the geotextile flat, but not stretched tight, and secure it with anchor pins. Overlap joints 500 mm minimum.

4.3 FILL MATERIALS

FILL TYPES: Material may include:

- Native soil, from either contract excavation or borrow areas on or off the site;
- Granular material;
- Rock ballast.

GRANULAR MATERIAL: Graded crushed rock or gravel conforming to [AS 2758.1](#) or RTA Specification No. 3051.

“UNSUITABLE” FILL: As defined in [AS 3798](#), Clause 4.2.

4.4 PLACING FILLING

EXTENT: Place and compact as specified. Keep surface self draining.

LAYERS: Place filling in near-horizontal layers of uniform thickness and compact each layer as specified.

PLACING AGAINST CONCRETE: Do not place filling against concrete until the concrete has been in place for fourteen days.

PLACING AT STRUCTURES: Place and compact filling in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading.

4.5 COMPACTION

NATIVE SOIL AND GRANULAR MATERIAL: Compact in specified layer thicknesses and to a specified dry density ratio (cohesive soils) or density index (cohesionless soils) at specified compaction moisture content.

5 FOUNDATIONS

5.1 GENERAL

REQUIREMENT: Provide minimum bearing capacity foundation, as specified, at required level (tolerance +0, -50 mm) without abrupt irregularities or undulations.

IMPROVEMENTS: If provisions not included in the design, advise, record for verification and provide documented remedial assessment from a qualified and practicing geotechnical engineer or engineering geologist.

5.2 ROCK FOUNDATIONS

REQUIREMENT: Remove all material below the specified foundation level that has been shattered, disturbed or loosened by the excavation process, including all grit and rock fragments and bring surface to specified level and profile with N20 concrete or with compacted "suitable" filling.

EXPLOSIVES: Charges to be limited to minimise disturbance to underlying rock and any nearby structures.

5.3 OTR FOUNDATIONS

REQUIREMENT: Excavate to foundation level and remove any under-lying "unsuitable" material and refill with compacted "suitable" filling.

6 SCHEDULES

6.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1289 - Methods of testing soils for engineering purposes
 - .5.5.1 - Determination of dry density/moisture content relation of a soil using standard compactive effort
 - .5.2.1 - Determination of dry density/moisture content relation of a soil using modified compactive effort
 - .5.7.1 - Compaction control test – Hilf density ratio and Hilf moisture variation (rapid method)

- AS 2758 - Aggregates and rock for engineering purposes
 - .1 - Concrete aggregates

- AS 3798 - Guidelines on earthworks for commercial and residential developments

- AS/NZS 3905.2 - Guide to AS/NZS ISO 9001, AS/NZS ISO 9002 and AS/NZS 9003 for construction

- AS/NZS ISO 9002 - Quality system: Model for quality assurance in production, installation and services

RTA (ROADS AND TRAFFIC AUTHORITY) OF NSW, SPECIFICATION:

- NO. 3051 - Unbound and Modified Base and Subbase Materials for Surfaced Road Pavements

6.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Prepare the foundation(s) in compliance with Section TR7 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR7	CLAUSE	DETAILS
Soil investigation reports	2.2	
Geotextile	4.2	
Compaction layer thickness	4.5	

SECTION TR10 CONCRETE PLACEMENT

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the construction of concrete civil engineering works such as liquid-retaining and marine structures.

1.2 CROSS REFERENCES

RELATED SECTIONS: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

DESIGN: Prepare to [AS 3735](#).

MATERIALS AND CONSTRUCTION: To [AS 3600](#).

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

TRAINING: [To be prepared]

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions | H |
| • Concrete to Section SP44 and/or Section SP45 | W |
| • Other products and materials to Section TR10 | W |
| • Reinforcement, cores and embedment completed and fixed in place | W |
| • Formwork completed, before concrete placement | W |
| • Curing | W |
| • Evaluation of concrete finish | W |

3 FORMWORK AND TOLERANCES

3.1 GENERAL

STANDARD: To [AS 3610](#). Make all formwork mortar-tight.

PRESTRESSED CONCRETE: Ensure forms allow any elastic shortening or movement of the members to take place during stressing without damage to the concrete.

FORMWORK OIL: Use only those which do not stain or discolour the concrete and apply to manufacturer's recommendation. Surface retarding agents not accepted.

FORM TIES: Observe cover requirements for embedded sections. Flat section ties accepted only with their longer cross-section vertical.

Removal: Remove ends or end fasteners without damaging concrete. Fill resultant holes on surfaces to be exposed to air with fully bonded cementitious mortar to **MORTAR - CLAUSE 4.3** with surface matching that of the surrounding concrete. On surfaces to be exposed to liquids or salt spray (including splash zones) or are buried or non-visible, fill holes with epoxy paste to **EPOXY PASTE - CLAUSE 4.4**.

3.2 TOLERANCES

REQUIREMENT: Construct to the following dimensional requirements. The tolerances given are for individual measurements and are not cumulative.

POSITION AND SIZE OF STRUCTURES AND MEMBERS:

Absolute position: 25 mm horizontal and 6 mm vertical from specified location and level.

Surfaces: To [AS 3610](#), Clause 3.4. Substitute [AS 3600](#), Clauses 19.5 tolerances for the asterisks in Table 3.4.2. Depressions on flat surfaces, and reverse slopes on sloping surfaces, prohibited.

Matching alignment and/or elevation: For relative positions of adjacent edges or points specified as being on the same level or alignment:

Separation (mm)	Tolerance (mm)
Below 150	± 3
150 to 300	± 6
Over 300	± 12

Specified dimensions: For cross-sectional dimensions of columns, beams and similar, and thickness of slabs and walls:

Dimension (mm)	Tolerance (mm)
Below 150	0, +5
150 to 1000	±5
Over 1000	1/200 times the dimension

Reinforcement: Between bars in a row ± 10% of specified spacing, or 15 mm, whichever is greater.

- Between rows of bars: ±6 mm;
- Cover to reinforcement: 0, + 10 mm;
- Restriction: To [AS 3600](#) requirements for spacing of bars.

Tendons, sheaths and ducts:

- Position and spacing:
 - (a) Pretensioned work ± 3 mm;
 - (b) Post-tensioned work ± 6 mm.
- Cover: 0, +6 mm.

Other dimensions: Any specified dimension, not included above:

Dimension	Tolerance (mm)
Below 300 mm	± 3
300 mm to 3 m	± 6
Over 3 m to 6 m	± 12
Over 6 m to 12m	± 18
Over 12 m	± 25

3.3 FORMWORK REMOVAL

REQUIREMENT: To AS 3600, Clause 19.6.2, except that Table 19.6.2.5 applies only to concrete which has reached at least 85% of its characteristic strength by the given periods.

CONTINUOUS STRUCTURES: Do not remove support from any span until all the concrete in adjacent spans has gained the specified characteristic strength.

EARLY LOOSENING: Required where temperature change or shrinkage could cause damage to restrained concrete.

PRECAUTION: Do not exert pressure on fresh concrete with crowbars or similar. Transfer load from formwork to concrete gradually and smoothly.

4 MATERIALS

4.1 CONCRETE

REQUIREMENT: Standard Class to Section SP44 and Special Class to Section SP45.

4.2 GROUT FOR PRESTRESSED DUCTS

STANDARD: To AS 3600, Clause 19.1.8.

MATERIALS: Portland cement Type SL and water.

Admixtures: Provide details. Chlorides, nitrates, sulphides or sulphites are prohibited.

WATER-CEMENT RATIO: Consistent with adequate fluidity, as low as possible and within range 0.40 to 0.45 by weight.

RELATIVE DENSITY: From 1.85 (0.45 w/c) to 2.00 (0.40 w/c). Test by hydrometer.

MINIMUM COMPRESSIVE STRENGTH: 25 MPa at 7 days and 40 MPa at 28 days. Test to BS 1881.116 on a 100 mm test cube.

BLEEDING: Grout sample approximately 100 mm high. Measure bleeding in a covered cylinder approximately 100 mm diameter.

Requirement: Maximum bleeding 4% of volume or, 3 hours after mixing, 2%. Separated water to be re-absorbed within 24 hours.

4.3 MORTAR

MATERIALS: Cement (type as specified for element in which mortar is used), fine sand and water.

MIX PROPORTIONS: Mortar to following proportions by weight:

Cement to sand ratio: 1:2½ minimum.

Water cement ratio: 0.35 maximum.

CONSISTENCY: Workable but not fluid. Free of voids, honey-combing or segregation when placed in position.

DRY-PACKED MORTAR: Mortar to be compacted by ramming without crumbling.

4.4 EPOXY PASTE

MATERIAL: Moisture tolerant (adherence to damp concrete), solventless epoxy paste, such as Hilti CA 273.

Mixing ratio: 1:1. Addition of fillers not accepted.

5 REINFORCEMENT

5.1 GENERAL

STANDARD: To [AS 3600](#), Clause 19.2.

REQUIREMENT: Supply and fix reinforcement, including soft ferrous ungalvanised tie wires, support chairs, formwork spacers and the like. Chairs and spacers to be plastic and purpose-made. Chair spacing 60 diameters maximum for bars, and 750 mm for fabric.

IDENTIFICATION: Reinforcement to be readily identifiable as to grade, origin and element location.

COMPLIANCE WITH STANDARD: Obtain from the manufacturer and furnish a certificate of compliance with the relevant standard [AS 1302](#), [AS 1303](#), or [AS 1304](#), or furnish a test certificate to the relevant standard from an independent testing authority.

SPLICING: To [AS 3600](#), Clause 13.2. Non-specified splices to be referred to the Design Engineer.

6 WORKMANSHIP

6.1 PLACING AND COMPACTION

STANDARD: To [AS 3600](#), Clause 19.1.3.

PLACEMENT: Provide details of proposed methods of placement.

VERTICAL MOVEMENT: In vertical elements, limit the free fall of concrete to 1500 mm per 100 mm element thickness, up to a maximum free fall of 2000 mm.

LAYERS: Place concrete in maximum 500 mm layers such that each succeeding layer is blended into the preceding one by the compaction process.

SEQUENCE OF POURS: Minimise shrinkage effect by pouring the sections of the work between construction joints in a sequence such that there will be suitable time delays between adjacent pours. Provide location of construction joints, pour sequence and time delays if not shown on the drawings or specified.

COMPACTION: Use immersion and screed vibrators accompanied by hand methods as appropriate and form vibrators where use of immersed vibrators is impracticable. Ensure concrete is fully compacted and entrapped air removed. Do not allow vibrators to come into contact with partially hardened concrete, or reinforcement embedded in it. Do not use vibrators to move concrete along the forms. Insert at points maximum 500 mm apart. Provide details of proposed methods of compaction.

6.2 PREPARATION FOR PLACING

ADJOINING SURFACES AND EMBEDDED ITEMS: Ensure surfaces against which concrete is to be placed are clean, moist (if absorbent), free from laitance and other coatings and free of weak or loose material. In hot weather, cool non-absorptive surfaces by watering and remove excess.

6.3 MOISTURE LOSS PREVENTION

REQUIREMENT: Prevent plastic shrinkage cracking by restricting the evaporation of water from freshly placed concrete.

EVAPORATION RETARDER: Application of a fine uniform spray is accepted provided that during finishing operations, it is not mixed into the surface mortar.

MEASUREMENT: **RATE OF EVAPORATION DRAWING - CLAUSE 9.4** attached, may be used as a guide.

6.4 PLACING IN WATER

REQUIREMENT: Use tremie method of placement such that neither free discharge of concrete into water nor segregation occurs. Continue placement so that the finished surface is free of laitance and contaminated concrete.

CONCRETE: Minimum cementitious content 400 kg/m³.

COMPACTION: By action of self weight only.

6.5 CONSTRUCTION JOINTS

STANDARD: To [AS 3600](#), Clause 19.4.1.

LOCATION: Non-specified construction joints to be referred to the Design Engineer.

JOINT PREPARATION: Before fresh concrete is placed at a construction joint, roughen and clean the hardened concrete surface of the joint, so that all loose or soft material, foreign matter and laitance is removed to expose clean coarse aggregate. Just prior to placement, dampen the hardened concrete surface, without leaving free water. Surface retarders prohibited.

FINISH AT CONSTRUCTION JOINTS: Unless otherwise specified, butt join the surfaces of adjoining pours. Surfaces/edges that remain visible, to [AS 3610](#), physical quality requirements, Class 2.

6.6 LEVEL SURFACES

REQUIREMENT: Provide following cross-fall to weather exposed surfaces.

Narrow surfaces: (up to 1 metre) 3 mm per 100 mm width.

Broad surfaces: (over 1 metre) 2 mm per 100 mm width.

6.7 FORMED SURFACES FINISH

REQUIREMENT: Provide one of the following classes as specified.

Class F1 - Acceptance criteria.

- Abrupt and gradual irregularities less than 25 mm.
- [AS 3610](#) - Class 3 finish. Blowholes to Appendix B, Figures B3 (a) and (b).
- Blowhole depth less than 10 mm.

Class F2 - Acceptance criteria.

- Abrupt irregularities less than 6 mm.
- Gradual irregularities less than 12 mm.
- [AS 3610](#) - Class 2 finish. Blowholes to Appendix B, Figures B2 (a) and (b).
- Blowhole depth less than 10 mm.

Class F3 - Acceptance criteria.

- Abrupt irregularities not accepted.
- Gradual irregularities less than 6 mm.
- [AS 3610](#) - Class 1 finish. Blowholes to Appendix B, Figures B1 (a) and (b).
- Blowhole depth less than 6 mm.

DEFINITION: Offsets resulting from displaced or misplaced form sections, from loose knots or otherwise defective forms, to be classed as abrupt irregularities and be assessed by direct measurement.

Gradual irregularities to be measured from a straight template 1.5 metres long.

Bagged surface finish prohibited.

6.8 UNFORMED SURFACES FINISH

REQUIREMENT: Provide one of the following classes as specified.

Class U1 - (Screeded finish)

Acceptance criteria.

- Abrupt and gradual irregularities less than 10 mm.

Class U2 - (Wood float finish)

Acceptance criteria.

- Abrupt and gradual irregularities less than 5 mm.

Class U3 - (Steel trowelled finish)

Acceptance criteria.

- Abrupt irregularities not accepted.
- Gradual irregularities less than 5 mm.

DEFINITION: Vertical offsets to be classed as abrupt irregularities and be assessed by direct measurement.

Gradual irregularities to be measured from a straight template 3 metres long.

6.9 CURING

STANDARD: To [AS 3600](#), Clause 19.1.5.

REQUIREMENT: Use following methods:

- ponding or continuous sprinkling with water (moist curing);
- an impermeable membrane with water flowing beneath it;
- an absorptive cover kept continuously wet.

CURING PERIOD (from time of placing): Commence curing immediately after finishing, and cure continuously in air between 5°C and 35°C (except steam curing) until the concrete has both attained 75% of its 28 day compressive strength as determined from trial mixes, and has cured for a minimum of 7 days.

CURING COMPOUNDS: Prohibited, unless specified.

Standard: To [AS 3799](#). Apply a minimum of 3 coats.

FORMS: Keep exposed concrete surfaces (and absorbent forms) wet for the curing period.

7 PRESTRESSING

7.1 GENERAL

STANDARD: To [AS 3600](#).

REQUIREMENT: Advise proposed prestressing system and prestressing subcontractor. Include details of grout mix, including its bleeding characteristics, grouting equipment and procedures. Prove grouting procedure by a trial operation on-site.

7.2 RECORDS

DATA: Record the following:

- concrete type;
- details of placing and curing;
- details of placing of reinforcement and prestressing tendons;
- date of prestressing operations;
- name of operator;
- piston areas;
- initial force of pressure where tendons are marked for measurement of elongations;
- final force or pressure and elongation on completion of tensioning;
- elongation remaining after release of jacks;
- tendon breakage;
- type and identification numbers of equipment used;
- identification of tendons;
- ramming pressure.

CERTIFICATES: Prior to stressing, check current calibration certificates for tensioning and tension measuring equipment.

7.3 DUCTS, ANCHORAGES AND TENDONS

STANDARD: To [AS 3600](#), Clause 19.3.

7.4 STRESSING OPERATIONS

STANDARD: To [AS 3600](#), Clause 19.3.4.

DUCTS: Clean ducts after concreting to remove any obstructions to impending post-tensioning. Avoid damage to ducts, vents and fittings during cleaning and grouting operations.

STRESSING: Do not commence until the concrete has attained the required transfer strength.

CUTTING TENDONS: Cut a minimum of seven days after grouting. Do not flame cut.

PROTECTION OF TENDONS AND ANCHORAGES: On completion of stressing and grouting, permanently protect all anchorage parts and tendons. Fill anchorage recesses with same concrete as in the member, providing no less than 40 mm cover to cut tendons. Where tendons ends are not to be concreted, advise details.

7.5 STRENGTH AT TRANSFER

REQUIREMENT: Verify compressive strength of concrete before transferring prestress load.

SAMPLES: In addition to compliance tests, the following are required:

Pre-tensioned work: 2 samples from each casting line. } **cure cylinders as**
Post-tensioned work: 2 samples from each member. } **per the cast**
 } **member.**

VERIFICATION: Test cylinders from one sample to [AS 1012.9](#). Test is satisfactory if one cylinder meets specified strength at transfer and the other exceeds it by at least 5%. If test fails after further curing, test second sample.

ADVICE: Record certified test results. If both tests fail, advise proposed action.

7.6 GROUTING DUCTS

STANDARD: To [AS 3600](#), Clause 19.3.4.7.

REQUIREMENT: Grout ducts as soon as practicable, maximum 73 hours after stressing tendons and when concrete temperature is between 10°C and 30°C. Immediately before grouting, prove ducts with water test. Remove water with oil-free compressed air.

GROUT: Before adding cement, place water with any premixed additive in agitator tank. Mix grout for 4 minutes maximum and use within 30 minutes. Pass the mixed grout through 1.18 mm screen. Reject the batch if lumps are retained.

WATER-FILLED DUCTS: Grouting prohibited.

EQUIPMENT: Minimum 1000 r.p.m. mixer, 2 stage type with separate agitator tank capable of producing grout free of lumps and undispersed cement. Pump, minimum 1 MPa head, fitted with a NATA calibrated pressure gauge.

REQUIREMENT: Inject grout at lower end at an even rate. Hold at minimum 400 kPa pressure and progressively bleed all vents, working back to injection point. After all entrapped water and air have been expelled, remove all inlet pipes, vents and drains, or cut off flush with concrete surface minimum 24 hours after grouting.

FAILURE: Keep flushing equipment on site for duration of grouting operation. If grouting fails, immediately flush out ducts and provide details of proposed rectification measures.

PROTECTION: Protect member from shock or vibration for 24 hours after grouting and from superimposed loads for 48 hours. Lift precast member minimum 7 days after grouting.

GROUT TESTS: Take not less than three samples during each day's grouting, and test for compliance with **GROUT FOR PRESTRESSED DUCTS - CLAUSE 4.2**.

GROUT RECORDS: For each duct grouted, identify the duct and tendons, the stressing and grouting dates, the composition of the grout (cement type, water cement ratio, admixtures), grout density, and details of grouting (interruptions, topping up, etc).

8 EMBEDMENTS, CORES AND FIXINGS

8.1 FIXINGS AND EMBEDDED ITEMS

STANDARD: To [AS 3600](#), Section 14.

TOLERANCES ON PLACEMENT: Maximum deviations from correct positions:

- Embedded items and cores ± 10 mm.
- Fixings (anchor bolts, etc) ± 3 mm.

8.2 PROTECTION OF FIXINGS

REQUIREMENT: Embedded and inserted ferrous fixings (other than stainless steel), including anchor bolts. Galvanise to [AS 1650](#) and grease threads.

9 SCHEDULES

9.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1012](#) - Methods of testing concrete
- [AS 1012.9](#) - Determination of the compressive strength of concrete specimens
- [AS 1302](#) - Steel reinforcing bars for concrete
- [AS 1303](#) - Steel reinforcing wire for concrete
- [AS 1304](#) - Welded wire reinforcing fabric for concrete
- [AS 1650](#) - Hot-dipped galvanized coatings on ferrous articles
- [AS 2159](#) - Piling code
- [AS 3600](#) - Concrete structures
- [AS 3735](#) - Concrete structures for retaining liquids
- [AS 3610](#) - Formwork for concrete
- [AS 3799](#) - Liquid membrane-forming curing compounds for concrete
- [AS/NZS 3905.2](#) - Guide to [AS/NZS ISO 9001](#), [AS/NZS ISO 9002](#), and [AS/NZS ISO 9003](#) for construction
- [AS/NZS ISO 9002](#) - Quality systems: Model for quality assurance in production, installation and servicing

WS-SPEC SECTIONS:

Section SP44: Concrete Supply Standard Class

Section SP45: Concrete Supply Special Class

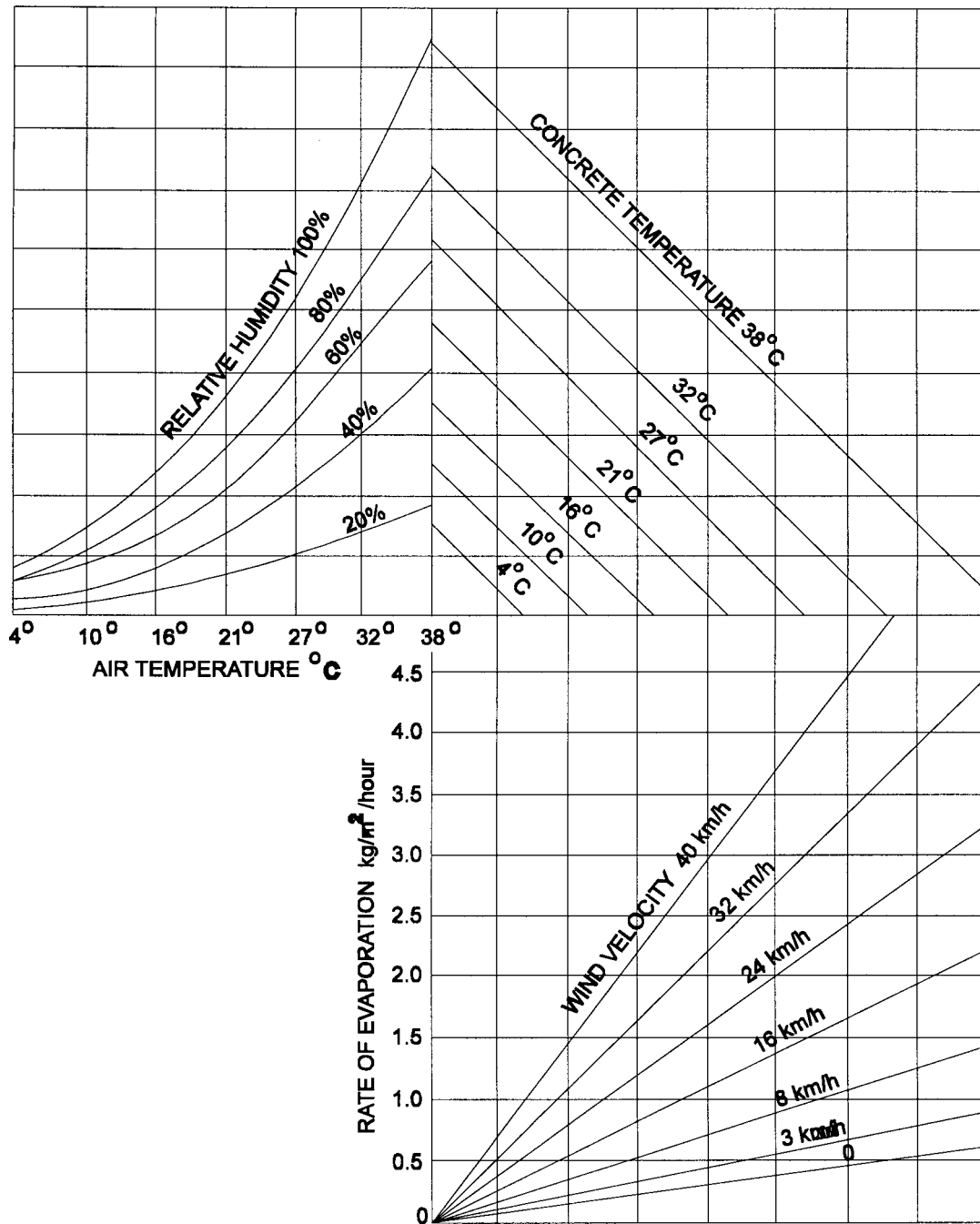
9.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications].

REQUIREMENT: Construct concrete works in compliance with Section TR10 and the following:

INFORMATION TO BE SUPPLIED			CONCRETE MIX TYPE			
SECTION TR10		CLAUSE				
Class and Grade		-				
STRENGTH GRADE	Pre-stressed Concrete, Compressive at Transfer (MPa)	7.5				
OTHER	Curing Compound Accepted Yes/No	6.9				
	Minimum Period Between Adjacent Pours (Days)	6.1				
SURFACE FINISH	Locations:	6.7				
		6.8				

9.3 RATE OF EVAPORATION DRAWING



APPLICATION: To determine expected rate of evaporation from freshly placed concrete start at *AIR TEMPERATURE* move up to *RELATIVE HUMIDITY* across to *CONCRETE TEMPERATURE* down to *WIND VELOCITY* and read *RATE OF EVAPORATION*.

ACKNOWLEDGEMENT: Derived from ACI 308-81 as adopted by RTA

SECTION TR12 PIPELINE EXCAVATION

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the excavation of trenches for both pressure and non-pressure pipelines up to and including 750mm nominal size (DN). Application includes, but is not limited to, water supply, sewerage, and stormwater.

1.2 CROSS REFERENCES

RELATED SECTION: Refer to **GENERAL TECHNICAL - SECTION TRI**.

1.3 STANDARDS

PIPELINES, FLEXIBLE: To [AS/NZS 2566](#), Parts 1 and 2 [Part 2 under preparation], complemented by [AS 2032](#), [AS 2033](#) and [AS 3690](#). [Note: Includes DI, Steel, PVC, PE, GRP and ABS]

PIPELINES, RIGID: To [AS 3725](#) and [AS 4060](#). [Note: Includes RC, VC and FRC]

DESIGN: To [WSA 02](#) and [WSA 03](#).

1.4 DEFINITIONS

ROCK: Material too hard to be broken up or dislodged by pneumatic spade and volume greater than 0.5m³.

OTR (OTHER THAN ROCK): Any excavated material not classified as rock.

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLANS(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

INSPECTION PERSONNEL: Personnel responsible for certification to be accredited pipe layers.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions and qualifications of inspection personnel | H |
| • Availability of relevant current referenced Standards | H |
| • Services located/exposed | W |
| • Trench width, and depth to design level | W |
| • Trench shoring and/or plating | W |
| • Trench drainage | W |
| • Foundation, minimum bearing capacity | W |

3 EXCAVATION

3.1 GENERAL

REQUIREMENT: Excavate to allow installation of pipelines and structures to specified depths or levels.

OVER-EXCAVATION AND CAVE-INS: Advise, record for verification, and rectify any over-excavation or cave-in. Obtain certification from a qualified practicing geotechnical engineer or engineering geologist for adequacy of rectification.

EXPLOSIVES: Not accepted unless specified. If required, provide blasting proposal for acceptance, outlining management of the process.

3.2 MATERIAL CLASSIFICATION

MATERIAL: Classify materials as either rock or OTR. If rock is encountered, advise and record for verification.

3.3 LIMITS OF EXCAVATION

REQUIREMENT: Excavate to the specified limits including provision for standard appurtenances such as pipe joints, anchor blocks, trench stops, bulkheads, maintenance holes and shafts, and valve chambers.

STABLE SOILS: Provide excavation width to ensure minimum embedment width between pipe barrel and excavated surface (or inside support for supported excavations) to Table 3.1 of [AS/NZS 2566.1](#).

“UNSTABLE SOILS”: Native soils with a SPT (standard penetration test) of less than 8, as described in Table 3.2 of [AS/NZS 2566.1](#). If provision not included in design, advise, record for verification, and refer to ITP for other actions.

3.4 SUPPORT OF EXCAVATIONS

REQUIREMENT: Provide temporary or permanent support as necessary to ensure safety of excavations and prevent damage to property including structures and services. Rectify any damage caused.

3.5 DEWATERING

REQUIREMENT: Keep excavations free of water during installation and backfilling.

3.6 EXCAVATED MATERIAL

SURPLUS EXCAVATED MATERIAL: Remove surplus material progressively from site.

STOCKPILING: Stockpile only material required for installation, backfilling and restoration.

4 FOUNDATIONS

4.1 GENERAL

REQUIREMENT: Provide minimum bearing capacity of 50 kPa foundation at required level (tolerance +0, -50 mm) without abrupt irregularities or undulations.

IMPROVEMENTS: If provisions not included in the design, advise, record for verification and provide documented remedial assessment from a qualified and practicing geotechnical engineer or engineering geologist.

5 SCHEDULES

5.1 REFERENCE DOCUMENTS

STANDARDS:

- AS 2032 - Code of practice for installation of UPVC pipe systems
 - AS 2033 - Installation of polythylene pipe systems
 - AS/NZS 2566 Buried flexible pipelines
 - .1 - Structural design
 - .2 - Installation [Under preparation]
 - AS 3690 - Installation of ABS pipe systems
 - AS 3725 - Loads on buried concrete pipes
 - AS 4060 - Loads on buried vitrified clay pipes
 - AS/NZS 3905.2 - Guide to AS/NZS ISO 9001, AS/NZS ISO 9002, and AS/NZS ISO 9003 for construction
 - AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing
- WSAA CODES
- WSA 02 - Sewerage Code of Australia
 - WSA 03 - Water Reticulation Code of Australia

5.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Prepare the trenches in compliance with Section TR12 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR12	CLAUSE	DETAILS
Soils investigation report	-	
Explosives accepted	3.1	
“Unstable” soil - trench widths	3.3	-
Permanent support	3.4	
Foundation stablisation	4.1	

SECTION TR13 PIPELINE INSTALLATION PRESSURE**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the installation of pressure pipelines up to and including DN 750. Application includes, but is not limited to, water supply and sewerage.

1.2 CROSS REFERENCES

RELATED SECTION: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

PIPELINES, FLEXIBLE: To [AS/NZS 2566](#), Parts 1 and 2 [Part 2 under preparation], complemented by [AS 2032](#), [AS 2033](#) and [AS 3690](#). [Note: Includes DI, Steel, PVC, PE, GRP and ABS]

PIPELINES, RIGID: To [AS 3725](#). [Note: Includes RC]

DESIGN: To [WSA 03](#).

1.4 DEFINITIONS

PIPELINE INSTALLATION: Lengths of jointed pipes, fittings and valves, including embedment and fill materials, geotextiles, marker tape (for non-metallic pipelines) and surface markers.

PRESSURE MAIN: A sewerage or water supply pressure pipeline, including scour drainage pipes, excluding water supply service connections.

SERVICE CONNECTION: Water supply pipeline from pressure main to property meter tap, including main tap and meter tap.

STRUCTURES: Includes valve pits and chambers, piered crossings, concrete bulkheads (ie traverse anchors), trench stops, anchor/thrust blocks, concrete encasement and other pipe support types.

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

TRAINING: All work covered by Section TR13 to be carried out and supervised by personnel either qualified or accredited as follows:

- Qualifications to be issued by a Registered Training Organisation listed by the National Training Information Service. These qualifications are specified in the National Training Information Package UTW 98, Utilities - Water Sector as endorsed by the Australian National Training Authority.
- Accredited to the short training courses and training assessment service providers contained in Appendix E of the Product Atlas, [WSA 03](#).

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions and qualifications of inspection personnel | H |
| • Availability of relevant current referenced Standards | H |
| • Prestart checks and site establishment | W |
| • Strategic products and materials to Section TR13 | W |
| • Pipeline installation and embedment | W |
| • Structures founded, formed and joined | W |
| • Backfilling of pipelines and structures | W |
| • Final inspection and testing | H |

2.2 EMBEDMENT TESTING

COHESIVE MATERIAL: To [AS 1289.5.4.1](#) or [AS 1289.5.7.1](#) and acceptance criteria not less than the specified dry density ratio.

COHESIONLESS MATERIAL: To [AS 1289.5.6.1](#) and acceptance criteria not less than the specified density index.

2.3 PIPELINE TESTING

HYDROSTATIC: To [AS/NZS 2566.2](#) [under preparation].

3 MATERIALS

3.1 PIPES, FITTINGS, AND VALVES

REQUIREMENT: To listed *SP SECTIONS - CLAUSE 6.1*, appropriate to the project specifics.

JOINTS: Use flexible watertight elastomeric seal (rubber ring) joints unless otherwise specified or permitted.

PRESSURE MAINS: To [WSA 03](#) for up to and including DN 375, and project specifics for up to and including DN 750.

FLANGE BOLTING (FASTENERS):

- i) Below ground:
 - For corrosive environments where a corrosion protection tape system is not specified, use stainless steel 316 to Section TR30.
 - Where a corrosion protection tape system is specified, use hot dip galvanised steel to [AS 1214](#) and [AS 4087](#), Appendix C.
- ii) Above ground: Hot dip galvanised steel to [AS 4087](#), Appendix C.

Flange Gasket: To [AS 4087](#), Appendix D.

Flange Connections: For raised to CI flat face, use manufacturer's torque, or provide shims. For raised to non-metallic flat face, provide spacer plates.

3.2 EMBEDMENT

REQUIREMENT: Comply with the following embedment materials:

Flexible pipe:- Particle size and grading limits to [AS/NZS 2566](#), Parts 1 and 2 [Part 2 under preparation].

- Rigid pipe:
 - As for flexible pipe, plus
 - Select fill to [AS 3725](#), Clause 4 and [AS 4060](#), Clause 4.5.6.

3.3 TRENCH FILL

ORDINARY FILL: Material removed from the excavation or imported and containing not more than 20 percent by mass of stones with a size between 75 mm and 150mm and none larger than 150 mm.

3.4 CONCRETE

STANDARD CLASS: To Section SP44.

SPECIAL CLASS: To Section SP45. Sulfate resistance required for applications in contact with sewage.

3.5 GEOTEXTILE

REQUIREMENT: To [AS/NZS 2566.2](#) [under preparation].

3.6 POLYETHYLENE SLEEVING

REQUIREMENT: To [AS 3680](#) and Section SP2.

4 PIPE LAYING

4.1 GENERAL

REQUIREMENT: Transport, handle, store and install pipes, fittings and jointing materials to [AS/NZS 2566.2](#) [under preparation] and in accordance with manufacturer's written instructions.

CLEANLINESS: Keep pipes and pipelines clean, and free of obstructions and material ingress.

TRENCH CLEARANCES: Further to chases, provide additional clearance around the pipe joints for the following operations made in the trench:

- Application and inspection of external protective tape systems, 500 mm radially, and at least 150 mm beyond tape extremities along the pipe.
- Site welding, to pipe manufacturer's written instructions.

VALVE OPERATION: To manufacturer's written instructions.

JOINTING DISSIMILAR PIPELINE MATERIALS: To manufacturer's written instructions.

4.2 PIPELINE EMBEDMENT

REQUIREMENT: Provide embedment as shown on Drawing WAT-100, and to Agencies Practices for applicable pipe type and depth, embedment material and native ground category. Supply and place geotextile where specified.

BEDDING: Provide even and uniform support along the pipe barrel. Provide suitable chases in foundations and bedding to ensure pipes and fittings do not bear on sockets or flanges.

COMPACTION: Compact embedment to achieve the following minimum compaction levels:

Cohesive material: 90% dry density ratio to [AS 1289.5.4.1](#) or
90% Hilf density ratio to [AS 1289.5.7.1](#).

Cohesionless material: 60% density index to [AS 1289.5.6.1](#).

Roadways: For embedment and trench fill under trafficable and other paved surfaces, increase compaction levels to 95% and 65% respectively.

DEEP PIPELINES: For covers greater than 6 metres, refer to project specifics.

4.3 INSTALLATION TOLERANCES

PIPELINES: Install to meet following criteria:

- a) Horizontal deviation from design alignment: ± 50 mm.
- b) Vertical deviation from design invert level: ± 30 mm.
- c) Angular deviation at any flexible joint not to exceed manufacturer's maximum deflection.
- d) All pipes in a length between design low and high points to have a continuously rising grade towards the high point.
- e) Locate hydrants off roadways and driveways unless otherwise specified. Install valves, scours, tees, bends and other fittings and structures within 300 mm of design location along pipeline.

4.4 CORROSION PROTECTION

REQUIREMENT: Apply corrosion protection systems for the pipe materials as detailed in ***CORROSION PROTECTION SYSTEMS - CLAUSE 6.5***.

DISSIMILAR METALS: Use materials and fixings to prevent corrosive action.

POLYETHYLENE SLEEVING: Apply sheeting generally to [AS 3681](#). Embedment to be free of sharp edged materials.

WELDED STEEL PIPELINES: Internal protection at joints to be made good to manufacturer's written instructions and in accordance with [AS 2865](#).

4.5 POLYETHYLENE TAPE SYSTEM

DESCRIPTION: Multi-component corrosion protection system for pipes, fittings and valves, applied in the factory or outside the trench prior to jointing or assembly. Systems equivalent to Polyken 927 primer, Polyken 931 mastic filler, and Polyken 930-35 wrapping tape, accepted.

REQUIREMENT: Apply in accordance with manufacturer's written instructions and as follows:

- extend wrapping to within 100 mm of field joint;
- apply filler to all cavities and spaces to provide a streamlined shape suitable for application of wrapping tape;
- wrap tape with minimum 55% overlap, to achieve a minimum of 2 tape thicknesses.

4.6 PETROLATUM TAPE SYSTEM

DESCRIPTION: Multi-component corrosion protection system, applied both outside and in the trench, for field joints (other than fusion bonded polyethylene elastomeric seal joints) including flange connections, unprotected joint fittings (such as mechanical couplings), welding collars and other welded joints. Systems equivalent to Denso multi-purpose primer, Denso mastic and/or Denso cord, Denso (600) Tape (petrolatum), Denso MP/HD overwrap tape, accepted.

REQUIREMENT: Apply in accordance with manufacturer's written instructions and as follows:

- extend wrapping minimum 200 mm beyond surface to be protected either side of joint;
- apply mastic/cord to all cavities and spaces to provide a streamlined shape suitable for application of petrolatum and overwrap tapes;
- wrap tapes with minimum 55% overlap, to achieve a minimum of 2 tape thicknesses.

4.7 HEAT SHRINK SLEEVE SYSTEM

DESCRIPTION: Corrosion protection system, applied both outside and in the trench, for welded collar joints in steel pipelines. Systems equivalent to Raychem WPC Type B with Denso WPC primer, or Canusa WLSB with Petrocote primer, accepted.

REQUIREMENTS: Apply in accordance with pipe and tape manufacturer’s written instructions.

4.8 TRENCH STOPS

REQUIREMENT: To Drawing WAT-103.

4.9 CONCRETE BULKHEADS

REQUIREMENT: To Drawing WAT-103.

4.10 STEEP PIPELINES

REQUIREMENT: Provide the following for all pipeline installations at the grades shown, irrespective of application and material type.

GRADE (%)	EROSION PROTECTION AND SUPPORT MEASURES	DRG NO.
5 - 14	TRENCHSTOPS* Spacing (M) = $\frac{100}{\text{Grade (\%)}}$	WAT-103
15 - 29	CONCRETE BULKHEADS Spacing (M) = $\frac{[L]}{\text{Grade (\%)}}$ L = [80 x Pipeline (M)] = 450 Max Where L > 100 use intermediate TRENCHSTOPS* Spacing (M) < $\frac{100}{\text{Grade (\%)}}$	WAT-103
30 - 50	CONCRETE ENCASEMENT (continuous) and CONCRETE BULKHEADS Spacing (M) = $\frac{100}{\text{Grade (\%)}}$	WAT-101 WAT-103
> 50	Project Specifics	-

* Not required in free draining native soils or select native soil embedment.

4.11 PIPE SUPPORTS

REQUIREMENT: Concrete encasement and other pipe support types to Drawings WAT-101 and 102.

CONCRETE: Cast concrete against bearing surfaces of undisturbed native soil.

4.12 SERVICE CONNECTIONS

WATER SERVICE: Connect to main and provide service to each property.

4.13 CONNECTION TO EXISTING WORKS

REQUIREMENT: Liaise with operating authority, make all necessary arrangements and complete connection to authority requirements.

4.14 THRUST AND ANCHOR BLOCKS

REQUIREMENT: Provide concrete thrust/anchor blocks at all points on pressure main where there will be unbalanced forces resulting from internal pressures such as at bends, tees, tapers and valves.

BEARING SURFACES: Provide thrust/anchor block of suitable size and bearing area to suit bearing capacity of native soil and specified test pressure. Cast concrete against bearing surfaces of undisturbed native soil.

4.15 MARKINGS

REQUIREMENT: Provide location markers as specified and shown on Drawing WAT-207 at each stop valve, air valve, scour, hydrant, change of direction and at not more than 100 metre intervals for sewerage and 200 metres for water supply pipelines along straight sections. Erect markers prior to acceptance testing. Cover hydrant markers with tape until completion of acceptance testing or until main is put into service, whichever occurs later.

SERVICE CONNECTIONS: Provide kerb marking to Drawings WAT-301 and 302.

MARKER PLATES: Provide 250 mm x 80 mm x 1.5 mm thick aluminium plates. Die-stamp red reflectorised lettering as shown below and distance to main, valve or other fitting to within 100mm.

Marker Plate Identification

	Sewer Main	Water Main
Stop valve	SEWER SV	SV
Air valve	SEWER AV	AV
Scour tee (no valve)	SEWER ScT	-
Scour with valve	SEWER ScV	ScV
Hydrant	-	H, HP or HR
Change of direction	SEWER BEND	WM BEND *
Straight section	SEWER MAIN	WM

* Alternatively, provide appropriately top coloured post as shown on Drawing WAT-207.

LOCATION: Locate marker on permanent wall, fence or post facing valve, fitting or main. If suitable permanent location is not available within 10 metres, provide marker post to detail shown on Drawing WAT-207.

FIXING: Fix plate with galvanised screw or clout at each corner.

MARKER POSTS: Use PVC DN 100 sewer pipe filled with concrete and rounded at top with central Y12 reinforcement bar, or accepted equivalent.

MARKER TAPE: For non-metallic pipelines. To [AS/NZS 2648.1](#), including a stainless steel 316 tracer wire continuously moulded onto the tape.

5 TRENCH FILL

5.1 TRENCH FILLING

SUPPORT REMOVAL: Ensure removal of temporary support does not damage or displace installations. If damage or displacement occurs, advise and record for verification.

REQUIREMENT: Fill excavations including voids left by temporary supports, with embedment or excavated material as appropriate. Reinstatement ground to pre-existing state as far as practicable. If suitable excavated material is unavailable, import cohesionless material with maximum particle size 20 mm.

5.2 COMPACTION

REQUIREMENT: Compact trench fill to achieve the following minimum compaction levels:

Cohesive material: 90% dry density ratio to [AS 1289.5.4.1](#) or
90% Hilf density ratio to [AS 1289.5.7.1](#).

Cohesionless material: 60% density index to [AS 1289.5.6.1](#).

Roadways: For trench fill under trafficable and other paved surfaces, increase compaction levels respectively to: ≥ 300 mm below pavement subgrade, 95% and 65%;
 < 300 mm below pavement subgrade, 100% and 80%.

5.3 TIMING

REQUIREMENT: Restore progressively as installations proceed.

6 SCHEDULES

6.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners
- [AS 1289](#) - Methods for testing soils for engineering purposes: Parts 5.4.1, 5.6.1 and 5.7.1
- [AS 1379](#) - Specification and supply of concrete
- [AS 2032](#) - Code of practice for installation of UPVC pipe systems
- [AS 2033](#) - Installation of polyethylene pipe systems
- [AS/NZS 2566](#) - Buried flexible pipelines
 - .1 - Structural design
 - .2 - Installation [under preparation]
- [AS/NZS 2648.1](#) - Underground marking tape, Part 1: Non-detectable tape
- [AS 2758](#) - Aggregates and rock for engineering purposes
 - .1 - Concrete aggregates
- [AS 2865](#) - Safe working in a confined space
- [AS 3680](#) - Polyethylene sleeving for ductile iron pipelines
- [AS 3681](#) - Guidelines for the application of polyethylene sleeving to ductile iron pipelines and fittings
- [AS 3690](#) - Installation of ABS pipe systems
- [AS 3725](#) - Loads on buried concrete pipes
- [AS/NZS 3905.2](#) - Guide to [AS/NZS ISO 9001](#), [AS/NZS ISO 9002](#), and [AS/NZS ISO 9003](#) for construction
- [AS 3972](#) - Portland and blended cements
- [AS 4060](#) - Loads on buried vitrified clay pipes

- AS 4087 - Metallic flanges for waterworks purposes
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and services

WSAA CODES:

- WSA 03 - Water Reticulation Code of Australia

WS-SPEC SECTIONS:

- Section SP1 : Steel Pipes and Fittings
- Section SP2 : Ductile Iron Pipes and Fittings
- Section SP3 : Grey (Cast) Iron Fittings
- Section SP4 : UPVC Pipes and Fittings
- Section SP5 : GRP Pipes and Fittings
- Section SP6 : Polyethylene Pipes and Fittings
- Section SP8 : Concrete Pipes
- Section SP11 : ABS Pipes and Fittings
- Section SP15: Elastomeric Seals
- Section SP20 : Sluice Valves Metal Seated
- Section SP21 : Sluice Valves Resilient Seated
- Section SP24 : Butterfly Valves Waterworks Purposes
- Section SP25 : Non-return Valves
- Section SP27 : Air Valves
- Section SP28 : Spring Hydrant Valves
- Section SP30 : Protective Coatings for Valves
- Section SP44 : Concrete Supply Standard Class
- Section SP45 : Concrete Supply Special Class
-
- Section TR30: Stainless Steel

6.2 REFERENCED DRAWINGS

WATER RETICULATION CODE OF AUSTRALIA (WSA 03):

- WAT-100 - Trench and Backfill Typical Arrangement
- WAT-101 - Pipe Supports Type A to G
- WAT-102 - Pipe Supports Type H to K and for Non-Supportive Soils
- WAT-103 - Trenchstop and Bulkheads Typical Arrangement

- WAT-203 - Thrust Blocks - Concrete
- WAT-207 - Location Markers Typical Arrangement
- WAT-300 - Service Connections Sheet 1 Single Service - Main to Meter
- WAT-301 - Service Connections Sheet 2 Twin Services - Main to Meter

6.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Install the pipelines in compliance with Section TR13 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR13	CLAUSE	DETAILS
Pipe materials and sizes	3.1	
Fitting materials and sizes	3.1	
Valve types and sizes <ul style="list-style-type: none"> - sluice valves: metal sealed - sluice valves: resilient sealed - butterfly valves - non-return valves - air valves - spring hydrant valves 	3.1	- - - - - -
Markings and marker tape	4.15	
Flange joint bolting and accessories not elsewhere supplied (eg. pipes, valves)	3.1	
Corrosion protection systems <ul style="list-style-type: none"> - pipes - fittings - valves 	4.4, 6.5	- - -
Geotechnical	-	
Embedment details <ul style="list-style-type: none"> - pipeline minimum covers - bedding minimum thicknesses - clearance minimum widths - overlay minimum thicknesses - embedment materials - trench fill materials 	3.2	- - - - - -
Service connections	4.11	
Pipe supports		
Trench stops and bulkheads	4.8, 4.9	
Testing (pressures and lengths)	2.3	

6.4 AGENCY PRACTICES

DEPT. OF LAND & WATER CONSERVATION, NSW AND

DEPT. OF PUBLIC WORKS & SERVICES, NSW:

Pipeline Installation: : To Figure TR13.1 (and TR14.1).

6.5 CORROSION PROTECTION SYSTEMS

GENERAL: The corrosion protection systems nominated in the Project Specifics have been selected from the following table:

PIPELINE ELEMENT	MATERIAL	INTERNAL PROTECTION (i) *	EXTERNAL PROTECTION	
			APPLIED OUTSIDE THE TRENCH (ii) *	APPLIED IN THE TRENCH (iii)
PIPES & FITTINGS	STEEL	CL, FB, LA	FB, LA, PET, HSS	PLT, HSS, nil
	DI/CI	CL, FB, nil, TB, LA, TC	PS, FB, nil, TB, LA, TC	PS (part), nil
	PVC, GRP, PE, ABS	nil	nil	nil
VALVES	DI/CI	TB, LA, TC	TB, LA, TC, PS	PLT, PS (part), nil

LEGEND: * = generally applied in the factory

- CL = cement lining
 - FB = fusion bonded polyethylene
 - LA = liquid applied
 - TB = thermal bonded
 - TC = transit coat
 - PS = polyethylene sleeving
 - PLT = petrolatum tape
 - PET = polyethylene tape
 - HSS = heat shrink sleeve
 - nil = no protection
 - part = partly applied in the trench
- } Refer to Sections SP1, SP2 and SP3
- } Refer to Section SP30
- } See Clause 4.4
- } See Clauses 4.5, 4.6 and 4.7

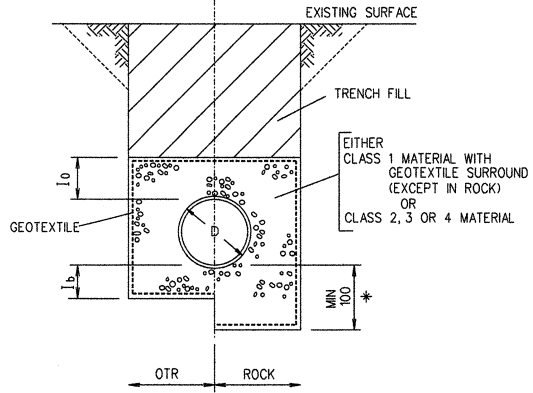
SPECIFICATION CODE: Use the following code in the contract specifics.

PIPELINE ELEMENT	:	MATERIAL, (i) – (ii) – (iii)
------------------	---	------------------------------

Example: PIPES (RRJ) : DI , CL - PS - PS (part)
 FITTINGS (plain) : DI , CL - PS - PS (part)
 (complex) : DI , CL - PET - PLT
 VALVES : DI/CI , TB - TB - PLT

Note: RRJ = elastomeric seal jointed Plain = plain bends
 Complex = tees, flanged jointed connections

TR13-14.1-DGN 2-7-00

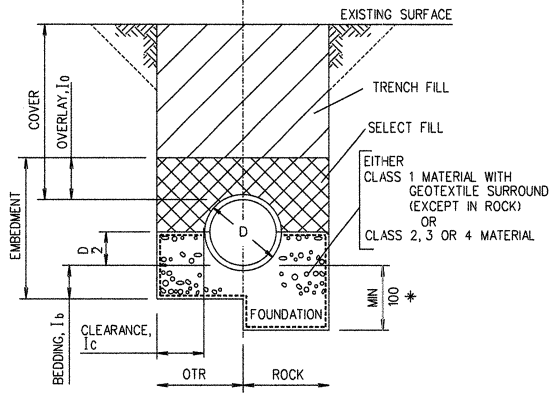


- **SEWERS:** ALL FLEXIBLE PIPE MATERIALS
- **PRESSURE PIPES:** ALL FLEXIBLE PIPE MATERIALS
- **STORMWATER:** ALL FLEXIBLE PIPE MATERIALS
- **ROADWAYS:** EXTEND EMBEDMENT MATERIAL TO ROAD PAVEMENT

DETAIL F

CLASS	MATERIAL DESCRIPTION
1	SINGLE SIZED GRAVEL (AGGREGATE), TO AS 2758.1, TABLE 1 AND TABLE C1, EXCEPT VC PIPE TO AS 4060, TABLE 1.
2	GRADED GRAVEL (AGGREGATE), TO AS 2758.1, TABLE 1 AND AS/NZS 2566.1, TABLE C1, EXCEPT VC PIPE TO AS 4060, TABLE 1.
3	NON-COHESIVE SOIL, TO AS/NZS 2566.1, TABLE C2, EXCEPT THAT % PASSING 0.075mm SIEVE SIZE, TO BE <5%.
4	QUARRY WASTE FILL TO AS/NZS 2566.1, TABLE C2, EXCEPT VC PIPE TO AS 4060, TABLE 2.
SELECT NATIVE SOIL	SOIL FREE OF ORGANIC OR OTHER DELETERIOUS MATERIAL TO AS/NZS 2566.1, TABLE C1 AND TABLE 3.2 (EXCLUDING SOILS WITH LL>50%).
SELECT FILL	TO AS 4060 AND AS 3725, AS APPLICABLE.

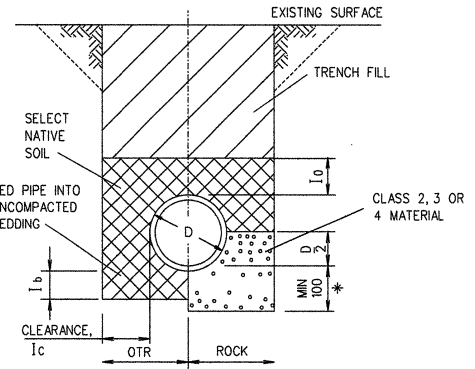
EMBEDMENT AND FILL MATERIALS.



- **SEWERS:** ALL RIGID PIPE MATERIALS
- **STORMWATER:** ALL RIGID PIPE MATERIALS
- **ROADWAYS:** EXTEND EMBEDMENT MATERIAL TO ROAD PAVEMENT

DETAIL R
TYPICAL TRENCH DETAILS.

* DENOTES UNDER REVIEW.



- **PRESSURE PIPES:** ALL PIPE MATERIALS FOR D <= 300 NOM. SIZE (DN) AND COVER <= 1500
- **STORMWATER:** ALL PIPE MATERIALS FOR D <= 300 NOM. SIZE (DN) AND COVER <= 1500
- **ROADWAYS & DRIVEWAYS:** DO NOT USE

DETAIL G

COVER OR APPLICATION	PIPE MATERIAL	COVERS		MINIMUM PIPE CLASSIFICATION										
		MIN.	MAX.	GRP	PE	PVC	ABS	DI	STEEL	VC	RC, FRC			
COVERS >3000	ALL	N/A												
SEALED ROADWAYS	ALL	600	6000	SN 10,000	SDR <17	SN8 PN 9	SN8 PN 9	K9	D/t <160	CLASS 4		VARIES WITH DIA.		
UNSEALED ROADWAYS	PLASTIC NON-PLASTIC	750 600												
COVERS <3000	ALL	450	3000	SN 5,000	SDR <21	SN4 PN 6	SN4 PN 6	K9	D/t <160	CLASS 4				
RESIDENTIAL DRIVEWAYS	ALL	600												

COVERS AND CLASSIFICATIONS

NOTES:

- COVERS AND CLASSIFICATIONS SHOWN ARE FOR STABLE TRENCH CONDITIONS OF EFFECTIVE COMBINED SOIL MODULUS > 3 MPa AND ARE TO BE READ IN CONJUNCTION WITH:
 - SECTIONS TR13 AND/OR TR14 AND
 - PROJECT SPECIAL REQUIREMENTS.
- MINIMUM VALUES OF Ib (BEDDING), Ic (CLEARANCE) AND Io (OVERLAY) TO AS/NZS 2566.1, FIGURE 3.1. ALSO AS 3725 AS APPROPRIATE.
- WHERE MINIMUM COVER CANNOT BE PROVIDED, ENCASE PIPELINE WITH N20 CONCRETE.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
- DRAWING NOT TO SCALE.

PIPELINE INSTALLATION PRACTICES IN NSW	WS-SPEC
FOR: DEPT. OF LAND & WATER CONSERVATION AND DEPT. OF PUBLIC WORKS & SERVICES	FIGURE TR13.1 & TR14.1

SECTION TR14 PIPELINE INSTALLATION NON-PRESSURE**1 GENERAL**

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the installation of pipelines for non-pressure applications up to and including DN 750, for sewage and stormwater.

1.2 CROSS REFERENCES

RELATED SECTION: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

PIPELINES, FLEXIBLE: To [AS/NZS 2566](#), Parts 1 and 2 [Part 2 under preparation], complemented by [AS 2032](#) and [AS 2033](#). [Note: Includes DI, Steel, PVC, PE, GRP and ABS]

PIPELINES, RIGID: To [AS 3725](#) and [AS 4060](#). [Note: Includes RC, VC and FRC]

DESIGN: To [WSA 02](#).

1.4 DEFINITIONS

NON-PRESSURE PIPELINE: May be subjected to internal hydrostatic pressure during normal operation but not to exceed manufacturer's published limits for either pipe, fitting or joints.

PIPELINE INSTALLATION: Lengths of jointed pipes and fittings, including embedment and fill materials, geotextiles, marker tape (for non-metallic pipelines) and surface markers.

MAIN SEWER: Sewer, excluding service connections.

PROPERTY CONNECTION: Sewer, from property connection point to main sewer, comprising sideline and riser.

STRUCTURES: Includes maintenance holes (ie. MH, access chambers or manholes), maintenance shafts (ie. MS), inspection shafts (ie. lampholes), vents, piered crossings, concrete bulkheads (ie. transverse anchors), trench stops, concrete encasement and other pipe support types.

2 QUALITY

2.1 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

TRAINING: All work covered by Section TR14 to be carried out and supervised by personnel either qualified or accredited as follows:

- Qualifications to be issued by a Registered Training Organisation listed by the National Training Information Service. These qualifications are specified in the National Training Package UTW 98, Utilities - Water Sector as endorsed by the Australian National Training Authority.

- Accredited to the short training courses and training assessment service providers contained in Appendix E of the Product Atlas, [WSA 02](#).

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions and qualifications of inspection personnel | H |
| • Availability of relevant current referenced Standards | H |
| • Prestart checks and site establishment | W |
| • Strategic products and materials to Section TR14 | W |
| • Pipeline installation and embedment | W |
| • Structures founded, formed and joined | W |
| • Backfilling of pipelines and structures | W |
| • Final inspection and testing | H |

2.2 EMBEDMENT TESTING

COHESIVE MATERIAL: To [AS 1289.5.4.1](#) or [AS 1289.5.7.1](#) and acceptance criteria not less than the specified dry density ratio.

COHESIONLESS MATERIAL: To [AS 1289.5.6.1](#) and acceptance criteria not less than the specified density index.

2.3 PIPELINE AND STRUCTURES TESTING

SEWERAGE: To [AS/NZS 2566.2](#) [under preparation], with testing extended to include structures.

PIPELINES AND STRUCTURES: One or more of the following tests, together with the frequency of application may be specified. Test maintenance holes separately, unless otherwise specified.

- Deflection: for flexible pipes only
- Low Pressure Air: application with structures not accepted
- Vacuum: may include maintenance holes
- Hydrostatic:
- Infiltration: limited application, see below
- CCTV: to [WSA 02](#)

SEWER INFILTRATION TEST: Measure infiltration over period of 24 hours. The test is satisfactory if infiltration does not exceed the allowable rate determined from the following:

$$\text{Allowable rate (L/hr)} = 6.5 \times 10^{-4} (L_1 D_1 H_1 + L_2 D_2 H_2 + \dots + L_n D_n H_n)$$

Where L_n is length (m) and H_n average head (m) of groundwater above invert level of sewer of nominal size D_n (mm) in section under test.

Acceptance Test: Test minimum 28 days after completion of backfill and with a free standing groundwater level at a minimum of 150 mm above the pipe obvert of any sideline and riser, and elsewhere 1.5 m above pipe invert.

MAINTENANCE HOLES: One of the following tests, together with a frequency of application may be specified:

- Vacuum: to [WSA 02](#)
- Hydrostatic: see below
- Infiltration: visible leaks not accepted

MH HYDROSTATIC TEST: Fill maintenance hole with water and allow 12 hours for absorption. Measure drop in water level in subsequent 30 minutes from bottom of cover recess in maintenance hole cover surround. Test is satisfactory if drop does not exceed 3 mm per metre depth of maintenance hole

measured from the bottom of the recess in the cover surround to outlet invert. Carry out initial and acceptance tests.

Initial Test: Test before rendering of channels and benches and before backfilling.

Acceptance Test: Test minimum 28 days after backfilling and internal rendering and for access chambers located below pavement, after final restoration.

STORMWATER: To project specifics.

3 MATERIALS

3.1 PIPES, FITTINGS AND VALVES

REQUIREMENT: To listed *SP SECTIONS - CLAUSE 8.1*, appropriate to the project specifics.

JOINTS: Use flexible watertight elastomeric seal (rubber ring) joints unless otherwise specified.

SEWERAGE: To [WSA 02](#) for up to and including DN 300, and project specifics for up to and including DN 750.

FLANGE BOLTING (FASTENERS):

- i) Below ground:
 - For corrosive environments where a corrosion protection tape system is not specified, use stainless steel 316 to Section TR30.
 - Where a corrosion protection system is specified, use hot dip galvanised steel to [AS 1214](#) and [AS 4087](#), Appendix C.
- ii) Above ground: Hot dip galvanised steel to [AS 4087](#), Appendix C.

Flange Gasket: To [AS 4087](#), Appendix D.

Flange Connections: For raised to CI flat face, use manufacturer's torque, or provide shims. For raised to non-metallic flat face, provide spacer plates.

STORMWATER: To project specifics.

3.2 EMBEDMENT

REQUIREMENT: Comply with the following embedment materials:

Flexible pipe: - Particle size and grading limits to [AS/NZS 2566](#), Parts 1 and 2 [Part 2 under preparation].

Rigid pipe:

- As for flexible pipe, plus
- Select fill to [AS 3725](#), Clause 4 and [AS 4060](#), Clause 4.5.6.

3.3 TRENCH FILL

ORDINARY FILL: Material removed from the excavation or imported and containing not more than 20 percent by mass of stones with a size between 75 mm and 150 mm and none larger than 150 mm.

3.4 CONCRETE

STANDARD CLASS: To Section SP44.

SPECIAL CLASS: To Section SP45. Sulfate resistance required for applications in contact with sewage.

3.5 MAINTENANCE HOLES

REQUIREMENT: To Section SP9 or Section SP13.

3.6 MAINTENANCE SHAFTS

REQUIREMENT: To Section SP14.

3.7 COVERS

REQUIREMENTS: To Drawing SEW-207.

Metal: To [AS 3996](#).

Concrete: To [AS 4198](#).

3.8 GEOTEXTILE

REQUIREMENT: To [AS/NZS 2566.2](#) [under preparation].

3.9 POLYETHYLENE SLEEVING

REQUIREMENT: To [AS 3680](#) and Section SP2.

4 PIPE LAYING

4.1 GENERAL

REQUIREMENT: Transport, handle, store and install pipes, fittings and jointing materials to [AS/NZS 2566.2](#) [under preparation] and in accordance with manufacturer's written instructions.

CLEANLINESS: Keep pipes and pipelines clean, and free of obstructions and material ingress.

TRENCH CLEARANCES: Further to chases, provide additional clearance around the pipe joints for the following operations made in the trench:

- Application and inspection of external protective tape systems, 500 mm radially, and at least 150 mm beyond tape extremities along the pipe.
- Site welding, to pipe manufacturer's written instructions.

VALVE OPERATION: To manufacturer's written instructions.

JOINTING DISSIMILAR PIPELINE MATERIALS: To manufacturer's written instructions.

4.2 PIPELINE EMBEDMENT

REQUIREMENT: Provide embedment as shown on Drawing SEW-100, [WSA-02](#) and to Agencies Practices for applicable pipe type and depth, embedment material and native soil classification. Supply and place geotextile where specified.

BEDDING: Provide even and uniform support along the pipe barrel. Provide suitable chases in foundations and bedding to ensure pipes and fittings do not bear on sockets.

COMPACTION: Compact embedment to achieve the following minimum compaction levels:

Cohesive material: 90% dry density ratio to [AS 1289.5.4.1](#) or
90% Hilf density ratio to [AS 1289.5.7.1](#).

Cohesionless material: 60% density index to [AS 1289.5.6.1](#).

Roadways: For embedment and trench fill under trafficable and other paved surfaces, increase compaction levels to 95% and 65% respectively.

DEEP PIPELINES: For covers greater than 6 meters, refer to project specifics.

4.3 INSTALLATION TOLERANCES

PIPELINES: Install to meet the following criteria:

- a) Horizontal deviation from design alignment: ± 30 mm.
- b) Vertical deviation from design invert level:
 - i) For pipeline grades up to and including 1%: ± 20 mm.
 - ii) For pipeline grades steeper than 1%: ± 30 mm.
- c) Angular deviation at any flexible joint not to exceed manufacturer's maximum deflection.
- d) No pipe to have backfall (negative grade).

STRUCTURES: Install to meet the following criteria:

- e) Horizontal deviation from design alignment: ± 50 mm
- f) Longitudinal deviation from design location: ± 300 mm
- g) Vertical deviation - laterally: $\pm 1\%$
- longitudinally from 90° to mainline: $\pm 1\%$

4.4 CORROSION PROTECTION

REQUIREMENT: Apply external corrosion protection systems for the pipe materials as detailed in ***CORROSION PROTECTION SYSTEMS - CLAUSE 8.5.***

DISSIMILAR METALS: Use materials and fixings to prevent corrosive action.

POLYETHYLENE SLEEVING: Apply sheeting generally to [AS 3681](#). Embedment to be free of sharp edged materials.

WELDED STEEL PIPELINES: Internal protection at joints to be made good to manufacturer's written instructions and in accordance with [AS 2865](#).

4.5 POLYETHYLENE TAPE SYSTEM

DESCRIPTION: Multi-component corrosion protection system for pipes, fittings and valves, applied in the factory or outside the trench prior to jointing or assembly. Systems equivalent to Polyken 927 primer, Polyken 931 mastic filler, and Polyken 930-35 wrapping tape, accepted.

REQUIREMENT: Apply in accordance with manufacturer's written instructions and as follows:

- extend wrapping to within 100 mm of field joint;
- apply filler to all cavities and spaces to provide a streamlined shape suitable for application of wrapping tape;
- wrap tape with minimum 55% overlap, to achieve a minimum of 2 tape thicknesses.

4.6 PETROLATUM TAPE SYSTEM

DESCRIPTION: Multi-component corrosion protection system, applied both outside and in the trench, for field joints (other than fusion bonded polyethylene elastomeric seal joints) including flange connections, unprotected joint fittings (such as mechanical couplings), welding collars and other welded joints. Systems equivalent to Denso multi-purpose primer, Denso mastic and/or Denso cord, Denso (600) Tape (petrolatum), Denso MP/HD overwrap tape, accepted.

REQUIREMENT: Apply in accordance with manufacturer's written instructions and as follows:

- extend wrapping minimum 200 mm beyond surface to be protected either side of joint;
- apply mastic/cord to all cavities and spaces to provide a streamlined shape suitable for application of petrolatum and overwrap tapes;
- wrap tapes with minimum 55% overlap, to achieve a minimum of 2 tape thicknesses.

4.7 HEAT SHRINK SLEEVE SYSTEM

DESCRIPTION: Corrosion protection system, applied both outside and in the trench, for welded collar joints in steel pipelines. Systems equivalent to Raychem WPC Type B with Denso WPC primer, or Canusa WLSB with Petrocote primer, accepted.

REQUIREMENTS: Apply in accordance with pipe and tape manufacturer’s written instructions.

4.8 TRENCH STOPS

REQUIREMENT: To Drawing SEW-103.

4.9 CONCRETE BULKHEADS

REQUIREMENT: To Drawing SEW-103.

4.10 STEEP PIPELINES

REQUIREMENT: Provide the following for all pipeline installations at the grades shown, irrespective of application and material type.

GRADE (%)	EROSION PROTECTION AND SUPPORT MEASURES	DRG NO.
5 - 14	TRENCHSTOPS* Spacing (M) = $\frac{100}{\text{Grade (\%)}}$	SEW-103
15 - 29	CONCRETE BULKHEADS Spacing (M) = $\frac{[L]}{\text{Grade (\%)}}$ L = [80 x Pipelength (M)] = 450 Max Where L > 100 use Intermediate TRENCHSTOPS* Spacing (M) < $\frac{100}{\text{Grade (\%)}}$	SEW-103
30 - 50	CONCRETE ENCASEMENT (continuous) and CONCRETE BULKHEADS Spacing (M) = $\frac{100}{\text{Grade (\%)}}$	SEW-101 SEW-103
> 50	Project Specifics	-

* Not required in free draining native soils or select native soil embedment.

4.11 PIPE SUPPORTS

REQUIREMENT: Concrete encasement and other pipe support types to Drawings SEW-101 and 102.

CONCRETE: Cast concrete against bearing surfaces of undisturbed native soil.

4.12 PIPEWORK AT CONCRETE STRUCTURES

JOINTS: For rigid pipes, use a rocker/starter pipe to provide two flexible joints, 1.5 DN but not less than 600 mm apart, at connections to concrete structures and concrete encased pipelines. Ensure closest joint is maximum 150 mm from face of concrete.

SEEPAGE: Prevent seepage along pipes embedded in walls of concrete structures. Adopt pipe manufacturer's written instructions.

4.13 PROPERTY CONNECTIONS

REQUIREMENT: Provide connection to each property to details on Drawings SEW-300, 301 and 302. Locate and ensure adequate depth at connection point, between min. cover and 2000 mm max, to allow property sewer pipework to connect. Mark connection point to Drawing SEW-302, 303 and 304.

RISERS: To Drawings SEW-302, 303 and 304 including as follows:

- i) Surround with the specified embedment material to a minimum distance of 500 mm radially and 150 mm over the top.
- ii) Compact surround as required for pipe embedment.
- iii) Concrete support at all junctions.
- iv) Concrete encase risers in residential driveways at 250 mm min. radius.

4.14 CONNECTION TO EXISTING WORKS

REQUIREMENT: Liaise with operating authority, make all necessary arrangements and complete connection to authority requirements.

BEARING SURFACES: Provide concrete support blocks of suitable size and bearing area to suit bearing capacity of native soil.

4.15 MARKINGS

Sewer Property Connections: To Drawings SEW-304.

Stormwater: To project specifics.

MARKER TAPE: For non-metallic pipelines. To [AS/NZS 2648.1](#), including a stainless steel 316 tracer wire continuously moulded onto the tape.

5 STRUCTURES

5.1 GENERAL

MAINTENANCE HOLES: Construct as water-tight in-situ concrete or install precast units as shown on Drawings SEW-201, 202 and 203.

INSPECTION AND MAINTENANCE SHAFTS: To Drawings SEW 209 and 210.

CLEANLINESS: Keep access chambers clean and prevent ingress of soil and other materials.

5.2 STEP IRONS AND LADDERS

METALLIC: Install either step irons or monorail ladder as specified to Sections SP9 and TR30.

NON-METALLIC: To project specifics.

6 ACCESS COVERS

6.1 GENERAL

REQUIREMENT: Provide either precast concrete or metal covers to maintenance holes, maintenance shafts and inspection shafts.

MATERIAL TYPE: Provide metal Class D or concrete Type H covers in location subject to vehicular loading and metal covers and frames in areas subject to flooding. Elsewhere, provide metal Class B and concrete Type L covers.

SEATING OF CONCRETE COVERS: Seat concrete covers on 25 mm x 25 mm bitumen impregnated sealing strip.

METAL COVERS AND FRAMES: Install to manufacturer's written instructions including greasing to provide gas tight installation.

7 TRENCH FILL

7.1 TRENCH FILLING

SUPPORT REMOVAL: Ensure removal of temporary support does not damage or displace installations. If damage or displacement occurs, advise and record for verification.

REQUIREMENT: Fill excavations including voids left by temporary supports, with embedment or with excavated material as appropriate. Reinstatement ground to pre-existing state as far as practicable. If suitable excavated material is unavailable, import cohesionless material with maximum particle size 20 mm.

7.2 COMPACTION

REQUIREMENT: Compact trench fill to achieve the following minimum compaction levels:

Cohesive material: 90% dry density ratio to [AS 1289.5.4.1](#) or
90% Hilf density ratio to [AS 1289.5.7.1](#).

Cohesionless material: 60% density index to [AS 1289.5.6.1](#).

Roadways: For trench fill under trafficable and other paved surfaces, increase compaction levels respectively to: ≥ 300 mm below pavement subgrade, 95% and 65%;
 < 300 mm below pavement subgrade, 100% and 80%.

7.3 TIMING

REQUIREMENT: Restore progressively as installations proceed.

8 SCHEDULES

8.1 REFERENCED DOCUMENTS

STANDARDS:

- [AS 1214](#) - Hot-dip galvanized coatings on threaded fasteners
- [AS 1289](#) - Methods for testing soils for engineering purposes: Parts 5.4.1, 5.6.1 and 5.7.1
- [AS 1379](#) - Specification and supply of concrete
- [AS 2032](#) - Code of practice for installation of UPVC pipe systems
- [AS 2033](#) - Installation of polyethylene pipe systems
- [AS/NZS 2566](#) - Buried flexible pipelines
- .1 - Structural design

- .2 - Installation [under preparation]
- [AS/NZS 2648.1](#) - Underground marking tape, Part 1: Non-detectable tape
- [AS 2758](#) - Aggregates and rock for engineering purposes
- .1 - Concrete aggregates
- [AS 2837](#) - Wrought alloy steels - Stainless steel bars and semi-finished products
- [AS 2865](#) - Safe working in a confined space
- [AS 3680](#) - Polyethylene sleeving for ductile iron pipelines
- [AS 3690](#) - Installation of ABS pipe systems
- [AS 3681](#) - Guidelines for the application of polyethylene sleeving to ductile iron pipelines and fittings
- [AS 3725](#) - Loads on buried concrete pipes
- [AS/NZS 3905.2](#) - Guide to [AS/NZS ISO 9001](#), [AS/NZS ISO 9002](#), [AS/NZS ISO 9003](#) for construction
- [AS 3972](#) - Portland and blended cements
- [AS 3996](#) - Metal access covers, road grates and frames
- [AS 4060](#) - Loads on buried vitrified clay pipes
- [AS 4087](#) - Metallic flanges for waterworks purposes
- [AS 4198](#) - Precast concrete access chambers for sewerage applications
- [AS/NZS ISO 9002](#) - Quality system: Model for quality assurance in production, installation and services

WSAA CODES:

- [WSA 02](#) - Sewerage Code of Australia

WS-SPEC SECTIONS:

- Section SP1 : Steel Pipes and Fittings
- Section SP2 : Ductile Iron Pipes and Fittings
- Section SP3 : Grey (Cast) Iron Fittings
- Section SP4 : UPVC Pipes and Fittings
- Section SP5 : GRP Pipes and Fittings
- Section SP6 : Polyethylene Pipes and Fittings
- Section SP7 : Vitrified Clay Pipes and Fittings
- Section SP8 : Concrete Pipes
- Section SP9 : Maintenance Holes Precast Concrete

Section SP10 : Concrete Drainage Pipes, Pits and Headwalls

Section SP11 : ABS Pipes and Fittings

Section SP12 : FRC Pipes and Fittings

Section SP13 : Maintenance Holes Plastics

Section SP14 : Maintenance Shafts

Section SP15 : Elastomeric Seals

Section SP23 : Knife Gate Valves

Section SP44 : Concrete Supply Standard Class

Section SP45 : Concrete Supply Special Class

Section TR30: Stainless Steel

8.2 REFERENCED DRAWINGS

SEWER CODE OF AUSTRALIA:

- SEW-100 - Trench and Backfill Typical Arrangement
- SEW-101 - Pipe Supports Type 1 to 8
- SEW-102 - Pipe Supports Type 9 to 11 and for Non-Supportive Soils
- SEW-103 - Trenchstop and Bulkheads Typical Arrangement
- SEW-207 - Sewer Maintenance Hole Access Covers Typical Installations
- SEW-209 - Sewer Maintenance Shaft Typical Arrangement
- SEW-210 - Terminal Maintenance Shaft and Inspections Shafts Typical Arrangements
- SEW-300 - Property Connections Sheet 1 Private Property and Reserves
- SEW-301 - Property Connections Sheet 2 Road Reserve
- SEW-302 - Property Connections Types A, B, C1 and C2 Typical Arrangements
- SEW-303 - Property Connections Types D and E Typical Arrangements
- SEW-304 - Property Connections Type F and Temporary End Location Marker Typical Arrangements

8.3 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Install the pipelines in compliance with Section TR14 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR14	CLAUSE	DETAILS
Pipe materials and sizes	3.1	
Fitting materials and sizes	3.1	
Knife gate valve sizes	3.1	
Cover types and classes		
- maintenance holes	3.6	-
- maintenance shafts	3.7	-
- inspection shafts		-
Markings and marker tape	4.15	
Flange joint bolting and accessories not elsewhere supplied (eg. pipes, valves)		
Corrosion protection	4.4, 8.5	
- pipes		-
- fittings		-
- valves		-
Geotechnical	-	
Embedment details	4.2	
- pipeline minimum covers		-
- bedding minimum thicknesses		-
- clearance minimum widths		-
- overlay minimum thicknesses		-
- embedment materials		-
- trench fill materials		-
Pipe supports	4.10	
Trench stops and bulkheads	4.8, 4.9	
Property connections	4.13	
Maintenance holes	5.1	
Maintenance shafts	5.1	
Inspection shafts	5.1	
Testing (option(s) and length)	2.3	
- pipelines and structures		-
- maintenance holes		-

8.4 AGENCY PRACTICES

DEPT. OF LAND & WATER CONSERVATION, NSW AND
DEPT. OF PUBLIC WORKS & SERVICES, NSW:

Pipeline Installation : To Figure TR14.1 (and TR13.1).

8.5 CORROSION PROTECTION SYSTEMS

GENERAL: The corrosion protection systems nominated in the Project Specifics have been selected from the following table:

PIPELINE ELEMENT	MATERIAL	INTERNAL PROTECTION (i)*	EXTERNAL PROTECTION	
			APPLIED OUTSIDE THE TRENCH (ii) *	APPLIED IN THE TRENCH (iii)
PIPES & FITTINGS	STEEL	CL, FP, LA	FB, LA, PET, HSS	PLT, HSS, nil
	DI/CI	CL, FB, nil, TB, LA, TC	PS, FB, nil, TB, LA, TC	nil PS (part)
	PVC, GRP, PE, ABS	nil	nil	nil
	VC	nil	nil	nil
	RC, FRC	nil, PL, LA	nil, PS, LA	nil, PS (part)
VALVES	DI/CI	TB, LA, TC	TB, LA, TC, PS	nil, PLT, PS (part)

LEGEND: * = generally applied in the factory

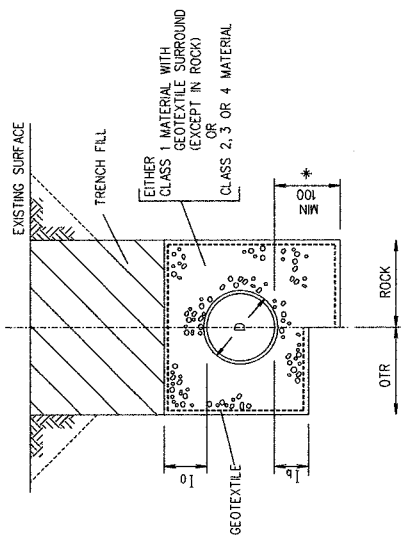
- CL = cement lining
 - FP = fusion bonded polyethylene
 - LA = liquid applied
 - TB = thermal bonded
 - TC = transit coat
 - PS = polyethylene sleeving
 - PL = plastiline
 - PLT = petrolatum tape
 - PET = polyethylene tape
 - HSS = heat shrink sleeve
 - nil = no protection
 - part = partly applied in the trench
- } Refer to Sections SP1, SP2 and SP3
- } Refer to Section SP30
- } See Clause 4.4
- } To project specific clauses
- } See Clauses 4.5, 4.6 and 4.7

SPECIFICATION CODE: Use the following code in the contract specifics.

PIPELINE ELEMENT : MATERIAL, (i) – (ii) – (iii)

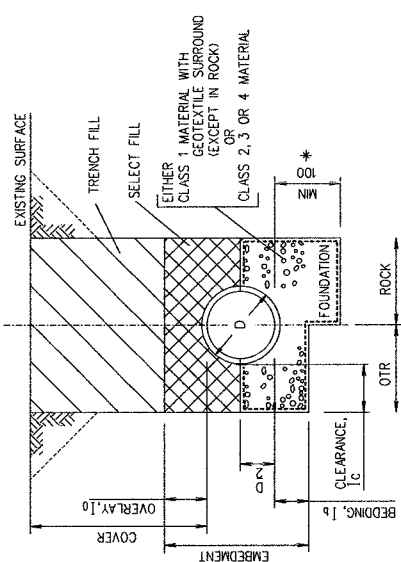
Example: PIPES (RRJ) : DI , CL - PS - PS (part)
 FITTINGS (plain) : DI , CL - PS - PS (part)
 (complex) : DI , CL - PET - PLT
 VALVES : DI/CI , TB - TB - PLT

Note: RRJ = elastomeric seal jointed Plain = plain bends
 Complex = tees, flanged jointed connections



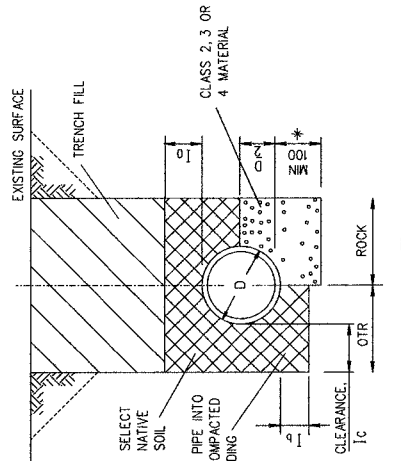
- SEWERS: ALL FLEXIBLE PIPE MATERIALS
- PRESSURE PIPES: PIPE MATERIALS
- STORMWATER: EXTEND EMBEDMENT MATERIAL TO ROAD PAVEMENT
- ROADWAYS: EXTEND EMBEDMENT MATERIAL TO ROAD PAVEMENT

DETAIL F



- SEWERS: ALL RIGID PIPE MATERIALS
- STORMWATER: PIPE MATERIALS
- ROADWAYS: EXTEND EMBEDMENT MATERIAL TO ROAD PAVEMENT

DETAIL R



- PRESSURE PIPES: ALL PIPE MATERIALS FOR D < 300 NOM. SIZE (DN) AND COVER < 1500
- STORMWATER: PIPE MATERIALS
- ROADWAYS & DRIVEWAYS: DO NOT USE

DETAIL G

TYPICAL TRENCH DETAILS.

* DENOTES UNDER REVIEW.

CLASS	MATERIAL DESCRIPTION
1	SINGLE SIZED GRAVEL (AGGREGATE), TO AS 2758.1, TABLE 1 AND TABLE C1, EXCEPT VC PIPE TO AS 4060, TABLE 1.
2	GRADED GRAVEL (AGGREGATE), TO AS 2758.1, TABLE 1 AND AS/NZS 2566.1, TABLE C1, EXCEPT VC PIPE TO AS 4060, TABLE 1.
3	NON-COHESIVE SOIL TO AS/NZS 2566.1, TABLE C2, EXCEPT THAT Z PASSING 0.075mm SIEVE SIZE, TO BE < 5%.
4	QUARRY WASTE FILL TO AS/NZS 2566.1, TABLE C2, EXCEPT VC PIPE TO AS 4060, TABLE 2.
SELECT NATIVE SOIL	SOIL FREE OF ORGANIC OR OTHER DELETERIOUS MATERIAL TO AS/NZS 2566.1, TABLE C1 AND TABLE 3.2 (EXCLUDING SOILS WITH LL>50%).
SELECT FILL	TO AS 4060 AND AS 3725, AS APPLICABLE.

EMBEDMENT AND FILL MATERIALS.

COVER OR APPLICATION	PIPE MATERIAL	COVERS				MINIMUM PIPE CLASSIFICATION								
		MIN.	MAX.	GRP	PE	PVC	ABS	DI	STEEL	VC	RC, FRC			
COVERS >3000	ALL	N/A												
SEALED ROADWAYS	ALL	600		SN 10,000	SDR <17	SN8 PN 9	SN8 PN 9	K9	D/t <160	CLASS 4				
UNSEALED ROADWAYS	PLASTIC NON-PLASTIC	750												VARIABLE WITH DIA.
COVERS <3000	ALL	450		SN 5,000	SDR <21	SN4 PN 6	SN4 PN 6	K9	D/t <160	CLASS 4				
RESIDENTIAL DRIVEWAYS	ALL	600												

COVERS AND CLASSIFICATIONS

1. COVERS AND CLASSIFICATIONS SHOWN ARE FOR STABLE TRENCH CONDITIONS OF EFFECTIVE COMBINED SOIL MODULUS > 3 MPa AND ARE TO BE READ IN CONJUNCTION WITH:
 - SECTIONS TR13 AND/OR TR14 AND
 - PROJECT SPECIAL REQUIREMENTS.
2. MINIMUM VALUES OF I_b (BEDDING), I_c (CLEARANCE) AND I_o (OVERLAY) TO AS/NZS 2566.1, FIGURE 3.1, ALSO AS 3725 AS APPROPRIATE.
3. WHERE MINIMUM COVER CANNOT BE PROVIDED, ENCASE PIPELINE WITH N20 CONCRETE.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
5. DRAWING NOT TO SCALE.

PIPELINE INSTALLATION PRACTICES IN NSW
 FOR: DEPT. OF LAND & WATER CONSERVATION AND
 DEPT. OF PUBLIC WORKS & SERVICES

WS-SPEC
 FIGURE
 TR13.1 & TR14.1

SECTION TR20 PROTECTIVE COATINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for preparing the surface and applying protective coating systems to new engineering structures and equipment (except steel reservoirs).

1.2 CROSS REFERENCES

RELATED SECTION: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

GENERAL: To [AS/NZS 2310](#), [AS 2311](#) and [AS/NZS 2312](#).

COATING PRODUCTS: To APAS (Australian Paint Approval Scheme) specification and approvals.

FILM THICKNESSES: Film thicknesses are expressed in micrometres.

1.4 SYSTEMS AND APPLICATIONS SUMMARY

SUBSTRATE SURFACE AND APPLICATION	SYSTEM		SECTION TR20 CLAUSE
	DESCRIPTION	CODE	
IRON AND STEEL			
<ul style="list-style-type: none"> • Atmosphere - Interior • Atmosphere - Exterior • Immersed* - Sewerage • Immersed* - Water 	Epoxy, 2-pack - Gloss Polyurethane, 2-pack solvent borne Epoxy Mastic, 2-pack Epoxy High Build, 2-pack solventless	I1-S E1-S W1-S W2-S	6.2 6.2 6.3 6.3
GALV. & NON-FERROS METALS			
◇ Galvanized (uncoated)	Galvanized	GAL	6.4
◇ Galvanized			
<ul style="list-style-type: none"> • Immersed* - Sewerage • Immersed* - Water 	Epoxy Mastic, 2-pack Epoxy High Build, 2-pack solventless	W1-G W2-G	6.5 6.5
◇ Galvanized & Non-Ferros Metals			
<ul style="list-style-type: none"> • Atmosphere - Interior • Atmosphere - Exterior 	Epoxy, 2-pack - Gloss Polyurethane, 2-pack solvent borne	I1-M E1-M	6.6 6.6
NON-METALS			
◇ Plastics, FRC, Masonry & Plasterboard			
<ul style="list-style-type: none"> • Atmosphere - Interior • Atmosphere - Exterior 	Acrylic Latex Acrylic Latex	I2-N E2-N	6.7 6.7
◇ Concrete			
<ul style="list-style-type: none"> • Immersed* - Sewerage • Immersed* - Water 	Epoxy High Build, 2-pack solventless Epoxy High Build, 2-pack solventless	W3-C W2-C	6.8 6.8
◇ Timber			
<ul style="list-style-type: none"> - Interior - Exterior 	[Acrylic Latex Alkyd Gloss Acrylic Latex	I2-T I3-T E2-T	6.8 6.8 6.8
PRE-COATED ITEMS			
◇ Electrical Cabinets, Pumps, Motors, Transformers, etc	To above systems or equivalent manufacturer's system		6.10

* Includes areas subject to splash or spray

2 QUALITY

2.1 PAINTING CONTRACTOR CERTIFICATION

REQUIREMENT: To *NATIONAL PRACTICES - CLAUSE 7.2*.

2.2 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

Use [AS 3894.10](#), [AS 3894.11](#) and [AS 3894.12](#) reports for recording inspection details.

INSPECTION PERSONNEL: Personnel responsible for certification of coating application to possess an Australasian Corrosion Association Coating Inspection Certificate.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for both internal and external protective system applications:

- | | |
|---|---|
| • Materials and qualifications certification, required for Section TR20 | H |
| • Availability of relevant current referenced Standards | W |
| • Surface preparation - first (trial) work area | H |
| • Surface preparation - other work areas | W |
| • Coating application - first (trial) work area | H |
| • Coating application - other work areas | W |
| • Testing of coatings | W |

2.3 SUBMISSIONS ON MATERIALS

MANUFACTURER'S INSTRUCTIONS: Provide copy(s) of manufacturer's technical literature, including material safety data sheets for the coating system to be used, before commencing application.

PROPRIETARY MATERIALS: Advise prior to application, the proposed brand of paint and paint line together with APAS approval certification(s).

2.4 SUBSTRATE INSPECTION

BLAST CLEANED SURFACES: Check for compliance with **IRON AND STEEL SURFACES - CLAUSE 5.2** as follows:

Class of finish: Visually compare surface with colour prints in [AS 1627.9](#).

Profile height: To [AS/NZS 3894.5](#).

2.5 WET FILM

STANDARD: [AS 3894.3](#) Appendix C.

REQUIREMENT: Measure wet thickness to enable modification of the rate of application before the coating has hardened.

2.6 DRY FILM

STANDARD: [AS 3894.3](#), Method B.

CALIBRATION: To [AS 3894.3](#), Appendix D.

2.7 CONTINUITY TESTING

IRON, STEEL AND GALVANISED: For "Epoxy, 2-pack solventless" systems on internal surfaces only. After curing, test entire surface using a fully variable DC high voltage holiday detector to [AS 3894.1](#).

Acceptance Criteria: No defects. Rectify any defects to manufacturer's technical literature.

CONCRETE: Immersed "Epoxy High Build, 2-pack solventless" system to be visually "pin-hole free". For disputed areas, adopt continuity testing as specified for iron and steel using an earth connection to the reinforcement or a trailing earth.

Acceptance Criteria: No defects. Rectify any defects to manufacturer's technical literature.

3 MATERIALS

3.1 GENERAL

COMBINATIONS: Paint systems to have all coats made by the same manufacturer.

DELIVERY: Deliver paints to the site in the manufacturer's labelled and unopened containers bearing batch number, instructions for application and shelf life.

CONTACT WITH POTABLE WATER: Provide manufacturer's certificate to [AS 3855](#) or [AS/NZS 4020](#), certifying that coating material to be used is suitable for contact with potable water.

THINNERS: Use only the type and proportions required by the paint manufacturer.

TINTING BY CONTRACTOR: Add tinters in accordance with the manufacturer's technical literature as to type, quality and tinting formula.

3.2 COLOUR SELECTION

COLOUR: To [AS 2700](#).

FINAL COAT: If not specified, obtain direction in sufficient time to avoid delaying the Contract.

4 WORK EXECUTION

4.1 GENERAL

PAINTING CONDITIONS: Do not paint when:

- Surface temperature is less than 3°C above the dew point.
- Surface temperature is greater than 55°C.
- Surface temperature is less than 10°C.
- Relative humidity is greater than 85%.
- Surface is in direct strong sunlight.
- Weather is deteriorating or is unfavourable for application or curing.
- Pot life of the paint has been exceeded.
- Shelf life of the paint has been exceeded.

PAINT MIXING: Mix and apply paint in accordance with the manufacturer's technical literature. Do not mix paint in areas or on surfaces liable to damage from spillage.

TOUCH UP: Clean off marks, paint spots and stains throughout, restoring damaged surfaces to their original condition. Where necessary for aesthetic reasons, touch up damaged paint work or misses only with the paint batch used in the original application.

PROTECTION: Protect coating that requires curing, prior to immersion, from rain or accidental immersion until it is fully cured.

Initial curing period: Reblast and recoat areas exposed to rain or immersed during this period.

After initial curing period: Dry affected areas without delay.

4.2 APPLICATION

STANDARD: To [AS 2311](#), Section 6 and [AS/NZS 2312](#), Section 8 as applicable.

PROCEDURE: Apply paint and related materials in accordance with the manufacturer's technical literature.

NUMBER OF COATS: Apply sufficient coats (which could be more than the number specified) to achieve the required colour, opacity, texture and film thickness.

FINISH: Ensure each coat of paint is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities. The standard of workmanship with regard to final colour, gloss and texture shall match that on the test plates.

4.3 CURING

REQUIREMENT: Before top-coating, check level of cure meets manufacturer's requirements, and before placing into service, check coating is fully cured to [AS/NZS 3894.4](#).

5 SUBSTRATE PREPARATION

5.1 GENERAL

STANDARDS: To [AS 1627](#) and [AS/NZS 2312](#), Section 5 as applicable.

REQUIREMENT: Prepare substrates to receive the systems specified by compliance with the following general requirements.

Drying: Ensure that surfaces are dry before painting commences.

Recontamination: Apply first coat within 4 hours of cleaning surface and before any flash corrosion or other recontamination occurs.

Bolted connections: Apply specified primer to mating surfaces and cure before connecting.

Fabrication and welding: Complete a particular item before preparing it for painting.

5.2 IRON AND STEEL SURFACES

DEGREASING: Clean the entire surface, using an aqueous alkaline oil emulsifier to [AS 1627.1](#).

GRINDING: Remove weld spatter, slag, burrs or any other surface irregularities. Remove all sharp edges and grind to a curvature with a radius not less than 3.0 mm. Grind all butt welds smooth, not necessarily flush with the adjacent surface, but free from sharp crests.

BLAST CLEANING: Blast clean the surfaces to [AS 1627.4](#), to the specified standards of finish and comply with the following:

System: Use a dry abrasive blast clean, using air free from oil and moisture.

Abrasives: Use alluvial garnet or steel grit, both free of chlorides.

Restrictions: Protect coated areas from damage during blast cleaning and blow down operations.

SURFACE PROFILE: Produce an angular surface profile to that specified.

5.3 GALVANIZED AND NON-FERROUS METAL SURFACES

DEGREASING: Clean the entire surface, using an aqueous alkaline oil emulsifier to [AS 1627.1](#).

5.4 PLASTIC SURFACES

DEGREASING: Solvent wash with mineral turpentine or other accepted solvent. Remove all residual traces of the solvent.

ABRASION: Lightly abrade by hand using 320 to 400 wet and dry paper to produce an even matt surface.

5.5 FRC SURFACES

REQUIREMENT: Fill holes, joints or other imperfections with the paint manufacturer's recommended filler, sand and dust off.

5.6 MASONRY AND CONCRETE SURFACES

CONCRETE, IMMERSED: Abrasive blast with alluvial garnet at reduced air pressure to provide a suitable key for the subsequently applied coating and to remove laitance. Remove loose friable matter before filling surface discontinuities (blowholes) with a two pack solventless epoxy paste.

CONCRETE AND MASONRY, ATMOSPHERIC: To [AS 2311](#), Clause 3.9. Do not apply to dusty or damp surfaces.

MINIMUM CURING TIMES: Allow following curing times before coating at 25°C:

- | | |
|-----------------------------------|-----------|
| - Cast in situ concrete | - 4 weeks |
| - Cement render | - 4 weeks |
| - Block or brickwork | - 2 weeks |
| - Pre-cast concrete (steam cured) | - 2 weeks |

5.7 PLASTERBOARD SURFACES

REQUIREMENT: Allow jointing compound to cure before coating.

5.8 TIMBER SURFACES

DEFECTS: Cut out large resinous knots and decayed areas, and replace with sound timber. Remove any defective putty and punch nails. Spot prime small knots, cracks, open joints, holes and bare timber with specified wood primer.

FILLING: Fill as necessary with polymeric fillers to match substrate.

SANDING: Lightly sand dressed surfaces in the direction of the wood grain with appropriate grade 'free-cut-paper' and remove powdery deposits.

MOISTURE CONTENT OF SUBSTRATE: To [AS 2311](#), Clause 3.2.5 at time of priming. Test the substrate with a moisture meter, to the manufacturer's requirements.

PRIMING BEFORE FIXING: Apply one coat of wood primer to the back of external fascia boards, timber door and window frames, bottoms of external doors, associated trims and glazing beads before fixing in position.

5.9 PRE-COATED ITEMS

REQUIREMENT: If coating on equipment has been damaged or does not comply with the specification, lightly brush blast or hand abrade to provide a surface profile of not greater than 10 micrometers.

6 PROTECTIVE COATING SYSTEMS

6.1 GENERAL

PRE-CONSTRUCTION PRIMERS: Factory applied primer accepted for iron and steel substrates, unless otherwise specified. Weld lines and damaged areas to be reinstated to comply with the full coating system.

6.2 IRON AND STEEL, ATMOSPHERE

SYSTEM I1-S, "EPOXY, 2-PACK - GLOSS"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Prime Coat: Zinc phosphate pigmented epoxy to GPC-C-29/7A Type 1 or 2.

First Finish Coat: Epoxy enamel to GPC-C-29/7A Type 2.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Prime Coat:	75	100
Intermediate coat:	75	125
Finish Coat:	75	125
TOTAL:	225	

SYSTEM E1-S "POLYURETHANE, 2-PACK SOLVENT BORNE"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Prime Coat: Zinc phosphate pigmented epoxy to GPC-C-29/7A Type 2 or Type 1.

Intermediate Coat: High build epoxy to GPC-C-29/7A Type 2.

First Finish Coat: Pigmented 2 pack polyurethane to GPC-C-29/11A.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Prime coat:	75	100
Intermediate coat:	100	120
First finish coat:	75	100
Second finish coat:	75	100
TOTAL:	325	

6.3 IRON AND STEEL, IMMERSSED

SYSTEM W1-S, "EPOXY MASTIC, 2-PACK"

Prepared Surface: Class 3 with surface profile 38 micrometers.

First Coat: Epoxy mastic to GPC-C-29/7S Type 3. Apply stripe coat of the epoxy mastic coating to all welds and surface irregularities before first coat.

Finish Coat(s): As for first coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
First Coat:	200	240
Finish Coat(s):	200	240
TOTAL:	400	

Continuity Testing: 2500 volts DC.

SYSTEM W2-S, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS"

Prepared Surface: Class 3 with surface profile 38 micrometers.

Holding Primer: Non-inhibitive 2-pack epoxy primer to GPC-C-29/7P Type 1 or 4.

Intermediate Coat: High build epoxy, solventless to GPC-C-29/7P Type 4. Apply stripe coat of the epoxy to all welds and surface irregularities before intermediate coat.

Finish Coat(s): As for intermediate coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
Holding primer:	40	60
Intermediate Coat:	250	300
Finish Coat(s):	250	300
TOTAL:	540	

Continuity Testing: 5000 volts DC.

6.4 GALVANIZED

SYSTEM GAL, "GALVANIZED (UNCOATED)"

REQUIREMENT: To [AS/NZS 4680](#).

Repairs: Abrasive blast damaged areas to Class 2½ and apply zinc rich epoxy primer to GPC-P-14/2. Minimum dry film thickness 75 micrometers.

6.5 GALVANIZED, IMMERSED

SYSTEM W1-G, "EPOXY MASTIC, 2-PACK"

Prepared Surface: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.

First Coat: Epoxy mastic to GPC-C-29/7S Type 3.

Finish Coat(s): As for first coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
First Coat:	200	250
Finish Coat(s):	200	250
TOTAL:	400	

Continuity Testing: 2500 volts DC.

SYSTEM W2-G, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS"

Prepared Surface: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.

Primer: Non-inhibitive, 2-pack epoxy to GPC-C-29/7P Type 1 or 4.

Intermediate Coat: High build epoxy, solventless to GPC-C-29/7P Type 4.

Finish Coat(s): As for intermediate coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
Primer:	40	60
Intermediate Coat:	250	300
Finish Coat:	250	300
TOTAL:	540	

Continuity Testing: 5000 volts DC.

6.6 GALVANIZED AND NON-FERROS METALS, ATMOSPHERE

SYSTEM I1-M, "EPOXY, 2-PACK-GLOSS"

Prepared Surface: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.

Primer: Non-inhibitive epoxy primer to GPC-C-29/7A Type 1 or 2.

First Finish Coat: Epoxy enamel to GPC-C-29/7A Type 2.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Primer:	75	125
First finish coat:	75	125
Second finish coat:	75	125
TOTAL:	225	

SYSTEM E1-M, "POLYURETHANE, 2-PACK SOLVENT BORNE"

Prepared Surface: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.

Primer: Non-inhibitive epoxy primer to GPC-C-29/7A Type 1.

First Finish Coat: Pigmented 2 pack polyurethane to GPC-C-29/11A.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Primer:	75	100
1st Finish Coat:	75	125

2nd Finish Coat:	75	125
TOTAL:	225	

6.7 NON-METALS, ATMOSPHERE

SYSTEM I2-N, "ACRYLIC LATEX"

Undercoat: Sealer to GPC-U-163/2. Not required for plastic surfaces.

First Coat: Pigmented acrylic paint to GPC-L-164.

Finish Coat(s): As for first coat. May be applied in one or two coats.

SYSTEM E2-N, "ACRYLIC LATEX"

Undercoat: Sealer to GPC-U-163/1. Not required for plastic surfaces.

First Coat: Pigmented acrylic paint to GPC-L-28 or GPC-L-29/1A.

Finish Coat: As for first coat.

6.8 CONCRETE, IMMERSED

REQUIREMENT: Confirm with coating manufacturer that the coating system is "fit for purpose" with the application.

SYSTEM W3-C, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS"

First Coat: High build epoxy, solventless to GPC-C-29/7, Type 4 or 6, and as required by paint manufacturer.

Finish Coat(s): As for first coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum
First Coat:	300
Finish Coat:	300
TOTAL:	600

SYSTEM W2-C, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS" - POTABLE

First Coat: High build epoxy, solventless to GPC-C-29/7P Type 4.

Finish Coat(s): As for first coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum
First Coat:	300
Finish Coat(s):	300
TOTAL:	600

6.9 TIMBER

SYSTEM I2-T, "ACRYLIC LATEX"

Prime Coat: Pigmented acrylic primer to GPC-P-18/3.

First Finish Coat: Pigmented gloss acrylic to GPC-L-164.

Second Finish Coat: As for first finish coat.

SYSTEM I3-T, "ALKYD GLOSS"

Prime Coat: Oil based primer to GPC-P-18/1.

Undercoat: Pigmented solvent borne alkyd material to [AS 2302](#) and GPC-U-16/1.

First Finish Coat: Pigmented gloss alkyd enamel to GPC-E-15/4.

Second Finish Coat: As for first finish coat.

SYSTEM E2-T "ACRYLIC LATEX"

Prime Coat: Pigmented acrylic primer to GPC-P-18/3.

First Finish Coat: Pigmented gloss acrylic paint to GPC-L-28 or GPC-L-29/1A.

Second Finish Coat: As for first finish coat.

6.10 PRE-COATED EQUIPMENT

"UNIVERSAL COPOLYMER PRIMER" SYSTEM

Prepared Surface: Degreased and lightly brush blasted or hand abraded with a surface profile of not greater than 10 micrometers.

Prime Coat: Non-inhibitive organic copolymer primer as required by manufacturer of finish coats.

Finish Coats: As required for each application.

7 SCHEDULES

7.1 REFERENCED DOCUMENTS

STANDARDS:

- | | |
|-----------------------------|--|
| AS 1627 | - Metal finishing - Preparation and pretreatment of surfaces |
| .1 | - Cleaning using liquid solvents and alkaline solutions |
| .4 | - Abrasive blast cleaning |
| .9 | - Pictorial surface preparation for painting steel surfaces |
| AS 2105 | - Inorganic zinc silicate paint |
| AS/NZS 2302 | - Undercoat, solvent borne, exterior/Interior |
| AS/NZS 2310 | - Glossary of paint and painting terms |
| AS 2311 | - The painting of buildings |

-
- AS/NZS 2312 - Guide to the protection of iron and steel against exterior atmospheric corrosion
 - AS 2700 - Colour standards for general purpose
 - AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water
 - AS/NZS 3894 - Site testing of protective coatings
 - AS 3894.1 - Non-conductive coatings - Continuity testing - High voltage (brush) method
 - AS 3894.3 - Determination of dry film thickness
 - AS 3894.4 - Assessment of degree of cure
 - AS/NZS 3894.5 - Determination of surface profile
 - AS/NZS 3894.6 - Determination of residual contaminants
 - AS/NZS 3894.7 - Determination of surface temperature
 - AS 3894.10 - Inspection report - Daily
 - AS 3894.11 - Equipment report
 - AS 3894.12 - Inspection report - Coating
 - AS/NZS 3905.2 - Guide to AS/NZS ISO 9001, AS/NZS ISO 9002, and AS/NZS ISO 9003 for construction
 - AS/NZS 4020 - Products for use in contact with drinking water
 - AS/NZS 4680 - Hot dip galvanized (zinc) coating on fabricated ferrous articles
 - AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and services

APAS SPECIFICATIONS:

- GPC-P-14/2 - Two pack epoxy binder zinc rich preconstruction primer
- GPC-E-15/4 - Full gloss interior enamel (buildings)
- GPC-U-16 - Undercoat for enamel (building)
- GPC-U-16/1 - Solvent borne undercoat - interior/exterior (buildings)
- GPC-P-18/1 - Solvent borne wood primer (buildings)
- GPC-P-18/3 - Latex wood primer (buildings)
- GPC-L-28 - Gloss exterior latex paint (buildings)
- GPC-L-29/1A - Latex coating for steel protection in the atmosphere
- GPC-C-29/7A - Catalysed epoxy coating for steel protection in the atmosphere
- GPC-C-29/7F - Catalysed epoxy coating for steel protection in fresh water
- GPC-C-29/7P - Catalysed epoxy coating for steel protection in potable water
- GPC-C-29/7S - Catalysed epoxy coating for steel protection in sea water
- GPC-C-29/11A - Polyurethane coating for steel protection in the atmosphere
- GPC-P-32 - Paint, metal primer (buildings)
- GPC-U-163/1 - Exterior latex undercoat (buildings)

GPC-U-163/2 - Interior latex undercoat (buildings)

GPC-L-164 - Interior gloss latex paint (buildings)

7.2 NATIONAL PRACTICES

STATE/TERRITORY	QUALITY SYSTEM CERTIFICATION
ACT NEW SOUTH WALES TASMANIA	CLASS 3 PCCP* (PREFERRED) OR ISO 9002
NORTHERN TERRITORY QUEENSLAND SOUTH AUSTRALIA WESTERN AUSTRALIA VICTORIA	AS ABOVE OR DOCUMENTARY EVIDENCE THAT CERTIFICATION TO PCCP IS WELL ADVANCED

* PCCP Painting Contractor Certification Program.

NSW CONTAINMENT PRACTICE:

Shop work: To local regulatory authority requirements.

Field work: Containment for abrasive blasting Cat 3B to minimum emission control criteria from [AS 4361.1](#), Table E1.

7.3 PROJECT SPECIFICS

[Note: Insert the following in project specifications].

REQUIREMENT: Prepare the surfaces and apply protective coatings in compliance with Section TR20 and the following:

MATERIAL / ITEM	PAINT SYSTEM	COLOUR	CONTACT WITH POTABLE WATER

7.4 EXCLUSIONS

REQUIREMENT: Do not paint the following unless otherwise specified.

- Metals plated or specifically finished for appearance, bronze, brass, copper and stainless steel;
- Aluminium frames;
- Metal floor duct covers;
- Fair faced brickwork, blockwork, stonework and exposed aggregates;
- Floors, paving, roads;

- Inside service ducts;
- Shower seats, store shelving, work benches;
- Those parts of timber fixtures, such as cupboards, which are finished with plastic laminates or veneers;
- Pipes that are lagged, in covered pipe trays or in trenches.

7.5 PROTECTIVE COATINGS SYSTEM CODE

GENERAL: The System Code adopted throughout the WS-SPEC is based on the following:

SYSTEM CODE

GENERIC COATING		-	SUBSTRATE TYPE
EXPOSURE	OPTION NO.		
I (INTERNAL)	1 TO 2		- S (STEEL)
			- G (GALVANISED)
E (EXTERNAL)	1 TO 6		- C (CONCRETE)
			- T (TIMBER)
W (WET)	1 TO 2		- N (NON-METALS)
			- M (METALS)

EG: E2-S (EXTERNAL, OPTION No. 2 - STEEL)

THE COMBINATION OF EXPOSURE CATEGORY AND PAINT OPTION NUMBER, DEFINES THE GENERIC COATING

SECTION TR21 STEEL RESERVOIR COATINGS

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for preparing the surface and applying protective coating systems to new steel reservoirs and appurtenances.

1.2 CROSS REFERENCES

RELATED SECTIONS: Refer to **GENERAL TECHNICAL - SECTION TR1** and **STEEL PLATE - SECTION SP40**

1.3 STANDARDS

GENERAL: To [AS/NZS 2310](#), [AS 2311](#) and [AS/NZS 2312](#).

COATING PRODUCTS: To APAS (Australian Paint Approval Scheme) specification and approvals.

FILM THICKNESSES: Film thicknesses are expressed in micrometres.

1.4 SYSTEMS AND APPLICATIONS SUMMARY

SURFACE AND APPLICATION	SYSTEM		SECTION TR21 CLAUSE																																
	DESCRIPTION	CODE																																	
EXTERNAL STEEL																																			
<ul style="list-style-type: none"> • Mild Environments (Inland) <ul style="list-style-type: none"> - Environmental Green <table border="0" style="margin-left: 20px;"> <tr> <td style="font-size: 2em; vertical-align: middle;">[</td> <td>Acrylic Latex-MIO</td> <td style="text-align: center;">E3-S</td> <td style="text-align: center;">6.3</td> </tr> <tr> <td></td> <td>Alkyd-MIO</td> <td style="text-align: center;">E4-S</td> <td style="text-align: center;">6.3</td> </tr> </table> - Other Colours <table border="0" style="margin-left: 20px;"> <tr> <td style="font-size: 2em; vertical-align: middle;">[</td> <td>Acrylic Latex</td> <td style="text-align: center;">E2-S</td> <td style="text-align: center;">6.3</td> </tr> <tr> <td></td> <td>Alkyd Gloss</td> <td style="text-align: center;">E5-S</td> <td style="text-align: center;">6.3</td> </tr> </table> • Aggressive Environments (Coastal) <ul style="list-style-type: none"> - Environmental Green <table border="0" style="margin-left: 20px;"> <tr> <td style="font-size: 2em; vertical-align: middle;">[</td> <td>Alkyd-MIO</td> <td style="text-align: center;">E4-S</td> <td style="text-align: center;">6.3</td> </tr> <tr> <td></td> <td>Epoxy, 2-pack-MIO</td> <td style="text-align: center;">E6-S</td> <td style="text-align: center;">6.3</td> </tr> </table> - Other Colours <table border="0" style="margin-left: 20px;"> <tr> <td style="font-size: 2em; vertical-align: middle;">[</td> <td>Polyurethane, 2-pack solvent borne</td> <td style="text-align: center;">E1-S</td> <td style="text-align: center;">6.3</td> </tr> <tr> <td></td> <td>Alkyd Gloss</td> <td style="text-align: center;">E5-S</td> <td style="text-align: center;">6.3</td> </tr> </table> 	[Acrylic Latex-MIO	E3-S	6.3		Alkyd-MIO	E4-S	6.3	[Acrylic Latex	E2-S	6.3		Alkyd Gloss	E5-S	6.3	[Alkyd-MIO	E4-S	6.3		Epoxy, 2-pack-MIO	E6-S	6.3	[Polyurethane, 2-pack solvent borne	E1-S	6.3		Alkyd Gloss	E5-S	6.3			
[Acrylic Latex-MIO	E3-S	6.3																																
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[Polyurethane, 2-pack solvent borne	E1-S	6.3																																
	Alkyd Gloss	E5-S	6.3																																
INTERNAL STEEL	Epoxy High Build, 2-pack solventless	W2-S	6.6																																

2 QUALITY

2.1 PAINTING CONTRACTOR CERTIFICATION

REQUIREMENT: To **NATIONAL PRACTICES - CLAUSE 7.3**.

2.2 CONSTRUCTION COMPLIANCE

INSPECTION AND TEST PLANS(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

Use [AS 3894.10](#), [AS 3894.11](#) and [AS 3894.12](#) reports for recording inspection details.

INSPECTION PERSONNEL: Personnel responsible for certification of coating application to possess an Australasian Corrosion Association Coating Inspection Certificate.

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for both internal and external protective system applications:

- | | |
|---|---|
| • Materials and qualifications certification, required for Section TR21 | H |
| • Availability of relevant current referenced Standards | W |
| • Dust containment system | H |
| • Blast cleaning - first (trial) work area | H |
| • Blast cleaning - other work areas | W |
| • Coating application - first (trial) work area | H |
| • Coating application - other work areas | W |
| • Testing of coatings | W |

2.3 SUBMISSIONS ON MATERIALS

MANUFACTURER'S INSTRUCTIONS: Provide copy(s) of manufacturer's technical literature, including material safety data sheets for the coating system to be used, before commencing application.

PROPRIETARY MATERIALS: Advise prior to application, the proposed brand of paint and paint line together with APAS approval certification(s).

2.4 SUBSTRATE INSPECTION

BLAST CLEANED SURFACES: Check for compliance with *IRON AND STEEL SURFACES - CLAUSE 5.2*, as follows:

Class of finish: Visually compare surface with colour prints in [AS 1627.9](#).

Profile height: To [AS/NZS 3894.5](#).

2.5 WET FILM

STANDARD : [AS 3894.3](#) Appendix C.

REQUIREMENT: Measure wet thickness to enable modification of the rate of application before the coating has hardened.

2.6 DRY FILM

STANDARD: [AS 3894.3](#) Method B.

CALIBRATION: To [AS 3894.3](#), Appendix D.

2.7 CONTINUITY TESTING

REQUIREMENT: For "Epoxy High Build, 2-pack solventless" systems on internal surfaces only. After curing, test entire surface using a fully variable DC high voltage holiday detector to [AS 3894.1](#).

ACCEPTANCE CRITERIA: No defects. Rectify any defects to manufacturer's technical literature.

3 MATERIALS

3.1 GENERAL

COMBINATIONS: Paint systems to have all coats made by the same manufacturer.

DELIVERY: Deliver paints to the site in the manufacturer's labelled and unopened containers bearing batch number, instructions for application and shelf life.

CONTACT WITH POTABLE WATER: Provide manufacturer's certificate to [AS 3855](#) to [AS/NZS 4020](#), certifying that all coating materials to be used inside the reservoir are suitable for potable water.

THINNERS: Use only the type and quantity required by the paint manufacturer.

TINTING BY CONTRACTOR: Add tinters in accordance with the manufacturer's technical literature as to type, quality and tinting formula.

GLOSS LEVEL: "Alkyd-MIO-Gloss" to have a Specular Gloss Level of 5 with a 60 degree geometric head to [AS/NZS 1580.602.2](#).

3.2 COLOUR SELECTION

COLOUR: To [AS 2700](#), except for MIO coating systems.

FINAL EXTERNAL COAT: WB environmental green, unless otherwise specified.

4 WORK EXECUTION

4.1 GENERAL

PAINTING CONDITIONS: Do not paint when:

- Surface temperature is less than 3°C above the dew point.
- Surface temperature is greater than 55°C.
- Surface temperature is less than 10°C.
- Relative humidity is greater than 85%.
- Surface is in direct strong sunlight.
- Weather is deteriorating or is unfavourable for application or curing.
- Pot life of the paint has been exceeded.
- Shelf life of the paint has been exceeded.

PAINT MIXING: Mix and apply paint in accordance with the manufacturer's technical literature. Do not mix paint in areas or on surfaces liable to damage from spillage.

TOUCH UP: Clean off marks, paint spots and stains throughout, restoring damaged surfaces to their original condition. Where necessary for aesthetic reasons, touch up damaged paint work or misses only with the paint batch used in the original application.

PROTECTION: Protect coating that requires curing prior to immersion from rain or accidental immersion until it is fully cured.

Initial curing period: Reblast and recoat areas exposed to rain or immersed during this period.

After initial curing period: Dry affected areas without delay.

4.2 DUST CONTAINMENT

REQUIREMENT: As prescribed by the relevant Government Occupational Health and Safety Authority. Refer to [AS 4361.1](#) for technical guidance. See *NATIONAL PRACTICES - CLAUSE 7.3*.

4.3 APPLICATION

STANDARD: To [AS/NZS 2312](#), Section 8 as applicable.

PROCEDURE: Apply paint and related materials in accordance with the manufacturer's technical literature.

NUMBER OF COATS: Apply inorganic zinc silicate paint in one coat only; recoating prohibited. For other paints, apply sufficient coats (which could be more than the number specified) to achieve the required colour, opacity, texture and film thickness.

FINISH: Ensure each coat of paint is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities.

4.4 CURING

REQUIREMENT: Before top-coating, check level of cure meets manufacturer's requirements, and before placing into service, check coating is fully cured to [AS/NZS 3894.4](#).

5 SUBSTRATE PREPARATION

5.1 GENERAL

STANDARDS: To [AS 1627](#) and [AS 2312](#), Section 5, as applicable.

REQUIREMENT: Prepare substrates to receive the systems specified by compliance with the following general requirements.

Drying: Ensure that surfaces are dry before painting commences.

Recontamination: Apply first coat within 4 hours of cleaning surface and before any flash corrosion or other recontamination occurs.

Bolted connections: Apply specified primer to mating surfaces and cure before connecting.

Fabrication and welding: Complete a particular item before preparing it for painting.

5.2 IRON AND STEEL SURFACES

DEGREASING: Use an aqueous alkaline oil emulsifier to [AS 1627.1](#).

GRINDING: Remove weld spatter, slag, burrs or any other surface irregularities. Remove all sharp edges and grind to a curvature with a radius not less than 3.0 mm. Grind all butt welds smooth, not necessarily flush with the plate surface, but free from sharp crests.

ADDITIONAL GRINDING: If grinding is required after abrasive blast cleaning, re-blast the ground areas before painting.

BLAST CLEANING: Blast clean the surfaces to [AS 1627.4](#), to the specified standards of finish and comply with the following:

System: Dry abrasive blast clean, using air free from oil and moisture.

Abrasives: Use alluvial garnet or steel grit, both free of chlorides.

Restrictions: Protect coated areas from damage during blast cleaning and blow down operations.

SURFACE PROFILE: Produce an angular surface profile to that specified.

5.3 GALVANISED SURFACES

DEGREASING: Clean the entire surface, using an aqueous alkaline oil emulsifier to [AS 1627.1](#).

6 PROTECTIVE COATING SYSTEMS

6.1 GENERAL

EXTERNAL SYSTEMS: Apply the system(s) specified in the 'EXTERNAL' clauses to the outer face of the shell and appurtenant pipe, steelwork and galvanised surfaces outside the reservoir unless otherwise specified.

INTERNAL SYSTEMS: Apply the system(s) specified in the 'INTERNAL' clauses to the inner face, the floor and non-excluded pipe, steelwork and galvanised surfaces within the reservoir.

6.2 PRE-CONSTRUCTION PRIMERS

REQUIREMENT: Accepted for external surfaces without removal, subject to the weld margins and damaged areas being reinstated to comply with the full coating system. For internal surfaces, after satisfactory hydrostatic testing, remove any pre-construction primers by blast cleaning.

SHOP APPLIED: Accepted where the applicator can demonstrate that surface preparation and coating application quality is consistent with this specification.

PLATE MANUFACTURER APPLIED: Accepted provided minimum total primer thickness is achieved, and for Systems E2-S, "Acrylic Latex" and E3-S, "Acrylic Latex-MIO", subject to removal of plate manufacturer applied primer.

6.3 EXTERNAL STEEL SURFACES

SYSTEM E1-S, "POLYURETHANE, 2-PACK SOLVENT BORNE"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Primer: Zinc phosphate pigmented epoxy primer to GPC-C-29/7A Type 1 or 2.

Intermediate Coat: Micaceous iron oxide pigmented epoxy to GPC-C-29/7A Type 2 or 3.

First Finish Coat: Pigmented polyurethane 2-pack to GPC-C-29/11A.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Primer:	75	90
Intermediate coat:	60	75
First finish coat:	50	85
Second finish coat:	50	85
TOTAL:	235	

SYSTEM E2-S, "ACRYLIC LATEX"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Primer: Inorganic zinc silicate paint to [AS 2105](#) Type 4 (GPC-C-29/8A).

Intermediate Coat: Micaceous iron oxide acrylic to GPC-C-29/1A.

First Finish Coat: Pigmented gloss acrylic GPC-C-29/1A.

Second Finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Primer	75	90
Intermediate coat:	50	70
First finish coat:	50	75
Second finish coat:	50	75
TOTAL:	225	

SYSTEM E3-S, "ACRYLIC LATEX-MIO"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Primer: Inorganic zinc silicate to [AS 2105](#), Type 4 (GPC-C-29/8A).

Intermediate Coat: Micaceous iron oxide acrylic to GPC-C-29/1A.

Finish Coat: As for intermediate coat.

Dry Film Thickness:

	Minimum	Maximum
Primer	75	90
Intermediate coat:	50	75
Finish coat:	50	75
TOTAL:	175	

SYSTEM E4-S, "ALKYD-MIO"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Shop Primer: Zinc phosphate pigmented alkyd primer to GPC-C-29/2A.

Field Primer: As for shop primer. [Note: Both shop and field primer are required].

Intermediate Coat: Micaceous iron oxide pigmented alkyd to GPC-C-29/10A.

Finish Coat: As for intermediate coat.

Dry Film Thickness:

	Minimum	Maximum
Shop primer:	60	80
Field primer:	60	80
Intermediate coat:	45	60
Finish coat:	45	60
TOTAL:	210	

SYSTEM E5-S, "ALKYD GLOSS"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Shop Primer: Zinc phosphate pigmented alkyd to GPC-C-29/2A.

Field Primer: As for shop primer. [Note: Both shop and field primer are required].

Intermediate Coat: Micaceous iron oxide pigmented alkyd to GPC-C-29/10A.

First finish Coat: Pigmented gloss enamel to GPC-E-15/3.

Second finish Coat: As for first finish coat.

Dry Film Thickness:

	Minimum	Maximum
Shop primer:	60	80
Field primer:	60	80
Intermediate coat:	45	60
First finish coat:	35	50
Second Finish coat:	35	50
TOTAL:	235	

SYSTEM E6-S, "EPOXY, 2-PACK-MIO"

Prepared Surface: Class 2½ with surface profile 38 micrometers.

Primer: Zinc phosphate epoxy, primer to GPC-C-29/7A Type 1 or 2.

Intermediate Coat: Micaceous iron oxide pigmented epoxy to GPC-C-29/7A Type 2.

Finish Coat: As for intermediate coat.

Dry Film Thickness:

	Minimum	Maximum
Primer:	75	90
Intermediate coat:	125	175
Finish coat:	125	175
TOTAL:	325	

6.4 EXTERNAL CAST AND DUCTILE IRON SURFACES

SYSTEMS: To *EXTERNAL STEEL SURFACES - CLAUSE 6.3*, except that:

- Pre-construction primers not required
- Use epoxy mastic surface tolerant primer, with minimum dry film thickness of 150 to 200 micrometers.

6.5 EXTERNAL GALVANISED SURFACES

SYSTEMS: To *EXTERNAL STEEL SURFACES - CLAUSE 6.3*, except that prepared surface as follows and all primers to be replaced by non-inhibitive epoxy primer to GPC-C-29/7A, Type 1 or 2, with minimum dry film thickness of 50 micrometers.

Prepared Surface: Degrease the surface and lightly brush blast or hand abrade to provide a surface profile of not greater than 10 micrometers.

Weld/Repair: Abrasive blast damaged surfaces to Class 2½ and apply zinc rich epoxy primer to GPC-P-14/2 with minimum dry film thickness 75 micrometers.

6.6 INTERNAL IRON AND STEEL SURFACES

SYSTEM W2-S, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS"

Prepared Surface: Class 3 with surface profile 38 micrometers.

Holding Primer: Non-inhibitive 2 pack epoxy primer to GPC-C-29/7P Type 1 or 4.

Intermediate Coat: High build epoxy, solventless to GPC-C-29/7P Type 4. Apply stripe coat of the epoxy to all welds and surface irregularities before intermediate coat.

Finish Coat(s): As for intermediate coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
Holding primer:	40	60
Intermediate coat:	250	300
Finish coat:	250	300
TOTAL:	540	

Continuity Testing: 5000 volts DC.

6.7 INTERNAL GALVANISED SURFACES

SYSTEM W2-G, "EPOXY HIGH BUILD, 2-PACK SOLVENTLESS"

Prepared Surface: Degrease the surface and lightly brush blast or hand abrade to provide a surface profile of not greater than 10 micrometers.

Primer: Non-inhibitive, 2-pack epoxy to GPC-C-29/7P Type 1 or 4.

Intermediate Coat: High build epoxy, solventless to GPC-C-29/7P Type 4.

Finish Coat(s): As for intermediate coat. May be applied in one or two coats.

Dry Film Thickness:

	Minimum	Maximum
Primer:	40	60
Intermediate coat:	250	300
Finish coat:	250	300
TOTAL:	540	

Continuity Testing: 5000 volts DC.

7 SCHEDULES

7.1 REFERENCED DOCUMENTS

STANDARDS:

[AS/NZS 1580.602.2](#) - Measurement of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees

[AS 1627](#) - Metal finishing - Preparation and pretreatment of surfaces
.1 - Cleaning using liquid solvents and alkaline solutions
.4 - Abrasive blast cleaning
.9 - Pictorial surface preparation for painting steel surfaces

[AS 2105](#) - Inorganic zinc silicate paint

- AS/NZS 2310 - Glossary of paint and painting terms
- AS 2311 - The painting of buildings
- AS/NZS 2312 - Guide to the protection of iron and steel against exterior atmospheric corrosion
- AS 2700 - Colour standards for general purpose
- AS 3855 - Suitability of plumbing and water distribution systems products for contact with potable water

- AS/NZS 3894 - Site testing of protective coatings
- AS 3894.1 - Non-conductive coatings - Continuity testing - High voltage (brush) method
- AS 3894.3 - Determination of dry film thickness
- AS 3894.4 - Assessment of degree of cure
- AS/NZS 3894.5 - Determination of surface profile
- AS/NZS 3894.7 - Determination of surface temperature
- AS 3894.10 - Inspection report - Daily
- AS 3894.11 - Equipment report
- AS 3894.12 - Inspection report - Coating

- AS/NZS 3905.2 - Guide to AS/NZS ISO 9001, AS/NZS ISO 9002, and AS/NZS ISO 9003 for construction

- AS/NZS 4020 - Products for use in contact with drinking water

- AS 4361 - Guide to lead paint management
- .1 - Industrial applications

- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing

APAS SPECIFICATIONS

- GPC-P-14/2 - Two pack epoxy binder zinc rich preconstruction primer
- GPC-E-15/3 - Full gloss exterior enamel (buildings)
- GPC-C-29/1A - Latex coating for protection of steel in the atmosphere
- GPC-C-29/2A - Air-drying coating for protection of steel in the atmosphere
- GPC-C-29/7A - Catalysed epoxy coating for steel protection in the atmosphere
- GPC-C-29/7P - Catalysed epoxy coating for steel protection in potable water
- GPC-C-29/8A - Inorganic zinc coating for steel protection in the atmosphere
- GPC-C-29/10A - MIO or aluminium coating for steel protection in the atmosphere
- GPC-C-29/11A - Polyurethane coating for steel protection in the atmosphere

WS-SPEC

7.2 AGENCY PRACTICES

PRACTICE	INTERNAL PROTECTION SYSTEM	EXTERNAL PROTECTION SYSTEM	
		COASTAL (CAT. D)*	INLAND (CAT. B & C)*
ACTEW Corporation	“Epoxy High Build, 2-pack solventless”	–	“Acrylic Latex-MIO” OR “Acrylic Latex”
Barwon Water	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack-MIO”	“Acrylic Latex-MIO”
Brisbane Water	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack-MIO”	–
Dept of Land and Water Conservation, NSW	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack-MIO” OR “Polyurethane, 2-pack solvent borne”	“Acrylic Latex-MIO” OR “Acrylic Latex”
Dept of Natural Resources, QLD	–	–	–
Dept of Public Works and Services, NSW	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack-MIO” OR “Polyurethane, 2-pack solvent borne”	“Acrylic Latex-MIO” OR “Acrylic Latex”
Hunter Water Corporation	“Epoxy High Build, 2-pack solventless”	“Polyurethane, 2-pack solvent borne”	“Acrylic Latex-MIO”
Melbourne Retail Water Companies	“Epoxy High Build, 2-pack solventless”	Under review	Under review
Power & Water Authority, NT	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack-MIO” OR “Polyurethane, 2-pack solvent borne”	“Acrylic Latex-MIO” OR “Acrylic Latex”
South Australian Water Corporation	“Epoxy High Build, 2-pack solventless”	–	“Acrylic Latex”
Sydney Water Corporation	“Epoxy High Build, 2-pack solventless”	“Alkyd-MIO” OR “Alkyd Gloss”	“Alkyd-MIO” OR “Alkyd Gloss”
Water Corporation, WA	“Epoxy High Build, 2-pack solventless”	“Epoxy, 2-pack” OR “Acrylic, 2-pack”	“Acrylic, 2-pack-Gloss”

* For definitions see [AS/NZS 2312](#).

7.3 NATIONAL PRACTICES

STATE/TERRITORY	CERTIFICATION
ACT NEW SOUTH WALES TASMANIA	CLASS 3 PCCP* (PREFERRED) OR ISO 9002
NORTHERN TERRITORY QUEENSLAND SOUTH AUSTRALIA WESTERN AUSTRALIA VICTORIA	AS ABOVE OR DOCUMENTARY EVIDENCE THAT CERTIFICATION TO PCCP IS WELL ADVANCED

* PCCP Painting Contractor Certification Program.

NSW CONTAINMENT PRACTICE:

Internal work: Use the reservoir as a containment vessel in association with mechanical ventilation operating at negative pressure to prevent emission.

External work: Adopt the following minimum emission control criteria from [AS 4361.1](#), Table E1:

- Containment abrasive blasting Cat 3B
- Vacuum shrouded power tools Cat 4.

7.4 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Prepare the surfaces and apply protective coatings in compliance with Section TR21 and the following:

ITEM	PAINT SYSTEM (*See Practices Table of Section TR21)	COLOUR
Shop Primer		
Internal Surfaces	*	
External Surfaces	*	
Final External Coat	*	

SECTION TR30 STAINLESS STEEL

1 GENERAL

1.1 CONTENTS

OUTLINE: This Section sets out the technical requirements for the supply, fabrication, and installation of stainless steel pipes, components and fasteners, for water supply and sewerage applications. It is applicable to all grades and forms, such as wrought, cast and forged, but primarily addresses Grades 304/304L and 316/316L. Grades 303 and 416 are excluded.

1.2 CROSS REFERENCES

RELATED SECTIONS: Refer to *GENERAL TECHNICAL - SECTION TRI*.

1.3 STANDARDS

DESIGN: Prepare to [AS 4041](#), [AS 4100](#) or ASCE 8.

MATERIALS:

- Plate, sheet and strip : [AS 1449](#) or ASTM A240M
- Bar : [AS 2837](#) or ASTM A276
- Pipe and tube : [AS 1769](#) or ASTM A312M

FABRICATION AND INSTALLATION: Welding to [AS/NZS 1554.6](#), structures to [AS 4100](#) and pressure pipe to [AS 4041](#).

FINISHING AND PASSIVATION: To [AS/NZS 1554.6](#), [AS 1627.5](#) and ASTM A380.

1.4 ENVIRONMENTS

REQUIREMENT: Adopt Table 1 for non-stagnant or free flowing applications where the fluid temperature and equipment are below 60⁰C. Also, allow for variation during commissioning and/or shut down that could result in stagnation and/or anerobic conditions.

TABLE 1

CHLORIDES (MAXIMUM) (ppm)	MATERIALS SELECTION	
	WATER AND WASTEWATER	BURIED
< 200	SS 304*/316 or SS 304L*/316L	SS 316 or SS 316L (unless soils are known to be non-corrosive, ie. resistivity greater than 50 ohm meters)
> 200, < 1000	SS 316 or SS 316L	
> 1000 and/or Sea Water	Specialist Advice Required	

* SS 316 or 316L may be required if moist gaseous hydrogen sulphide > 5 mg/L is present.

1.5 STORAGE AND TRANSPORT

REQUIREMENT: Avoid both contact with other metals and rubbing with any other item during transportation. Do not use adhesive labels.

2 QUALITY

2.1 MATERIALS SUPPLY

STANDARD: To [ISO 9001](#) or [ISO 9002](#) as appropriate.

2.2 FABRICATION QUALITY

CERTIFICATION: To [AS/NZS 1554.6](#) and [AS 4041](#).

2.3 COMPLIANCE

INSPECTION AND TEST PLAN(S): To [AS/NZS 3905.2](#) for use in conjunction with [ISO 9002](#).

REQUIREMENT: Obtain Principal's agreement that ITP(s) demonstrate compliance with the relevant Standard(s) and/or these technical requirements.

INSPECTION PERSONNEL: Personnel responsible for inspection to be accredited to the Welding Technology Institute of Australia or meet the requirements of [AS 1554.6](#) and/or [AS 4041](#).

WITNESS (W) AND HOLD (H) POINTS: Give adequate notice for the following inspections for:

- | | |
|---|---|
| • Contractor's submissions and qualifications of inspection personnel | H |
| • Availability of relevant current referenced Standards | H |
| • Material validation and traceability through to the fabricated item | H |
| • Post fabrication testing and inspection | H |
| • Protection for transport and storage | W |
| • Components and installation | H |

2.4 SUBMISSIONS

SHOP DRAWINGS: To include all welded joints and details of proposed welding procedures.

SITE WELDING: Include weld positions and details of proposed process.

3 COMPONENTS AND MATERIALS

3.1 MATERIALS

ANTI-GALLING OR ANTI-SEIZE: To be PTFE, either tape, dipped or sprayed. Molybdenum disulphide also accepted.

3.2 COMPONENTS

BOLTING (FASTENERS): Rolled only threads accepted, to DIN 13, Parts 12 and 15. Markings and properties of hexagon head bolts, nuts and washers to [ISO 3506, Parts 1 and 2](#). All bolts, nuts and washers to be of same grade.

(Note: Designation A2 and A4 correspond to 304 and 316 respectively).

PRE-TREATMENT: All bolts, nuts and washers to be supplied passivated.

4 FABRICATION

REQUIREMENT: All storage and fabrication to be in a stainless steel dedicated area to prevent contamination from other metals. All finishing tools to be dedicated to stainless steel.

WELDS: Unless otherwise specified, adopt the following for:

- Minimum Category of Weld: 1B to [AS/NZS 1554.6](#) for general structural welding, or to [AS 4041](#) for pressure piping.
- Surface finish and passivation for all work, use Grade II(a), (c), (d) or (e), to [AS/NZS 1554.6](#).
- Base metal thicknesses greater than 3mm, use low carbon or stabilised stainless steel grades.

5 INSTALLATION

PIPEWORK: Either fully self draining or with provision for full drainage.

THREADED CONNECTIONS: Use anti-galling or anti-seize on all threaded joint interfaces, to the product manufacturer's recommendations.

BOLTED PIPELINE CONNECTIONS: To [AS 4087](#), Appendix D, all pipeline materials. For hexagon bolts, Type A2 and A4 (304 and 316), strength grade Class 70 (700 N/mm²), adopt tightening torques to Table 2. For Class 35 flanges, specialist advice required.

TABLE 2

PIPE DIA (DN)	BOLT SIZE	NO. OF BOLTS	FULL FACE, CLASS 14		RAISED FACE, CLASS 16	
			BOLT TENSION (kN)**	ESTIMATED TIGHTENING TORQUE* (N.m)	BOLT TENSION (kN)**	ESTIMATED TIGHTENING TORQUE* (N.m)
100	M16	4	32	102	18	58
150	M16	8	27	86	15	48
200	M16	8	37	118	22	70
225	M16	8	45	144	23	74
250	M20	8	53	212	34	136
300	M20	12	43	172	28	112
375	M24	12	62	298	42	202
450	M24	12	83	398	52	250
500	M24	16	75	360	52	250
600	M27	16	101	545	67	362
750	M30	20	116	696	80	480

* Torques shown are calculated to achieve sealing and to limit risk of stress corrosion. Flat, smooth, well-lubricated surfaces such as would be achieved with anti-seize compounds for a torque coeff. of 0.2, and fibre reinforced natural rubber gaskets, have been assumed. Bolt tensions may vary considerably with different applications. Check with manufacturer for application of torques inconsistent with the above.

** Using a torque wrench, the resultant bolt tension may vary as much as $\pm 25\%$.

INSULATION: Electrically insulate between stainless steel components and other dissimilar metals, such as steel, DI/CI, in conditions of total or partial immersion in water, sewerage or in below ground applications. Over-sized bolt holes required for insulating bushes.

6 SCHEDULES

6.1 REFERENCED DOCUMENTS

STANDARDS:

- AS 1449 - Wrought alloy steels - Stainless and heat resisting steel plate, sheet and strip
- AS/NZS 1554.6 - Welding stainless steel for structural purposes
- AS 1627.5 - Metal finishing - Preparation and pretreatment of surfaces
- Pickling, descaling and oxide removal
- AS 1769 - Welded stainless steel tubes for plumbing applications
- AS 2837 - Wrought alloy steels - Stainless steel bars and semi-finished products
- AS/NZS 3905.2 - Guide to AS/NZS ISO 9001, AS/NZS ISO 9002, and AS/NZS ISO 9003 for construction
- AS 4041 - Pressure piping
- AS 4100 - Steel structures
- AS 4087 - Metallic flanges for waterworks purposes
- AS/NZS ISO 9001 - Quality systems: Model for quality assurance in design, production, installation and servicing
- AS/NZS ISO 9002 - Quality systems: Model for quality assurance in production, installation and servicing
- ASCE 8 - Specification for the design of cold-formed stainless steel structural members
- ASTM A240M - Heat-resisting chromium and chromium-nickel stainless steel plate, sheet and strip for pressure vessels (metric)
- ASTM A276 - Standard specification for stainless and heat-resisting steel bars and shapes
- ASTM A312M - Standard specification for seamless and welded austenitic stainless steel pipes (metric)
- ASTM A380 - Standard practice for cleaning, descaling and passivation of stainless steel parts, equipment and systems
- DIN 13-12 (ENGLISH) - ISO metric screw threads; 1 mm to 300 mm diameter coarse and fine pitch threads; selected diametres and pitches
- DIN 13-15 (ENGLISH) - ISO metric screw threads; Fundamental deviations and tolerances for screw threads from 1 mm diameter upwards
- ISO 3506.1 - Mechanical properties of corrosion resistant stainless steel fasteners
- Bolts, screws and studs
- ISO 3506.2 - Nuts

6.2 PROJECT SPECIFICS

[Note: Select from or add to the following and insert in project specifications.]

REQUIREMENT: Prepare the stainless steel items and components in compliance with Section TR30 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS
Manufactured products: <ul style="list-style-type: none"> - Identification (include bolts, nuts and washers) - SS grade(s) - Grade of surface finish - Jointing type(s) - Insultation (eg. bushes) 	- - - - -
Components and materials: <ul style="list-style-type: none"> - Anti-seize - Jointing materials 	- -
Fabricated items: <ul style="list-style-type: none"> - Select from check list in AS/NZS 1554.6, Appendix G 	-
Certificate of Compliance, to Section TR30	Manufacturer to supply

ATTACHMENTS

ATTACHMENT A

CONTACTS LIST

Where WS-SPEC has referenced other documents or organisations and additional information may be required, to assist users, the following contact information has been included:

NAME AND CONTACT DETAILS		
APAS (AUSTRALIAN PAINT APPROVAL SCHEME)		
Website: www.apas.gov.au		
Phone: (03) 9248-4902	Fax: (03) 9646-5165	E:mail: ken.lofhelm@agal.gov.au
AUSPOLY (Polyethylene Pipelines Assoc. of Australasia LTD)		
Phone: (02) 4363-2159	Fax: (02) 4363-2456	E:mail: dimip@ozemail.com.au
AUSTRALIAN NATIONAL TRAINING AUTHORITY (NATIONAL TRAINING INFORMATION SERVICE)		
Phone: (07) 3246-2300	Fax: (07) 3246-2490	Website: www.anta.gov.au
INDUSTRY TRAINING ADVISORY BODIES (ITAB)		
NU&EITAB (National Level) Website: nueitab.com.au		
Phone: (02) 9290-2533	Fax: (02) 9290-2544	E:mail: nueitab@nueitab.com.au
STATE/TERRITORY TRAINING AUTHORITIES		
ACT OFFICE OF TRAINING AND ADULT EDUCATION		
Phone: (02) 6205-7047	Fax: (02) 6205-8448	Website:
NORTHERN TERRITORY EMPLOYMENT AND TRAINING AUTHORITY		
Phone: (08) 8999-4396	Fax: (08) 8999-4300	E:mail: greg.flanagan@nt.gov.au
NSW: VOCATIONAL EDUCATION AND TRAINING ACCREDITATION BOARD		
Phone: (02) 9244-5335	Fax: (02) 9244-5344	Website: www.det.nsw.edu.au/trainingmarket
Q'LD: DEPARTMENT OF EMPLOYMENT, TRAINING AND INDUSTRIAL RELATIONS		
Phone: (07) 3224-6960	Fax: (07) 3247-5488	Website: www.detir.qld.gov.au/training
SA: ACCREDITATION AND REGISTRATION COUNCIL		
Phone: (08) 8226-3188	Fax: (08) 8226-1523	Website:
TAS: OFFICE OF VOCATIONAL EDUCATION AND TRAINING		
Phone: (03) 6233-4623	Fax: (03) 6234-4358	Website:
VIC: OFFICE OF POST COMPULSORY EDUCATION, TRAINING AND EMPLOYMENT		
Phone: (03) 9637-2762	Fax: (03) 9637-2520	Website: www.otfe.vic.gov.au
WA DEPARTMENT OF TRAINING		
Phone: (08) 9235-6222	Fax: (08) 9235-6224	Website:
DIAL-BEFORE-YOU-DIG		
Phone: 1100	Fax: 1 300-652-077	Website: www.dialbeforeyoudig.com.au
PCCP (PAINTING CONTRACTOR CERTIFICATION PROGRAM)		
Phone: (03) 9248-4938	Fax: (03) 9646-5165	E:mail: gerry.eccleston@agal.gov.au
PIPA (PVC Pipelines Industry Assoc. of Australasia LTD.)		
Phone: (02) 9959-9880	Fax: (02) 9929-7588	E:mail: dsumner@bigpond.com
STANDARDS AUSTRALIA (HEAD OFFICE)		
Phone: (02) 9746-4700	Fax: (02) 9746-8450	E:mail: mail@standards.com.au
THE INSTITUTION OF ENGINEERS, AUSTRALIA, NPER REGISTER		
Phone: (02) 6270-6555	Fax: (02) 6273-1488	Website: www.ieaust.org.au

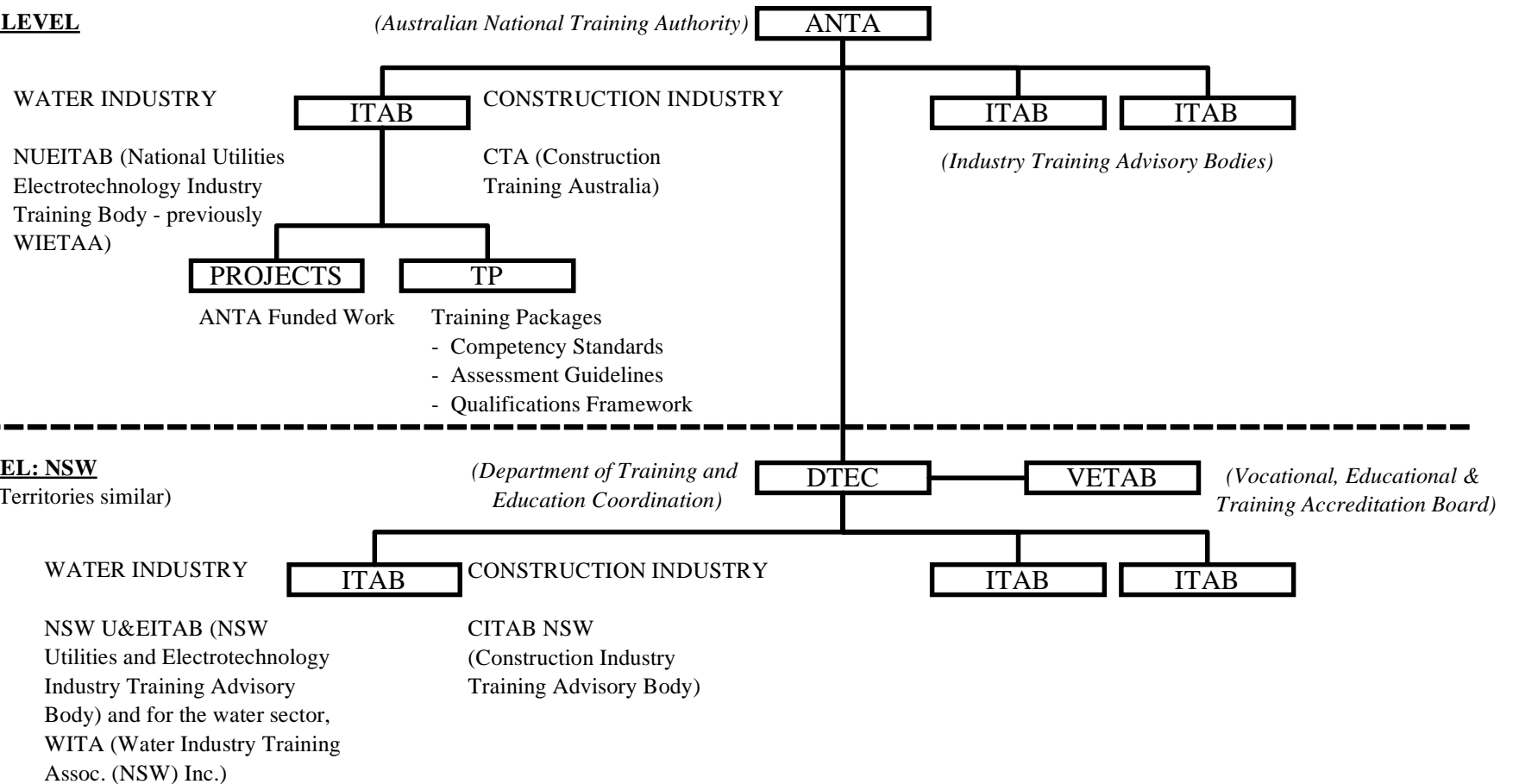
WS-SPEC

NAME AND CONTACT DETAILS		
WSAA CODES		
Phone: (02) 9746-4719	Fax: (02) 9746-8450	E:mail: david.cox@standards.com.au
WSAA-QAN		
Phone: (02) 9350-6457	Fax: (02) 9350-6497	E:mail: shan.ruprai@sydneywater.com.au
WS-SPEC		
Phone: (02) 9372-7856	Fax: (02) 9372-7872	E:mail: ken.pearson@dpws.nsw.gov.au

ATTACHMENT B

AUSTRALIA'S VOCATIONAL EDUCATION AND TRAINING SYSTEM

NATIONAL LEVEL



ATTACHMENT C

SUMMARY OF CERTIFICATION REQUIREMENTS

The following table summarises the requirements for certification, and has been developed in consultation with industry with the aim of standardising and minimising the paper work involved.

	STRATEGIC PRODUCTS						
	PIPES , FITTINGS VALVES & METERS				CONCRETE SUPPLY	PROTECTIVE COATINGS	
SCENARIO	Case	A	B	C	D	E	F
Product Standard Available		✓	✓	-	-	✓	APAS Specs
Product Certification Obtained (eg:Stds Mark, Kite Mark, S Mark)		✓	-	-	-	N/A	APAS Approval
WSAA Product Appraisal Obtained		◆	◆	✓	-	N/A	N/A
QA Requirement (ISO 9001, 9002 as approp.)		✓	✓	**	**	✓	APAS Requirements
CERTIFICATION							
Acceptable Product Verification Report	#	N/A	●	N/A	N/A	N/A	N/A
Type Test Results	*	-	-	●	●	● (Trial Mix)	-
Cert. of Compliance to Section SP...		●	●	●	●	●	● (APAS Prods)
Test Cert. of Results to Section SP...		-	-	●	●	●	-

- Certificate required # WSAA-QAN req'mt ✓ Yes
- ◆ Required for any extension of size range - No
- * Also referred to as proof tests and acceptance tests ** To suit design process
- APAS Australian Paint Approval Scheme N/A Not applicable

Notes: Cases A, B and C represent the bulk of these strategic products. The SP Section specifies any Product Standard(s) involved, including from overseas.
 Case D is low frequency or special products and may be from overseas with local or project appraisal.

Examples:

- Case A**
 - DI pipes and fittings to Section SP2, Product Certified to AS/NZS 2880 or to an accepted overseas third party product certification scheme.
 - VC pipes and fittings to Section SP7, manufactured in the UK and Product Certified to EN295, including delivery, factory to site.
- Case E**
 - Durable, special concrete for treatment plants, etc.
- Case F**
 - Protective coatings for steel reservoirs, etc.

ATTACHMENT D

PROTECTIVE COATING SYSTEM TITLES

Presently Australian Standards and APAS (Australian Paint Approval Scheme) specifications, for paints and protective coatings are being reviewed and new system titles introduced. The following table may be of assistance during the transition.

APAS - CURRENT	AUST. STDS. - DRAFT
PIGMENTED ACRYLIC	ACRYLIC LATEX
MIO ACRYLIC	ACRYLIC LATEX - MIO
ENAMEL ALKYD OR PIGMENTED ALKYD	ALKYD GLOSS
MIO ALKYD	ALKYD - MIO
EPOXY ENAMEL	EPOXY, 2-PACK-GLOSS
HIGH BUILD EPOXY OR CATALYSED EPOXY	EPOXY HIGH BUILD, 2-PACK
HIGH BUILD SOLVENTLESS EPOXY	EPOXY HIGH BUILD, 2-PACK SOLVENTLESS
EPOXY MASTIC *	EPOXY MASTIC, 2-PACK
MIO EPOXY	EPOXY, 2-PACK-MIO
RECOATABLE POLYURETHANE (OR URETHANE)	POLYURETHANE, 2-PACK SOLVENT BORNE

* "Surface tolerant" is used by some manufacturers

ATTACHMENT E

CONTRACT DOCUMENTATION

The following contract documentation structure and elements are commonly adopted throughout the construction industry and amongst WSAA agencies.

		ELEMENTS	SOURCE	SECTION NO.
		TENDER CONDITIONS	Project specifics	
		TENDER SCHEDULES	Project specifics	
CONTRACT DOCUMENTS	SPECIFICATION	GENERAL CONDITIONS AND ANNEXURES *	Agency to nominate	1
		PRELIMINARIES *	Project specifics	2
		TECHNICAL SECTIONS	Project specifics	3, 4 etc
		STANDARD TECHNICAL SECTIONS **	Agency	-
	DRAWINGS	MASTER SPECIFICATION SYSTEM	WS-SPEC (Ref)	-
		DRAWINGS	Project specifics	-
		STANDARD DRAWINGS	WSAA Codes (Ref) and/or Agency	-

- Ref Referenced, not attached to the contract documents
- * Commercial clauses
- ** Also called "Schedule to Specification"

ATTACHMENT F

**PREPARATION OF
CONSTRUCTION SPECIFICATIONS**

The following table demonstrates how to compile relevant Sections from the WS-SPEC to create a project specific technical specification for typical water industry projects.

SECTIONS*		SPECIFICATION TYPE (& WSAA CODES)				
NO.	TITLE	SEWER PIPELINES (see WSA 02)	WATER SUPPLY PIPELINES (see WSA 03)	SEWAGE PUMPING STNS		STORM WATER PIPELINES
				RM included	RM excluded	
SP ..	Various	Referenced from project specifics and/or WSAA Codes				
TR1	GENERAL REQUIREMENTS	✓	✓	✓	✓	✓
TR2	SITE PREPARATION AND RESTORATION	✓	✓	✓	✓	✓
TR7	EARTHWORKS	-	-	✓	✓	-
TR10	CONCRETE PLACEMENT	✓	***	✓	✓	✓
TR12	PIPELINE EXCAVATION **	✓	✓	✓	-	✓
TR13	PIPELINE INSTALLATION PRESSURE	-	✓	✓	-	-
TR14	PIPELINE INSTALLATION NON-PRESSURE	✓	-	-	-	✓
TR20	PROTECTIVE COATINGS	✓	***	✓	✓	✓
TR30	STAINLESS STEEL	✓	-	✓	✓	-
TR ..	DISINFECTION GENERALLY	-	✓	-	-	-
TR ..	SEWAGE PS • PUMPS • MOTORS • CONTROLS	-	-	✓	✓	-

* See “WS-SPEC” (Water Services Specification).

RM = Rising Main

Contract specific sections will also be required.

** All pipe materials { Flexible Pipes : Steel, DI, PVC, PE, GRP, ABS
Rigid Pipes : VC, RC, FRC

*** Required for structures only

ATTACHMENT G

**MODEL SPECIFICATION:
WATER SUPPLY PIPELINE**

PROJECT: SUPPLY AND CONSTRUCT
DN 300 & 375
WATER SUPPLY PIPELINE

ASSET OWNER: "BELL BIRD" WATER

TECHNICAL SPECIFICATION:

SECTION 3: GENERAL

SECTION 4: STRATEGIC PRODUCTS

SECTION 5: PIPELINE CONSTRUCTION

- Notes:
- Confine all quantities and discussion of payment items to the Tender Schedules and Preliminaries.
 - Advise of any material options for strategic products in the Conditions of Tendering, for example options herein are:
 - DI pipes and DI fittings
 - PVC pipes and CI/DI fittings
 - GRP pipes and GRP/DI fittings
 - The examples given herein, offer a variety of project requirements (and different ways of specifying them), reflecting both the special needs of the Major Urbans as well as the Rural Agencies. Also given are means of addressing changed practices and/or the one-off project, as well as Agency Standards.
 - Individual agencies may wish to nominate, as additional requirements, products from their "Authorised Products List". These may include products covered by "WSAA Product Appraisals".

SECTION 3 GENERAL

1 SECTION CONTENTS

The following is a brief outline of the Works under the Contract:

- Supply all nominated strategic products and associated components;
- Construct DN 300 and DN 375 water supply pipeline.

2 STANDARD TECHNICAL SPECIFICATION

2.1 STRATEGIC PRODUCTS

The following Sections of the WS-SPEC form part of this specification:

Section SP2	Ductile Iron Pipes and Fittings
Section SP3	Grey (Cast) Iron Fittings
Section SP4	PVC Pipes and Fittings
Section SP5	GRP Pipes and Fittings
Section SP15	Elastomeric Seals
Section SP20	Sluice Valves Metal Seated
Section SP21	Sluice Valves Resilient Seated
Section SP27	Air Valves
Section SP30	Protective Coatings for Valves

Unless otherwise shown herein, adopt Melbourne Retail Water Companies practices for all strategic products as detailed in the individual SP-Sections.

For pipeline construction, use the agency practices shown for the Department of Land and Water Conservation (for NSW rural areas).

2.2 CONSTRUCTION

The following Sections of the WS-SPEC form part of this specification:

Section TR1	General Requirements
Section TR2	Site Preparation and Restoration
Section TR12	Pipeline Excavation
Section TR13	Pipeline Installation Pressure

Unless otherwise shown herein, adopt Department of Land and Water Conservation, NSW practices for all construction activities as detailed in the individual TR-Sections.

2.3 AGENCY STANDARDS

The following Bell Bird Water Standards form part of this specification and are attached:

-
-

SECTION 4 STRATEGIC PRODUCTS

1 SECTION CONTENTS

This Section includes and specifies the purchasing of the following strategic products and associated components:

- Pipes and fittings (includes alternative materials);
- Valves.

2 PIPES AND FITTINGS

2.1 DI PIPES AND FITTINGS: To Section SP2 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2280 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP2 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	<i>Potable water, pressure</i>
Pipes - Nominal size(s) - Class(es) - Jointing - Coating and lining	<i>DN 300 Class K9 DN 375 Class K9 } Socketed joints and flanges, see "Schedule of Pipes, Fittings and Valves" * Cement lined, polyethylene sleeved</i>
Fittings - Nominal size(s) - Class(es) } - Type and jointing - Coating and lining	<i>DN 300 and DN 375 Class K14 (or of at least equivalent rating to adjoining pipe) Socketed joints and flanges, see "Schedule of Pipes, Fittings and Valves" * Cement lined, polyethylene sleeved</i>
Series 1 (metric) or Series 2 (cast iron OD)	<i>Series 2 for DI/GRP and Series 1 for PVC pipelines</i>
Flanged joint bolting selection (excluding valves)	<i>SS 304</i>
Flange gaskets, O-rings and lubricant	<i>Required</i>
Elastomeric seal material	<i>* EPDM</i>
Bactericidal lubricant	<i>Required</i>
Polyethylene sleeving	<i>Required</i>
Adhesive tape, straps	<i>Required</i>
Hydrostatic testing of fittings	<i>* Required</i>
Acceptable Product Verification Report	<i>Manufacturers without Product Cert. to supply</i>
Certificate of Compliance, to Section SP2	<i>Manufacturer to supply</i>

ADDITIONAL REQUIREMENTS: Nil

2.2 CI FITTINGS: To Section SP3 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2544 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP3 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	<i>Potable water, pressure</i>
Fittings - Nominal size(s) - Class(es)] - Type(s) and jointing - Coating and lining	<i>DN 300 and DN 375 of at least equivalent rating to adjoining pipe</i> <i>Socketed joints and flanges, see "Schedule of Pipes, Fittings and Valves" and drawings</i> <i>* Cement lined, polyethylene sleeved</i>
Series 1 (metric) or Series 2 (cast iron OD)	<i>* Series 1 for PVC pipelines</i>
Flanged joint bolting selection (excluding valves)	<i>SS 304</i>
Flange gaskets and lubricant	<i>Required</i>
Elastomer seal material	<i>* EPDM</i>
Bactericidal lubricant	<i>Required</i>
Hydrostatic testing of fittings	<i>* Required</i>
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP3	Manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

2.3 PVC PIPES AND FITTINGS: To Section SP4 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (*See Practices Table of Sections SP4 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	<i>Potable water, pressure</i>
Series 1 (metric) or Series 2 (cast iron OD)	<i>* Series 1</i>
Pipes - Nominal size(s) - Class(es)] - Class(es)	<i>DN 300, Class 12</i> <i>DN 375, Class 12</i>
Fittings	<i>Not required</i>
Elastomer seal material	<i>* Natural rubber</i>
Bactericidal lubricant	<i>Required</i>
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certification of Compliance, to Section SP4	Manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

2.4 GRP PIPES AND FITTINGS: To Section SP5 and the following:

INFORMATION TO BE SUPPLIED (See AS 3571 Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP5 & SP15)
Application (water: potable/non-potable, sewerage, pressure or non-pressure)	<i>Potable water, pressure</i>
Pipes - Nominal size(s)] - Pressure class(es)] - Stiffness(es) - Couplings	<i>DN 300, Classes 12.5 and 16</i> <i>DN 375, Class 12.5</i> <i>SN 10,000 (SN 5,000 not available in size range)</i> <i>Required</i>
Fittings - Nominal size(s)] - Pressure class(es)] - Stiffness(es) - Types/configuration - Couplings - Overall dimensions	<i>DN 300, Class 16</i> <i>DN 375, Class 12.5</i> <i>SN 10,000</i> <i>See Schedules and/or project specifics</i> <i>Required</i> <i>Manufacturer to supply</i>
Elastomer material	<i>* EPDM</i>
Bactericidal lubricant	<i>Required</i>
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP5	Manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

2.5 ELASTOMERIC SEALS: To Section SP15 and the following:

INFORMATION TO BE SUPPLIED (See AS1646 - Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Section SP15)
Elastomers - Type - Material - Hardness	To Melbourne Retail Water Companies nominated materials and the pipe and fitting manufacturer(s) details
Root inhibitor	Not required
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Certificate of Compliance, to Section SP15	Manufacturer to supply

ADDITIONAL REQUIREMENTS: EPDM is also acceptable for DI pipes and DI/CI fittings.

3 VALVES

3.1 SLUICE VALVES METAL SEATED: To Section SP20 and the following:

INFORMATION TO BE SUPPLIED (See AS/NZS 2638.1)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP20 & SP30)
Valve size(s), class(es) and flange class(es)	<i>DN 300 & DN 375, Class 16</i>
Materials: - Body and bonnet - Seal retainer - Wedge core - Seating rings - Stem - Gear box housing	<i>DI</i> <i>Gunmetal</i> <i>Gunmetal</i> <i>Gunmetal</i> <i>SS 316</i> <i>-</i>
Closure direction	<i>* Anti-clockwise</i>
Flanged joint bolting selection (fasteners)	<i>SS 304</i>
Coatings	<i>* Thermal bonded</i>
Additional testing	<i>-</i>
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	<i>Required</i>
Bactericidal lubricant	<i>Required</i>
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP20	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP20	If no Aust. Std., manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

3.2 SLUICE VALVES RESILIENT SEATED: To Section SP21 and the following:

INFORMATION TO BE SUPPLIED (See AS 2638.2)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP21 & SP30)
Valve size(s), class(es) and flange class(es)	<i>DN 300 & DN 375, Class 16</i>
Materials: - Body and bonnet - Seal retainer - Wedge core (and encapsulation) - Stem - Gear box housing	<i>DI</i> <i>Gunmetal</i> <i>DI and rubber</i> <i>SS 431</i> -
Closure direction	* <i>Anti-clockwise</i>
Flanged joint bolting selection (fasteners)	<i>SS 304</i>
Coatings	* <i>Thermal bonded</i>
Additional testing	-
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	<i>Required</i>
Bactericidal lubricant	<i>Required</i>
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP21	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP21	If no Aust. Std., manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

3.3 AIR VALVES: To Section SP27 and the following:

INFORMATION TO BE SUPPLIED (See Appendix A)	PROJECT REQUIREMENTS (* See Practices Table of Sections SP27 & SP30)
Valve size(s), class(es) and flange class(es)	<i>DN 80, Class 16</i>
Materials: - Body - Cover - Float - Seats, rigid - Levers (small orifice valves) - Float guide (double air valves)	 <i>DI</i> <i>DI</i> <i>SS 316</i> <i>Gunmetal</i> <i>SS 316</i> <i>Gunmetal</i>
Flanged joint bolting selection (fasteners)	<i>SS 304</i>
Coatings	<i>* Thermal bonded</i>
Additional testing	-
Acceptable Product Verification Report	Manufacturers without Product Cert. to supply
Flange gaskets, O-rings and lubricants	<i>Required</i>
Bactericidal lubricant	<i>Required</i>
Type Test Results	If no Aust. Std., manufacturer to supply
Certificate of Compliance, to Section SP27	Manufacturer to supply
Test Certificate of Results, obtained to establish compliance to Section SP27	If no Aust. Std., manufacturer to supply

ADDITIONAL REQUIREMENTS: Nil

SECTION 5 PIPELINE CONSTRUCTION

1 SECTION CONTENTS

This Section details the technical requirements for the construction of pipelines and includes:

- Site preparation and restoration, and
- Pipeline excavation and installation.

2 GENERAL TECHNICAL

REQUIREMENT: Construct the Works in compliance with Section TR1 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS
SECTION TR1	DETAILS
Strategic products surveillance: - Nominated agency representative	<i>Mr Q.A. Feedback Tel: (09) 1234-5678</i> <i>Bell Bird Water Fax (09) 1234-5678</i>
Waste disposal certificate	<i>Required</i>
Site survey plan	<i>Available on request</i>
Work-as-executed plans	<i>Required</i>
Maintenance instructions/records	<i>Strategic products operating instructions required</i>
Manufacturer's warranty	Manufacturer may supply
Technical records	<i>Strategic products supplier list required</i>

ADDITIONAL REQUIREMENTS: Nil

3 SITE PREPARATION AND RESTORATION

REQUIREMENT: Prepare the site and restore in compliance with Section TR2 and the following table:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR2	CLAUSE	DETAILS
Project Management Plan - Site management provisions	3.1	<i>Include all listed items where appropriate and liaise with Pump Station Contractor at limit-of-contract.</i>
- Environmental provisions	5.1	<i>Available but not attached to the project specification.</i>
Existing services	4	<i>All known services have been identified in the project specification.</i>
Clearing and tree retention	5.1	<i>Identified by coloured ribbons and numbered.</i>

ADDITIONAL REQUIREMENTS: Nil

4 PIPELINE EXCAVATION


REQUIREMENT: Prepare the trenches in compliance with Section TR12 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR12	CLAUSE	DETAILS
Explosives accepted	3.1	<i>Not required</i>
“Unstable” soil - trench widths	3.3	<i>Increase stable soil minimum side embedment width by 50% and use single sized graded gravel embedment with geo-textile</i>
Permanent support	3.4	<i>Nil</i>
Foundation stabilisation	4.1	<i>Excavate to acceptable material and replace with compacted embedment</i>

ADDITIONAL REQUIREMENTS: Nil

5 PIPELINE INSTALLATION

REQUIREMENT: Install the pressure pipelines in compliance with Section TR13 and the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR13	CLAUSE	DETAILS
Pipe materials and sizes	3.1	<i>DI, PVC or GRP for DN 300 and DN 375</i>
Fitting materials and sizes	3.1	<i>DI, CI or GRP for DN 300 and DN 375</i>
Valve types and sizes - sluice valves: metal sealed - sluice valves: resilient sealed - air valves	3.1	<i>DN 375 DN 300 DN 80</i>
Markings and marker tape	4.15	<i>Required</i>
Flange joint bolting and accessories not elsewhere supplied (eg. pipes, valves)	3.1	<i>Supplied with pipes, fittings and valves</i>
Corrosion protection systems - pipes - fittings - valves	4.4, 6.5	<i>DI pipes DI/CI fittings: CL-PS-PS (part) PVC/GRP pipes and GRP fittings: nil-nil-nil DI/CI valves: TB-TB-nil</i>
Geotechnical	-	<i>Available under separate cover</i>
Embedment details - pipeline minimum covers - bedding minimum thicknesses - clearance minimum widths - overlay minimum thicknesses - embedment materials - trench fill materials	3.2	<div style="text-align: center;">  <p><i>To Section TR13, Figure TR13.1</i></p> </div> <p><i>Excavated material, except at roadways use embedment material</i></p>
Service connections	4.11	<i>Not included</i>
Pipe supports		<i>Concrete encasement at creek crossings</i>
Trench stops and bulkheads	4.8, 4.9	<i>Required</i>
Testing (pressures and lengths)	2.3	<i>DN 300, 1.25 × pipe class rating DN 375, 130 meters</i>

ADDITIONAL REQUIREMENTS: Nil

ATTACHMENT H

MODEL SPECIFICATION:**SUPPLY AND PLACEMENT OF CONCRETE**

APPLICATIONS: The following summary table does not stand alone, but needs to be integrated with other contract specific requirements, as required, and as briefly indicated below.

TECHNICAL SPECIFICATION:	[See Attachment G]
SECTION 3: GENERAL	[Insert Sections SP44, SP45 and TR10]
SECTION 4: STRATEGIC PRODUCTS	[Insert following summary sheet]
SECTION 5: CONSTRUCTION	[Insert Section TR10]

MIX TYPE EXAMPLES: The following mixes are examples only and need to be appraised by a specialist designer for suitability for each application. The concrete types are nominal or project specific selections and not standard mixes.

- MIX TYPE G: Normal concrete – for blinding layers footpaths, unreinforced concrete
- MIX TYPE B: Structural concrete – for buildings and structures generally where not water retaining
- MIX TYPE RC: Structural concrete, Type SL cement – for reinforced concrete water supply retaining structures
- MIX TYPE SGE: Durable concrete, Type SR cement – for elements in contact with sewerage
- MIX TYPE WT: Structural concrete, type SR cement – for reinforced concrete water and waste water treatment plants
- MIX TYPE PC: Structural concrete, Type SL cement – for prestressed concrete reservoirs

DRAWING NOTATION EXAMPLE: CONCRETE S32, TYPE RC.

SUMMARY FOR PRE-MIXED CONCRETE SUPPLY

SUPPLY TO THE REQUIREMENTS OF:		Sect'n SP44		Section SP45			
CONCRETE MIX TYPE		G	B	RC	SGE	WT	PC
Class and Grade		N20	N25	S32	S40	S40	S40
MATERIALS and MIX	Cement Type	-	-	SL	SR	SR	SL
	Minimum Cementitious Material (kg/m ³)	-	-	360	380	380	380
	Maximum Cementitious Material (kg/m ³)	-	-	-	450	-	-
	Max Aggregate Size	-	15	25	25	25	25
	W/C Ratio Maximum	-	-	0.5	0.45	0.45	0.45
	Laboratory Trial Mix Required (Yes/No)	No	No	Yes	Yes	Yes	Yes
STRENGTH GRADE	f 'c at 28 days (MPa)	20	25	32	40	40	40
OTHER	Nominal Slump (mm)	80	80	*	*	*	*
	Drying Shrinkage (strain x 10 ⁻⁶) at 3 weeks OR {8 weeks}	-	-	500 {700}	500 {700}	500 {700}	500 {700}
	Air Content %	-	-	-	-	-	-
	Pumped Concrete Accepted Yes/No	Yes	Yes	Yes	Yes	Yes	Yes

- NOT SPECIFIED

* AS DETERMINED BY PLACEMENT METHOD (MAX 80, WATER BASED)

SUMMARY FOR CONCRETE PLACEMENT

CONCRETE MIX TYPE		G	B	RC	SGE	WT	PC
Class and Grade		N20	N25	S32	S40	S40	S40
CHARACTERISTIC STRENGTH MPa	Pre-stressed Concrete, Transfer Compressive Strength	-	-	-	-	-	●
OTHER	Curing Compound Accepted Yes/No	No	No	No	No	No	No
	Minimum Period Between Adjacent Pours (Days)	-	-	●	●	●	●
SURFACE FINISH	Locations: ●						

● DESIGNER TO SPECIFY

ATTACHMENT I

SUMMARY OF ACRONYMS

AEEMA	Australian Electrical and Electronic Manufacturers' Association
APAS	Australian Paint Approval Scheme
APMCA	Australian Premixed Concrete Association
APMF	Australian Paint Manufacturers' Federation
ASSDA	Australian Stainless Steel Development Association
AUSPOLY	Polyethylene Pipelines Association
AWAQAN	Australian Water Agencies Quality Assurance Network (replaced by WSAA-QAN)
BOT	Build, Operate and Transfer
BOO	Build, Own and Operate
BOOT	Build, Own, Operate and Transfer
CCF	Civil Contractors Federation
CPEng	Chartered Professional Engineer
CIA	Composites Institute of Australia
CPAA	Concrete Pipe Association of Australia
D&C	Design and Construct
DCO	Design, Construct and Operate
DPWS	NSW Department of Public Works and Services
ITAB	Industry Training Advisory Bodies
NATSPEC	National building and services specification published by Construction Information Systems Australia Pty Ltd
NPER	National Professional Engineers Register
PCCP	Painting Contractor Certification Program
PIPA	PVC Pipelines Industry Assoc. of Australasia Ltd
WSAA	Water Services Association of Australia
WSAA-QAN	Water Services Association of Australia, Quality Assurance Network
WS-SPEC	Water Services Specification

ATTACHMENT J

<p>W S – S P E C</p> <p>SUGGESTION/IMPROVEMENT REQUEST FORM</p> <p>(Please type or print neatly) (Where space is insufficient please use separate attachments)</p> <p>Send to: Mr K. J. Pearson WS-SPEC Technical Co-ordinator NSW Department of Public Works and Services McKell Building, 2 - 24 Rawson Place, Sydney, NSW, 2000 Telephone: (02) 9372 7856 Facsimile: (02) 9372 7872 Email: ken.pearson@dpws.nsw.gov.au</p>		
Proposer details: Include Name, Title, Company, Address, Phone, Fax and E:mail, or enclose a business card.		
Reference details: Please describe the location of the proposed improvement.		
Document and issue nos:		
Section:		
Page:		
Clause/Table/Figure/Drawing:		
Suggested improvements, changes and/or additions: Please attach a photocopy of the original section/clause/page/drawing/table with your comments, including any supporting documentation.		
Benefits and Actions: Please describe how the proposed improvement will benefit users of WS-SPEC and any actions taken.		
Name:	Signature:	Date:
RECORDS USE ONLY		
Amendment No.:	Date received:	