WATER SERVICES ASSOCIATION OF AUSTRALIA

WSA 03:2011: Water Supply Code of Australia Version 3.1

Amendment No 1

Revised text amendment

The 2011 edition of WSA 03 is amended as follows:

SUMMARY This amendment applies to Introduction, Clauses 1.2.5.2, 2.5.3.2, 2.7.1, 3.7 Table 3.4, Clause 4.2.5 Table 4.1, Clauses 4.3.1, 4.3.1, 4.3.3, 4.3.6, 4.3.7, 4.4, 4.5, 4.6, 4.6.5, 4.7, 4.8.3, 4.8.7, 4.8.8, 5.1.1, 5.4.1 (c) and item (6), Clauses 5.4.9.1, 5.4.9.2, 5.4.11, 5.5, 5.7, 5.8, 5.9, 7.1 Table 7.1, Clauses 8.1.4,12.8.2,15.9, 15.20 .3, Figures 15.2, Figure 15.5 and Clauses 16.17.3

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INTRODUCTION

New insert after Water Industry Standards

WORK HEALTH AND SAFETY (WHS) LAWS

The model work health and safety laws consist of the Model Work Health and Safety (WHS) Act, supported by model WHS regulations, model Codes of Practice and a National Compliance and Enforcement Policy.

Safe Work Australia is the national policy body responsible for the development and evaluation of the model work health and safety laws. The Commonwealth, states and territories are responsible for regulating and enforcing the laws in their jurisdictions.

The model work health and safety laws are the basis for harmonised laws across Australia. For the model work health and safety laws to become legally binding, they need to be enacted or passed by Parliament in each jurisdiction.

For information on the operation of WHS laws in your jurisdiction, please contact your WHS regulator.

SafeWork NSW

Workplace Health and Safety Queensland

Worksafe Victoria

WorkSafe ACT

SafeWork SA

NT WorkSafe

Worksafe WA

WorkSafe Tasmania

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NATIONAL STANDARD FOR CONSTRUCTION WORK

In those jurisdictions that have implemented the harmonisation Work Health and Safety (WHS) laws, the adopted National Standard for Construction Work [NOHSC:1016 (2005)] was superseded by the model WHS Regulations and the Model Code of Practice: Construction Work.

This model Code of Practice has been developed to provide practical guidance to principal contractors and other persons conducting a business or undertaking who carry out construction work on how to meet the health and safety requirements under the WHS Act and Regulations applying in a jurisdiction relating to construction work.

This model Code should be read in conjunction with other codes of practice on specific hazards and control measures relevant to the construction industry including:

a) How to manage and control asbestos in the workplace
b) Managing noise and preventing hearing loss at work
c) Confined spaces
d) How to safely remove asbestos
e) Preparation of safety data sheets for hazardous chemicals
f) Labelling of workplace hazardous chemicals
g) Managing risks of hazardous chemicals in the workplace
h) Abrasive blasting
i) Spray painting and powder coating
j) Welding processes
k) First aid in the workplace
l) Managing the risk of falls at workplaces
m) Hazardous manual tasks
n) Managing the risk of falls in housing construction
o) Safe design of structures
p) Managing electrical risks in the workplace
q) Demolition work
r) Excavation work
s) Work health and safety consultation, cooperation and coordination
t) Managing the work environment and facilities
u) How to manage work health and safety risks
v) Construction work

The model Code should be read in conjunction with other codes of practice on specific hazards and control measures relevant to the construction industry.

To have legal effect in a jurisdiction, the model Code of Practice must be approved as a code of practice in that jurisdiction. To determine if this model Code of Practice has been approved as a code of practice in a particular jurisdiction, check with the relevant regulator.

SAFE DESIGN OF STRUCTURES

Safe Design is concerned with eliminating hazards at the design stage or controlling risks to health and safety as early as possible in the planning and design of products, process or systems and items that comprise a workplace, or are used or encountered at work.

The model WHS laws, Regulations and model Codes of Practice also impose duties on a range of parties to ensure health and safety in relation to particular products, such as:

a) designers of plant,

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b) buildings and structures building owners and persons with control of workplaces manufacturers,
c) importers and suppliers of plant and substances, and
d) persons who install, erect or modify plant.

These obligations will vary depending on the relevant state or territory OHS legislation.

The Australian Safety and Compensation Council (ASCC) Guidance on the Principles of Safe Design for Work has been developed to eliminate hazards at the design stage. The purpose of this document is to provide guidance and information to persons who are directly or indirectly involved with the design or modification of products, buildings, structures and processes used for work. It focuses on the key principles of safe design and sets the framework for the development of further detailed and practical guidance material. It contains 10 principles that demonstrate how to achieve good design of work and work processes. The principles are all general in nature so they can be applied to any workplace, topic or industry.

For more information on safe design refer to the Principles of Good Work Design Handbook and the model Code of Practice: Safe Design of Structures and WHS Regulations.

Clause 1.2.5.2

Inserted New Item (O)

(o) climate requirements (e.g Alpine and/or frost areas)

Clause 2.5.3.2

Insert new last paragraph

A note shall be placed on the Design Drawings stating that a pressure reducing valve (PRV) is required for each individual premise affected by pressures >500 kPa. (AS/NZS 3500 requires any property with >500 kPa pressure to have an individual PRV.)

Clause 2.7.1

Replace the last sentence with the following:

Where the non-drinking water supply needs to be supplemented by water from the drinking water supply, this shall be provided through an air-gap at the inlet to the non-drinking water storage or an or appropriate backflow prevention device.

Clause 3.7

Replace Table 3.4 with the following

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TABLE 3.4

TEMPERATURE DE-RATING FACTORS FOR PLASTICS PIPES OPERATING AT ELEVATED TEMPERATURES

Pipe material	De-rating factor1, t				
	Time weighted 12 month average temperature, °C				
	20	25	30	35	40
PVC-U[5]	1.0	0.94	0.87	0.78	0.70
PVC-M[5]	1.0	0.94	0.87	0.78	0.70
PVC-O[5]	1.0	0.94	0.87	0.78	0.70
PE 80B[2]	1.0	1.0	0.83	0.77	0.77
PE 100[2]	1.0	0.91	0.91	0.83	0.83
GRP[3]	1.0	1.0	1.0	1.0	1.0

1. At elevated temperatures a reduction in the design life may occur.
2. The figures for PE80B and PE100 are based on PIPA POP013 Temperature rerating of PE pipelines. The guidance provided in POP013 is based on typical PE compounds used in Australia and New Zealand to manufacturer AS/NZS 4130 PE pipe and listed in PIPA Guideline POP004 Polyethylene Pipe Compounds.
3. Multiply the **temperature de-rating** factor t by the PN number of the pipe to determine the de-rated PN of the pipe.
4. The figures for GRP are based on a polyester body resin. However, for continuous operation ≥35°C vinylester resins are required. No **temperature de-rating** is required up to 50°C for GRP pipes with vinylester body resins.
5. The figures for PVC pipe re-rating are based on PIPA "Temperature Derating of PVC Pipes for Pressure Applications" (TN003) and "PVC Pressure Pipes Design for Dynamic Stresses" (POP101).

Clause 4.2.5

Replace Table 4.1 with the following

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COMPONENT		DRINKING WATER SYSTEM	NON-DRINKING WATER SYSTEM
RETICULATION MAINS			
Pipe	PVC	Light blue	Purple
	PE	Blue, black with blue stripes or jackets	Black with purple stripes or jackets
	Ductile Iron	Blue PE sleeving or blue coating[2,6]	Purple PE sleeving or purple coating[2,6]
Fitting e.g. bend, coupling		Colour not required [3,4]	Colour not required [3,4]
Valve (spindle cap)		Blue coating	Purple coating
Valve (body)		Colour not required [3,4]	Colour not required [3,4]
Hydrant (claw)		Blue coating or blue shroud	Purple coating or purple shroud
Hydrant (body)		Colour not required [3,4]	Colour not required [3,4]
Standpipe hydrants		Blue coating	Purple coating
Scours (outlets)		Blue coating	Purple coating
Marking tapes		Blue	Purple
Surface fittings and surrounds		Note 5	Note 5
Signage (marker posts, plates etc.)		Note 5	Note 5
PROPERTY SERVICES			
PE Pipe		Black with blue stripes [1]	Purple jackets[1]
Pre-tapped connector (plug)		Blue coating	Purple coating
Pre-tapped connector (body)		Colour not required [3,4]	Colour not required [3,4]
Tapping band or saddle		Blue band or saddle	Purple plastics (plastics moulding) or purple coating (metallic)
Fittings e.g. ball valve		Blue handle	Purple handle (plastics moulding) or purple coating (metallic)
Meters		Blue or blue coating	Purple plastics (plastics moulding) or purple coating (metallic)
Meter boxes (lids)		Note 5	Note 5

1. It is recommended that a combination of plain and striped pipes be used in dual water reticulation drinking and non-drinking water supply property services rather than all plain or all striped pipes.
2. Factory applied coating where permitted by the Product Specification.
3. Some Water Agencies may require colour differentiation to be provided.
4. For any system, do not apply purple sleeve over a pipe, fitting, valve or other appurtenance that is coloured blue and vice versa.
5. To be coloured in accordance with Water Agency requirements.
6. Colour coding of pipe classes

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PN	Socket end Marking
20	Green
35	Red
FLCL	white

Clause 4.3.1

Links provided to the following product Specifications

WSA PS – 200 Ductile Iron Pipes (CIOD) for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 201 Ductile Iron Fittings (CIOD) for Pressure and Non-Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 202 Ductile Iron Pipes and Fittings (ISO Sized) for Pressure Applications - Drinking Water and Non-Drinking Water Supply

WSA PS – 202S Ductile Iron Pipes and Fittings (ISO Sized) for Pressure and Non-Pressure Applications - Sewerage

WSA PS – 244 Ductile Iron Fittings (CIOD) With Restrained Flexible Joints for Ductile Iron Pipe In Pressure and Non-Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 310 Tapping Bands – Mechanical for Pressure Applications - Water Supply

WSA PS – 312 Flange Gaskets and O-Rings

WSA PS – 320 Sleeving, Polyethylene (PE) For Ductile Iron Pipes and Fittings – Drinking Water, Non-Drinking Water Supply and Sewerage

Clause 4.3.3

Replace Note with the following

AS/NZS 2280 provides for seal coating of cement mortar lined DI pipes subject to compliance with *ISO 16132 Ductile iron pipes and fittings – Seal coats for cement mortar linings*.

Insert additional informative text under the revised Note:

The intended purpose of a seal coating is to reduce the contact between the cement mortar lining and the contents of the water main, thereby restricting lime leaching and consequent high pH levels when conveying soft (i.e. low carbonate alkalinity) water, especially in small diameter pipelines where flow rates are low and residence times are lengthy.

AS/NZS 2280 suggests that consideration should be given to the use of seal coatings where the total alkalinity of the water being conveyed is less than 30 mg/L.

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Many Australian water utilities specify seal coatings as mandatory for pipes up to and including DN 300.

Clause 4.3.6

Replace the paragraphs with the following:

Flanges shall comply with AS/NZS 4087. Select bolting in accordance with Appendix C of AS/NZS 4087. Gaskets shall comply with WSA 109. The Design Drawings shall specify the type of flange gasket and the tightening sequence (see Figure 4.1). Corrosion protection of bolted connections shall be specified in accordance with 4.8.8 Bolted connections.

New Clause 4.3.7

4.3.7. Coatings

The majority of Australian Water Agencies have adopted a policy of specifying loose polyethylene sleeving (LPS) for all ductile iron pipes as a corrosion protection measure, unless specialised coatings such as polyurethane or polyethylene, for example, are employed. Properly installed LPS provides a high degree of corrosion protection by creating a passive uniform environment around the pipe and limiting oxygen exposure. LPS should be installed in accordance with AS 3681 and only accredited pipe layers trained in the application of sleeving should be utilised.

The need for LPS depends on the type of soil and the required service life of the pipeline. Ductile iron pipes may be buried without extra external protection in soils that are not aggressive. In soils that are aggressive, and where either the time or the cost of soil assessment is prohibitive, LPS is the recommended solution.

The application of zinc coatings has not historically been utilised on ductile iron pipes in Australia, although they have been used in Europe for more than 60 years. Zinc coatings are now provided in Australia as a standard offering with 200 g/m^2 thickness complete with a finishing layer and are considered to enhance the external corrosion benefits of pipe in buried applications. In some soil applications it is considered acceptable to install zinc coated pipes without polyethylene sleeving.

Enhancements to zinc coatings are also available where 85/15 Zinc-Aluminium alloy, copper enhanced Zinc-Aluminium alloy and rare earth element enhanced Zinc-Aluminium alloys are offered with 400 g/m^2 thickness complete with a finishing layer. It is reported that these coatings provide improved corrosion protection over standard zinc coating and allows for installation in a wider range of soils, without the need for sleeving.

EN 545 nominates that DI pipes with zinc coating of 200 g/m^2 thickness and min 100μm thick finishing layer or enhanced zinc alloy coating with 400 g/m^2 thickness and min 100μm thick finishing layer can be buried without sleeving except:

For Zinc coatings

- *soils with a resistivity less than 1500 Ω cm when laid above the water table, or less than 2500 Ω cm when laid below the water table*
- *mixed soils i.e. comprising two or more soil natures*

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- *soils with a pH below 6 and a high reserve of acidity*
- *soils containing refuse, cinders, slags or polluted by wastes or industrial effluents*
- *areas where there are stray currents*

For Zinc-Aluminium or enhanced Zinc-Aluminium alloys

- *- acidic peaty soils*
- *- soils containing refuse, cinders, slag or polluted by wastes or industrial effluents*
- *- soils below the marine water table with a resistivity lower than 500 Ω cm,*
- *- areas where there are stray currents*

EN 545 also advises that evidence of the long-term performance of the above-mentioned solution (e.g. tests and references) should be provided by the manufacturer.

It should be noted however that there has been no proven experience or data to support the extrapolation of European experience to Australian conditions and environments. It is considered imperative that testing be undertaken to ensure that the soil environment meets any necessary pre-conditions.

Manufacturers should be consulted for life expectancy estimates.

Clause 4.4

The titles of numerous Product Specifications have been amended and links provided.

WSA PS – 209 Polyvinylchloride, Modified (PVC-M) Pressure Pipes for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 210 Polyvinylchloride, Oriented (PVC-O) Pressure Pipes for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 211 Polyvinylchloride, Unplasticised (PVC-U) Pressure Pipes for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 212 Ductile Iron Fittings (CIOD) for Plastics Pressure Pipe for Pressure and Non-Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 213 PVC Pressure Fittings, Moulded and Post-Formed for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

Clause 4.5

The titles of numerous Product Specifications have been amended and links provided.

WSA PS – 207 Polyethylene (PE) Pipes for Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 208 Plastics Moulded Fittings for Pressure Applications with PE Pipe – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 327 Tapping Bands, Mechanical for Use with Polyethylene (PE) Mains for Pressure Applications – Drinking Water and Non-Drinking Water Supply

ISBN TBA

WSA PS – 329 Tapping Bands, Electrofusion for Use with Polyethylene (PE) Mains for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

Inclusion of new Product Specifications developed since 2011

WSA PS – 271 Ductile Iron Wide Tolerance Mechanical Couplings and Flange Adapters with End Thrust Restraint for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 329 Tapping Bands, Electrofusion for Use with Polyethylene (PE) Mains for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 310 Tapping Bands – Mechanical for Pressure Applications – Drinking Water and Non-Drinking Water Supply

WSA PS – 278 Gate Valves, Resilient Seated, with Integral Polyethylene (PE) Ends for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 279 European Gate Valves, Resilient Seated, with Integral Polyethylene (PE) Ends for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 281 Gate Valves, Resilient Seated with Restrained Flexible Joints for Polyethylene Pipe in Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

Replace the second Note in Clause 4.5 with the following

NOTE PIPA Industry Guideline POP007 provides guidelines for the geometric specification of metal backing rings suitable for use with PE flange adaptors in the sizes DN 20 through to DN 1000 and flanges in accordance with AS 2129, AS/NZS 4331.1 (ISO 7005-1) and AS/NZS 4087.

Clause 4.6

The titles of numerous Product Specifications have been amended and links provided.

WSA PS – 203 Steel Pipes for Pressure and Non-Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

WSA PS – 204 Steel Fittings for Pressure and Non-Pressure Applications - Drinking Water, Non-Drinking Water Supply and Sewerage

Clause 4.6.5

Replace the first paragraph with the following

Flanges shall comply with AS/NZS 4087.Select bolting in accordance with Appendix C of AS/NZS 4087. Gaskets shall comply with WSA 109. The Design Drawings shall specify the class of flange, the type of flange gasket and the tightening sequence (See Figure

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4.1). Gasket types should generally be designated as either full face (FF) or inside bolt circle (IBC) Gaskets may be single flat sheet or moulded.

Clause 4.7

The titles of numerous Product Specifications have been amended and links provided.

WSA PS – 205 Filament Wound Glass Reinforced Plastics (FW-GRP) Pipes and Fittings for Pressure Applications – Drinking Water and Non-Drinking Water Supply

WSA PS – 205J Centrifugally Cast Glass Reinforced Plastics (CC-GRP) Pipes for Pressure and Non-Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage – Installed Using Trenchless Installation Methods

WSA PS – 206J Filament Wound Glass Reinforced Plastics (FW-GRP) Pipes for Pressure and Non-Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage – Installed Using Trenchless Installation Methods

WSA PS – 237 Centrifugally Cast Glass Reinforced Plastics (CC-GRP) Pipes and Fittings (ISO Sized) for Pressure and Non-Pressure Applications – Drinking Water and Non-Drinking Water Supply

Clause 4.8.3

Replace the Note in Clause 4.8.3 with the following

All DI fittings and valves are required to be thermal-bonded polymeric coated in accordance with AS/NZS 4158. Other coating systems for fittings may be specified by the Water Agency. The availability of coating systems should be checked with the manufacturer.

Clause 4.8.7

Replace the last paragraph with the following:

Guidance notes for laying drinking water pipelines in contaminated ground are outlined in

(a). Plastics Industry Pipe Association of Australia Polyolefins and PVC Guidelines POP207 Installation of Potable Watermains in Contaminated Ground available at https://pipa.com.au/technical/pop-guidelines/

(b). Water Regulation Advisory Service (WRAS) Information and Guidance Note No 9-04-03: "The Selection of Materials for Water Supply Pipes to be laid in Contaminated Land". This is a freely available document from their website www.wras.co.uk.

(c). Foundation for Water Research Report No. FR 0448 November 1994 available at www.fwr.org.

(d). UKWIR report "Guidance for the Selection of Water Pipes to be used in Brownfield sites" Report Ref No. 10/WM/03/21 August 2010 available at https://ukwir.org.

Clause 4.8.8

Replace the first and second paragraph with the following:

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Bolted connections using Grade 316 (see note below) stainless steel bolts, nuts and washers (and backing rings if required) of polymeric coated metallic flanged fittings and/or flanged PE pipes and fittings do not require additional corrosion protection.

Bolted connections using galvanised steel bolts, nuts and washers (and backing rings if required) of polymeric coated metallic flanged fittings and/or flanged PE pipes and fittings shall be provided with additional corrosion protection in the form of an encapsulating system of bolt head and nut sealing caps filled with corrosion prevention priming paste, wrapped with petrolatum tape or with PE sleeving and taped (See Figure 4.3, Figure 4.4 and Figure 4.5).

Clause 5.1.1

Replace the last paragraph with the following

Horizontal alignment shall be referenced to the Water Agency's preferred coordinate system, and, where possible, to local property boundaries. Levels shall be referenced to AHD.

Clause 5.1.5 Insert New Clause

5.1.5. Survey Control

5.1.5.1 Marking

All survey work submitted to the Water Agency shall be directly related to the Water Agency's coordinate system. The plan shall clearly identify the origin of both horizontal and vertical control, and shall quote the values adopted in each case.

5.1.5.2 Horizontal control

Control marks of engineering and cadastral survey standard will normally be sufficient for positioning of pipelines and associated facilities. Data supplied to the Water Agency shall include coordinates for all control marks used or placed during the survey.

5.1.5.3 Vertical control

Sufficient level control marks shall be provided to satisfy construction requirements.

Marks shall be positioned in locations that are stable and unlikely to be disturbed by construction. Marks shall be spaced to minimise set-ups needed when pegs are replaced or Work As Constructed levels are run.

The surveyor shall verify levels at every opportunity by connecting to other control marks.

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Clause 5.4.1 (c)

Insert new item (iv)

(iv) minimise potential damage to other assets in the event of a water main failure.

Insert new item (6)

(6) Avoidance of placement of mains on the fill sides of roads and PUAs.

Clause 5.4.9.1

Replace 2nd paragraph with the following

The crossing shall be at 90° to the road, service, etc. if practicable. Otherwise variation shall be subject to approval by the Water Agency and other owner of the infrastructure.

Insert new 4th and 5th paragraph

Elastomeric seal joints or flanges are not permitted below obstructions. The maximum depth of cover to mains crossing obstructions shall be 1.5 m. The maximum length of obstruction(s) over the main shall be 1.5 m. Where maximum cover or length of obstruction is exceeded, a 'maintenance free' crossing shall be provided (refer to clause 7.12).

Subject to approval by the Water Agency, installation of PE mains using trenchless methods below obstructions may be permitted without mechanical protection.

Clause 5.4.9.2

Insert new Second paragraph

The encasing pipe shall be capable of withstanding all installation (e.g. jacking, grouting etc.) and post installation loads (e.g. soil overburden, groundwater, traffic, rail, etc.).

Clause 5.4.11

Replace 1st paragraph with the following

The Design Drawings and/or Specification shall nominate the means for crossing of creeks and drainage reserves, as well as the alignment, mechanical protection (e.g. encasing pipe or concrete encasement) and construction details.

Insert new third paragraph

Subject to approval of the Water Agency, installation of PE mains using trenchless methods below minor creeks or drainage services may be permitted without mechanical protection.

Insert new second last paragraph

Cold bending of any PVC-M, PVC-O, PVC-U pipe is not permitted.

Clause 5.5

Delete 1st paragraph and replace with the following

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The use of trenchless techniques for pipelaying can reduce environmental impact, social costs and at the same time provide economic alternatives to traditional open cut methods of installation, renewal or repair.

Installations using trenchless techniques such as directional drilling, thrust-boring, micro-tunnelling, pipe-jacking and similar processes as well as "plough-in" type installation methods should be considered on their merits with respect to grade, alignment, ground conditions, obstructions and environmental and economic considerations including externalities.

Trenchless techniques should be evaluated for alignments:

(a). passing through:
(i). environmentally sensitive areas;
(ii). built-up or congested areas to minimise disruption and reinstatement; and
(iii). other areas, particularly where the location is not suitable for trenching e.g. railway and freeway crossings; and
(b). where the impact of the works on existing pavements and trees can be reduced.

Where trenchless technology is adopted for pipelaying or installation of other network infrastructure, the Designer shall prepare a construction specification in consultation with the installer, the pipe manufacturer and the asset Owner.

Clause 5.7

Insert new last paragraph

Hydrants on the duplicate mains shall be provided in accordance with Clause 8.8

Clause 5.8

Insert new last paragraph

Hydrants, where necessary on the distribution main and/or rider main, shall be provided in accordance with Clause 8.8.

Clause 5.9

Insert new Heading and the following text, new product specifications added including links.

2 5.9.1 Product Specifications

Relevant Product Specifications

WSA PS – 313 Repair and Off-Take Clamps for Pressure Applications - Drinking Water and Non-Drinking Water Supply

WSA PS – 329 Tapping Saddles, Electrofusion, for use with Polyethylene (PE) Mains for Pressure Applications – Drinking Water, Non-Drinking Water Supply and Sewerage

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Clause 7.1

The water main installation shall be designed to resist structural failure. The design of flexible pipelines shall be in accordance with Table 2.1 of AS/NZS 2566.1:1998/Amdt 1:2017 and Table 7.1. Details of the final design requirements shall be shown on the Design Drawings

Table 7.1

Table 7.1 has been revised as follows

TABLE 7.1

PE 100 & PVC PIPE MATERIAL CHARACTERISTICS

Pipe material	Allowable long-term vertical pipe deflection for non-pressure* $\Delta_{y\,all}/D$ %	Allowable long-term ring-bending strain ε_{ball} %	Maximum allowable long-term hoop stress $\sigma_{h\,all}$ (see Product Standard) MPa	Poisson's ratio ν	Ring-bending modulus MPa		Long-term factor of safety		
					E_b	E_{bL50}	Press-ure η_p	Bend-ing η_b	Com-bined η
PE100	7.5	4.0	8.0	0.4±0.05	950	260	1.25	2.0	1.25
PVC-M	7.5	1.0	17.6	0.38	3000	1200	1.4	1.4	1.4
PVC-O 400	7.5	1.3	25	0.38	4000	1800	1.6	1.6	1.5
PVC-O 450	7.5	1.3	28	0.38	4000	1800	1.6	1.6	1.5
PVC-O 500	7.5	1.3	32	0.38	4000	1800	1.6	1.6	1.5
PVC-U	7.5	1.0	11/12.3[4]	0.38	3200	1400	2.1	2.1	1.5

NOTES:

1 The typical material properties in Table 2.1 relate to pipes that comply with the product Standards listed in relevant WSAA Product Specifications.

2 Long-term values in Table 7.1 are specified at 50 years. Values for E_b and E_{bL50} are 3 minute and 2 year values, respectively. Poisson's ratio is not time dependent.

2 The allowable vertical pipe deflections for elastomeric seal joints are:

(i) where specified in an Australian Standard, to be in accordance with such Standard; or

(ii) for all other materials, to be checked with the manufacturer.

Where an allowable vertical pipe deflection for elastomeric sealing joints applies, the predicted vertical pipe deflection shall still be determined using the properties of the barrel of the pipe, i.e. no allowance shall be made for different properties of the pipe at the joint.

4 Maximum allowable long term hoop stress for PVC-U is 11 MPa for sizes up to and including DN 150 and 12.3 MPa for sizes greater than DN 150.

Clause 8.1.4

Replace the last paragraph with the following:

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Flange dimensions and drillings shall be specified to be in accordance with AS/NZS 4087 PN 16. Where pump isolation and non-return valve flanges do not match the pump flanges, adaptors (spool pieces) shall be provided to achieve flange compatibility with AS/NZS 4087.

Clause 12.8.2

Replace the second paragraph with the following

Supply an extension spindle to WSA PS−262 or WSA PS −269 as required.

Clause 15.19

Replace 3rd and 4th paragraphs with the following

For PE pipelines use a butt welded PE stub flange /adaptor with backing ring conforming to requirements of the Specification.

Further information on metal backing rings for flange adaptors for use with PE pipelines is given in the Plastics Industry Pipe Association Technical Guideline POP007.

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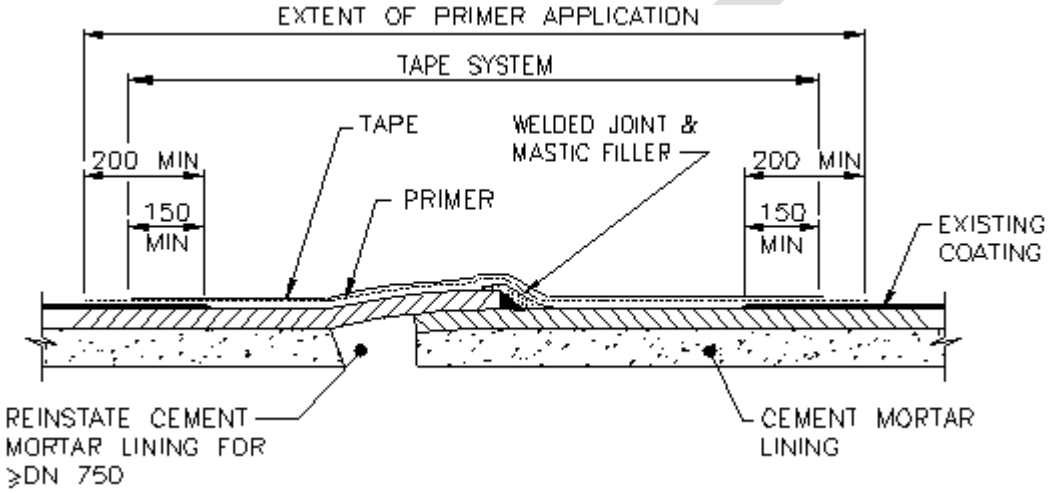
In Clause 15.20.3 delete the last paragraph and replace it with:

For spherical slip-in welded joint pipes ≤ DN 750, consideration should be given to internal corrosion from the water being conveyed. If corrosion control is required this could be achieved by the specification of ≥ 150µm of zinc metal spray with a seal coating applied to the internal socket surfaces; or alternatively utilising a welded collar joint (with no joint deflection), minimal joint gap and ≥ 8mm weld collar thickness; or using CML/FBPE welded joints (CLPEWJ - for ≥324mm OD pipe), refer to Figure 15.5.

Replace Figure 15.2 with the following:



Insert new Figure 15.5

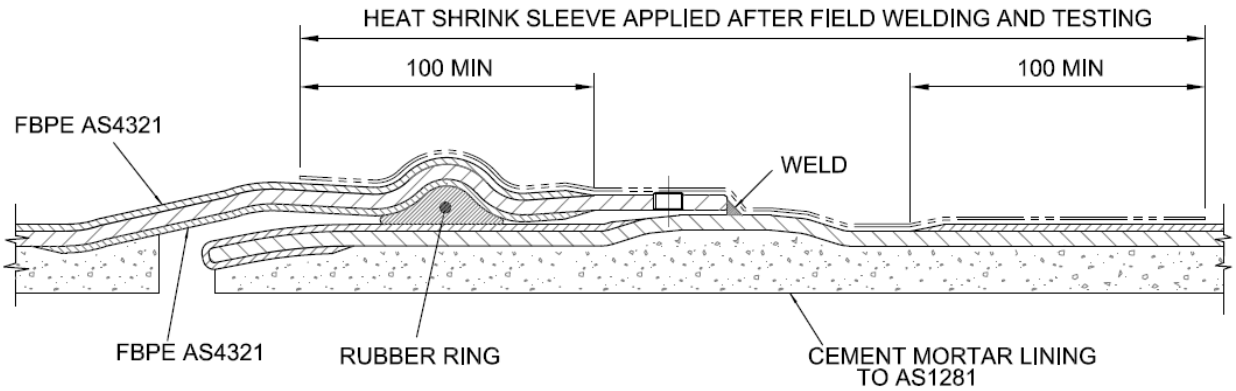


FIGURE 15.5 CML/FBPE WELDED JOINT (CLPEWJ)

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Clause 16.17.3

Make connections to PVC/ABS/DI/steel pipelines using PE flange adaptors and backing rings with AS/NZS 4087 Figure B2 mating dimensions

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APPENDIX B EQUIVALENT PIPE SIZES FOR COMMONLY USED MATERIALS

Equivalent pipe DN for Copper and PE pipe shall be determined using Table B1.

Equivalent pipe DN for other commonly used materials and PE pipe shall be determined using Table B2.

TABLE B1

EQUIVALENT PE PIPE DIAMETER COPPER PIPE AS 1432—2004

COPPER AUSTRALIA			EQUIVALENT PE 100 PIPE SERIES 1		
Material and Pressure Class	**Pipe Size DN**	**Mean internal diameter ID**	**Pipe Size DN**	**Max Mean ID[4]**	**Pressure Class PN**
Copper[1] - Type A	20	16.2	25	21.1	12.5
Copper[1] - Type B	20	17.3		20.7	16
Copper[1] - Type A	25	22.1	32	27.5	12.5
Copper[1] - Type B	25	23.0		26.5	16
Copper[1] - Type A	32	28.5	40	34.5	12.5
Copper[1] - Type B	32	29.3		33.0	16
Copper[1] - Type A	40	34.8	50	42.0	12.5
Copper[1] - Type B	40	35.7		41.2	16
Copper[1] - Type A	50	47.5	63	53.0	12.5
Copper[1] - Type B	50	48.4		52.0	16
Copper[1] - Type A	65	60.2	90	76.0	12.5
Copper[1] - Type B	65	61.1		74.5	16
Copper[1] - Type A	80	72.7	90	76.0	12.5
Copper[1] - Type B	80	72.1		74.5	16
Note 2			110	94.0	12.5
				90.0	16
Note 2			160	136	12.5
				130	16

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1. Copper pipe is no longer specified for new property; however, most existing property services are copper and it can be used for renewal of these services (Refer to 5.11.3 Services, outlets and meters)
2. No equivalent pipe size
3. Values in the Table B1 for Copper were calculated from the value for maximum outside diameter and minimum wall thickness (straight lengths) as specified in AS 1432—2004.
4. Values in the Table B1 for PE pipe were calculated from the value for maximum outside diameter and minimum wall thickness as specified in AS/NZS 4130:2018.

TABLE B2

EQUIVALENT PE PIPE DIAMETER COMMONLY SPECIFIED WATER PIPE MATERIALS AND SIZES

COMMONLY SPECIFIED WATER PIPE MATERIALS AND SIZES			EQUIVALENT PE 100 PIPE SERIES 1		
Material and Pressure Class	**Nominal diameter DN**	**Nominal internal diameter ID**	**Pipe Size DN**	**Max Mean ID[5] mm**	**Pressure Class PN**
PVC-M – PN 12/16	100	114/111	125	108	12.5
PVC-O[3] – PN 12.5/16		117/116		103	16
PVC-U –.PN 12/16		110/106			
DICL[4] – PN 35		108			
PVC-M – PN 12/16	150	166/162	180	155	12.5
PVC-O[3] – PN 12.5/16		170/168		149	16
PVC-U –.PN 12/16		159/154			
DICL[4] – PN 35		163			
PVC-M – PN 12/16	200	217/212	250	216	12.5
PVC-O[3] – PN 12.5/16		223/221		207	16
PVC-U –.PN 12/16		211/204			
DICL[4] – PN 35		218			
PVC-M – PN 12/16	225	242/236	280	241	12.5
PVC-O[3] – PN 12.5/16		249/246		232	16
PVC-U –.PN 12/16		235/227			
DICL[4] – PN 20/35		246/245			
PVC-M – PN 12/16	250	268/262	315	272	12.5
PVC-O[3] – PN 12.5/16		275/272		261	16
PVC-U –.PN 12/16		260/252			
DICL[4] – PN 20/35		273/272			

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COMMONLY SPECIFIED WATER PIPE MATERIALS AND SIZES			EQUIVALENT PE 100 PIPE SERIES 1		
Material and Pressure Class	**Nominal diameter DN**	**Nominal internal diameter ID**	**Pipe Size DN**	**Max Mean ID[5] mm**	**Pressure Class PN**
PVC-M[1] – PN 12/16	300	323/316	355	306	12.5
PVC-O[2] – PN 12.5/16		331/328		294	16
PVC-U[3] –.PN 12/16		314/304			
DICL[4] – PN 20/35		332/329			
PVC-M[1] – PN 12/16	375	418/423	450	388	12.5
PVC-O[2] – PN 12.5/16		409/405		372	16
PVC-U[3] –.PN 12/16		407/395			
DICL[4] – PN 20/35		413/408			
PVC-M[1] – PN 12/16	450	474/463	560	483	12.5
PVC-O[2] – PN 12.5/16		474/463		463	16
PVC-U[3] –.PN 12/16		460/446			
DICL[4] – PN 20/35		493/487			
PVC-M[1] – PN 12/16	500	524/512	630	543	12.5
PVC-O[2] – PN 12.5/16		538/532		521	16
PVC-U[3] –.PN 12/16		509/492			
DICL[4] – PN 20/35		545/539			
PVC-M[1] – PN 12/16	600	623/609	800	690	12.5
PVC-O[2] – PN 12.5/16		640/639		662	16
PVC-U[3] –.PN 12/16		606/586			
DICL[4] – PN 20/35		650/643			
PVC-O[2] – PN 12.5/16	750	793/785	1000	864	12.5
DICL[4] – PN 20/35		805/797		827	16

1. The nominal internal diameter ID's in Table B2 for PVC-M pipe were calculated using the max Mean OD mm ($D_{m\ max}$) minus 2 x wall thickness (T_{min}) as specified in AS/NZS 4765: 2017.
2. The nominal internal diameter ID's in Table B2 for PVC-O MRS 500 pipe were calculated using the nominal diameter (min Mean OD mm) minus 2 x minimum wall thickness as specified in AS/NZS 4441:2017.
3. The nominal internal diameter ID's in Table B2 for PVC-U pipe were calculated using the max Mean OD mm ($D_{m\ max}$) minus 2 x wall thickness (T_{min}) as specified in AS/NZS 1477: 2017.
4. The nominal internal diameter ID's in Table B2 for DICL pipe were calculated using the Mean OD mm (y) minus 2 x (nominal wall thickness (t) + minimum cement mortar lining thickness) as specified in AS/NZS 2280:2020.
5. Values in the Table B2 for PE pipe were calculated from the value for maximum outside diameter and minimum wall thickness as specified in AS/NZS 4130:2018.

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