



Sydney Water Supplement to Pressure Sewerage Code of Australia WSA-07 2007

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Revision details

Version No.	Clause	Description of revision
1.0	N/A	Original Issue
2.0	Clauses 6.2, 6.5, 6.6, 7.5, 7.6	Minor amendments

Introduction

Sydney Water's Supplement to the WSAA Pressure Sewerage Code of Australia WSA 07-2007 details where Sydney Water's requirements differ from the WSAA Pressure Sewerage Code of Australia WSA-07 2007 V1.1.

Deviation from WSA-07 Sewerage Code of Australia and this Supplement must be approved in accordance with Sydney Water's Procedure – Deviation from Standards (Document Number D0001738).

In order to assist the reader, the tables include references and clause numbers presented as they appear in WSA-07 (The Pressure Sewerage Code of Australia). Only those clauses where changes have been made are shown in the Supplement. Associated clause headings are also provided to provide context to the modified clauses. Informative text, where provided is italicised.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

It is the user's sole responsibility to ensure that the copy of the Supplement is the current version as in use by Sydney Water.

Sydney Water accepts no liability whatsoever in relation to the use of this Supplement by any party, and Sydney Water excludes any liability which arises in any manner by the use of this document.

For the purpose of this Specification "Sydney Water" is the nominated person or organisation that has written authority to act on Sydney Water's behalf.

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Scope

The scope of this document includes the planning, design and construction of pressure sewerage systems for Sydney Water including works for brownfield and greenfield developments.

This Supplement is intended for Sydney Water personnel, consultant engineers and contractors engaged in the planning, design and construction of Sydney Water pressure sewerage systems.

This Supplement is to be read in conjunction with the following documents:

- WSA-07-2007 V1.1 Pressure Sewerage Code of Australia
- WSA 201 Manual for Selection and Application of Protective Coatings and Sydney Water's Supplement to the WSA 201
- EPS 500 - Engineering Product Specification for Standard Pipes and Fittings for Networks
- EPS 501 - List of Approved Non-Standard Products for Networks
- Sydney Water's Wastewater System Planning Guidelines

Copyright

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WSA-07 Preface and Introduction

Code References	Amendments to WSA 07-2007 V1.1
Introduction	<p><i>Insert at end of Page 10:</i></p> <p>Drawing and Figures</p> <p>In reading this amendment, reference is to be made to Sydney Water version of the WSA 07-2007 standard drawings. A suffix “-V” has been added to any WSAA Standard Drawing modified by Sydney Water and a suffix “-S” on the drawing number denotes an added or new Sydney Water drawing. In the event of an inconsistency between details shown in a standard drawing compared to a figure within the body of the Code, Sydney Water shall be consulted to confirm the appropriate interpretation.</p>

Part 0: Glossary of Terms and Abbreviation

Code References	Amendments to WSA 07-2007 V1.1													
<p>I. Glossary of Terms</p>	<p><i>Add the following to the list:</i></p> <table border="1"> <thead> <tr> <th data-bbox="526 465 790 510">Term</th> <th data-bbox="790 465 1452 510">Definition</th> </tr> </thead> <tbody> <tr> <td data-bbox="526 533 790 656">trench width</td> <td data-bbox="790 533 1452 656">The clear width between the sides of an unsupported trench or the width inside the internal faces of a trench system.</td> </tr> <tr> <td data-bbox="526 678 790 801">tank breather</td> <td data-bbox="790 678 1452 801">Small holes provided in the tank lid which allow small volumes of air to move in and out of the wastewater collection tank as required.</td> </tr> <tr> <td data-bbox="526 824 790 969">burial line</td> <td data-bbox="790 824 1452 969">Indication mark embossed on the external wall of the wastewater collection tank. No backfill and/or landscaping should be placed above this line.</td> </tr> <tr> <td data-bbox="526 992 790 1115">finished lot level</td> <td data-bbox="790 992 1452 1115">Finished ground level approx. 150mm below the Burial Line. This allows for final landscaping to be placed after tank installation.</td> </tr> <tr> <td data-bbox="526 1137 790 1193">finished landscape level</td> <td data-bbox="790 1137 1452 1193">Finished ground level including landscaping</td> </tr> </tbody> </table>		Term	Definition	trench width	The clear width between the sides of an unsupported trench or the width inside the internal faces of a trench system.	tank breather	Small holes provided in the tank lid which allow small volumes of air to move in and out of the wastewater collection tank as required.	burial line	Indication mark embossed on the external wall of the wastewater collection tank. No backfill and/or landscaping should be placed above this line.	finished lot level	Finished ground level approx. 150mm below the Burial Line. This allows for final landscaping to be placed after tank installation.	finished landscape level	Finished ground level including landscaping
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<p>II. Abbreviations</p>	<p><i>Add the following to the list:</i></p> <table border="1"> <thead> <tr> <th data-bbox="526 1294 790 1339">ABBREVIATION</th> <th data-bbox="790 1294 1452 1339">INTEPRETATION</th> </tr> </thead> <tbody> <tr> <td data-bbox="526 1361 790 1406">ADWF</td> <td data-bbox="790 1361 1452 1406">Average Dry Weather Flow</td> </tr> <tr> <td data-bbox="526 1429 790 1473">I/I</td> <td data-bbox="790 1429 1452 1473">Inflow and Infiltration</td> </tr> <tr> <td data-bbox="526 1496 790 1541">PSU</td> <td data-bbox="790 1496 1452 1541">Pressure Sewer Pumping Unit</td> </tr> <tr> <td data-bbox="526 1563 790 1608">WHS</td> <td data-bbox="790 1563 1452 1608">Work Health and Safety</td> </tr> </tbody> </table>		ABBREVIATION	INTEPRETATION	ADWF	Average Dry Weather Flow	I/I	Inflow and Infiltration	PSU	Pressure Sewer Pumping Unit	WHS	Work Health and Safety		
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Part 0: Glossary of Terms and Abbreviation

Code References	Amendments to WSA 07-2007 V1.1		
III. Referenced Documents	<i>Add or replace where applicable the following under WSAA Standards:</i>		
	STANDARD	TITLE	CLAUSE/ TABLE/ DRAWING
	WSA 02-2002	Sewerage Code of Australia Sydney Water Edition 2017 V4	Clauses 1.1, 1.7.1, 4.2, 4.4.1, 5.8, 18.6
	WSA 01	Polyethylene Pipeline Code of Australia	Clause 18.3
	WSA 201	Manual for Selection and Application of Protective Coatings	Clause 5.8
	<i>Insert after list of WSAA Standards:</i>		
	Sydney Water Standards		
	STANDARD	TITLE	CLAUSE/ TABLE/ DRAWING
	ACP0166	Sydney Water's Supplement to the WSA 201 Manual for Selection and Application of Protective Coatings	Clause 5.8
	EPS 500	Engineering Product Specification for Standard Pipes and Fittings for Networks	Clauses 2.6, 5.3.1, 10.5 and 13.1
	EPS 501	List of Approved Non-Standard Products for Networks	Clause 2.6, 10.1 and 13.1

Part 1: Planning and Design

Code References	Amendments to WSA 07-2007 V1.1
<h3>1. General</h3>	
<p>1.2.3 Description of the System</p>	<p><i>Insert after 1st paragraph of the clause:</i></p> <p>Only grinder pump pressure sewer systems are acceptable. STEP systems are not permitted.</p>
<p>1.5.3 Design Responsibilities</p>	<p><i>Replace (iv) (H) with:</i></p> <p>(H) locations of cleanouts, flushing points, isolation valves, air valves and odour control;</p>
<p>1.6.1 System Design Life</p>	<p><i>Replace the nominal pump life in Table 1.1 with 10 years</i></p>
<p>1.6.2 Objectives of the System Design</p>	<p><i>Replace items (a), (f), (n) and (o) with:</i></p> <p>(a) Least life cycle cost with acceptable risk</p> <p>(f) Compliance with WH&S requirements</p> <p>(n) The ability to manage wet weather flows</p> <p>(o) Sufficient hydraulic capacity for the schemes ultimate service area</p>
<p>1.6.3 Design Output</p>	<p><i>Replace 1st sentence with:</i></p> <p>The design outputs shall satisfy the requirements of the Code, this Supplement and Sydney Water’s project specific requirements.</p> <p><i>Add to item (a) after pipe materials:</i></p> <p>air valves and odour control facilities</p>

Code References	Amendments to WSA 07-2007 V1.1
<h2 data-bbox="108 277 593 331">2. Concept Design</h2>	
<p data-bbox="108 367 325 430">2.1 Life Cycle Considerations</p>	<p data-bbox="523 367 884 398"><i>Replace 1st paragraph with:</i></p> <p data-bbox="523 425 1343 658">Pressure sewer systems shall be planned and designed to optimise construction, operation and maintenance costs for the total life cycle of infrastructure and equipment. The evaluation will also consider community costs (eg power costs to the customer) and where known environmental impacts and implications.</p> <p data-bbox="523 685 801 716"><i>Replace item (f) with:</i></p> <p data-bbox="523 743 1343 891">(f) operating and maintenance costs over the life of the system. Operating costs will include energy costs and any costs (such as additional flushing costs) associated with staging of the development.</p>
<p data-bbox="108 931 344 963">2.2 Functionality</p>	<p data-bbox="523 931 810 963"><i>Replace item (d) with:</i></p> <p data-bbox="523 990 1318 1061">(d) Pump design flows across the expected normal operating pressures.</p> <p data-bbox="523 1088 865 1120"><i>Add to the last paragraph:</i></p> <p data-bbox="523 1146 1359 1254">The ability to respond to widespread and lengthy power outages and to system wide failure will be evaluated as part of meeting the minimum standard for system functionality.</p>
<p data-bbox="108 1299 363 1330">2.3 Maintainability</p>	<p data-bbox="523 1299 724 1330"><i>Add item to list:</i></p> <p data-bbox="523 1357 1299 1464">(f) Use the same pump units for all units to be owned and operated by Sydney Water. Sydney Water will advise of the units to be adopted.</p>
<p data-bbox="108 1505 300 1536">2.4 Reliability</p>	<p data-bbox="523 1505 852 1536"><i>Add at end of the clause:</i></p> <p data-bbox="523 1563 1359 1760">When planning pressure sewerage systems in areas of known poor power supply reliability, the availability of dual network power supplies to the area being served will be investigated to minimise the impact of widespread power outage on reliability of the system.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>2.6 Materials Design</p>	<p><i>Replace 2nd paragraph with:</i></p> <p>Only pressure sewer products approved by Sydney Water shall be specified. For products that do not comply with EPS 500 – Engineering Product Specification for Standard Pipes and Fittings for Networks or EPS 501-List of Approved Non-Standard Products for Networks, a written application must be submitted to and approved by Sydney Water. Refer to Sydney Water Deviation from Standards Procedure.</p>
<p>2.7 Staging</p>	<p><i>Replace clause with:</i></p> <p>Staging of the development will need to be considered during planning and design to ensure that the system meets the performance requirements of the code during all stages of development. Where additional operational flushing is required to achieve the required performance, the flushing requirements (location, volume, duration and regularity) are to be documented in the planning and design documentation. Any other measures adopted to address hydraulic requirements during the staged development, including temporary connections must be detailed and assessed during the planning and design phases.</p> <p>In reviewing the performance of the system at various stages the following must be considered:</p> <ul style="list-style-type: none"> • Likely lot connection dates, rather than lot ‘release’ dates • Ensuring the timed-release of lots aligns with any necessary capacity upgrades to downstream wastewater infrastructure downstream of the connection point • Increases in sewage detention times and impacts on system odour and corrosion potential • Achieving minimum peak pipe flow velocities • Impact on dead end sections • Mains with small numbers of connections during early connection stages
<p>2.8.2 Sewage quality/Trade waste management</p>	<p><i>Replace 1st paragraph with:</i></p> <p>Sydney Water has an established Trade Waste approval process. Any customer with trade waste discharges is required to contact Sydney Water and gain approval prior to discharge of any trade water to Sydney Water’s wastewater system.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>2.9 Odour Control</p>	<p><i>Add the following to end of clause:</i></p> <p>The Designer shall provide evidence that odour generation and control has been considered. This will include calculations that demonstrate odour generating potential and how any odours generated will be treated. This will also include the impact of any proposed development staging (refer clause 2.7).</p> <p>During concept design, the assessment of odour potential will be determined based on the average age of the wastewater and Table 3.2 of WSA-07. During detailed design stage, the odour potential will be determined by modelling both sulphide generation and sewage age.</p> <p>The Designer will document all proposed ventilation and odour control measures.</p> <p>Potential odour control measures include:</p> <ul style="list-style-type: none"> • Location of air valves and or vents to minimise impacts • Use of vent stacks (with odour scrubbing where necessary) • Chemical dosing <p>Where chemical dosing is required, Sydney Water shall be consulted to determine the appropriate chemical to be dosed as well as the method and the location of dosing.</p>
<p>2.12.1 General</p>	<p><i>Insert at end of the clause:</i></p> <p>The design process and outputs shall comply with requirements detailed in Construction Hazard Assessment Implication Review (CHAIR) – Safety in Design Tool published by WorkCover (available at www.workcover.nsw.gov.au).</p> <p>Outputs from the CHAIR sessions shall be addressed/ incorporated into the design. Meeting minutes from the CHAIR 1 and CHAIR 2/3 workshops are to be included in the final Concept Design Report and final Detailed Design Report respectively.</p>

Code References	Amendments to WSA 07-2007 V1.1
<h2>3. General Design</h2>	
<p>3.2 Design Tolerances</p>	<p><i>Replace item (a) with:</i></p> <p>(a) In plan to 0.01m</p> <p><i>Replace 1st sentence of the last paragraph with:</i></p> <p>Horizontal alignment shall be referenced to the GDA94 (MGA Zone 56) coordinate system and, where possible, to local property boundaries.</p>
<p>3.6.4 Contaminated Sites</p>	<p><i>Replace item (a) with:</i></p> <p>(a) Need for site contamination assessment.</p> <p><i>Add after item (g):</i></p> <p>(h) Limitations, constraints or considerations with respect to the works, identified from enquiries with the Environmental Regulator.</p>
<p>3.6.6 Flooding – New Clause</p>	<p><i>Insert after clause 3.6.5:</i></p> <p>3.66 Flooding</p> <p>To minimise wet weather flows, Sydney Water may require flood mapping demonstrating that wider and local flooding (including overland flow) issues will not occur on developable lots sufficient to cause inflow into the pressure sewerage system.</p> <p>Collection tank is to be located so that the top of the tank is minimum 300mm above the 1 in 100 year flood level.</p>
<p>3.10 Mechanical Protection of Pipelines</p>	<p><i>Add at the end of item (c):</i></p> <p>Installation of all pressure sewer laterals crossing roads to be located within a PN16 PVC or PN16 PE100 conduit with minimum 50mm annular clearance.</p>
<p>Table 3.1</p>	<p><i>Replace ‘Water mains’ with ‘Water and Recycled Water Mains’ in Table 3.1.</i></p>

Code References	Amendments to WSA 07-2007 V1.1
3.14 Disused or Redundant Pipelines	<p><i>Replace item (a) with:</i></p> <p>(a) Pipelines shall be designated disused; pipelines shall not be designated “abandoned”.</p> <p><i>Insert items (d) and (e) to the list:</i></p> <p>(d) Where it is necessary to fill a disused or redundant pipeline, low strength grout (≤ 5 MPa) or similar material shall be used.</p> <p>(e) Where AC pipelines are to be disused or made redundant, advice from Sydney Water shall be sought for any additional requirements.</p>

Code References	Amendments to WSA 07-2007 V1.1
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4. Hydraulic Design

<p>4.1 Introduction</p>	<p><i>Add at the end of clause:</i></p> <p>Modelling software shall:</p> <ul style="list-style-type: none"> • Be based on Sydney Water’s ‘MOUSE’ modelling software and should be used to build the model and planning tool. • Have functionality for assessing pressure sewerage systems. (e.g. not an adapted solution based on generic flow/pressure software). • Be able to model based on various diurnal patterns.
<p>4.3 Design Inputs and Outputs</p>	<p><i>Replace clause excluding Figure 4.1:</i></p> <p>This Code defines a method of design that is acceptable to Sydney Water.</p> <p>Hydraulic design shall be carried out to ensure that the system will deliver acceptable pressures and flows under design flow conditions.</p> <p>Sydney Water inputs to the design process shall include:</p> <ol style="list-style-type: none"> a) Approved design methodology e.g. Default pipe sizes for small developments (see 4.4.4.1) or modelling. b) Sanitary drainage flows as detailed in Appendix E (Flow Estimation) of this Supplement. c) Wastewater flow diurnal patterns. d) Wet weather flow allowance as detailed in clause 4.4.2 of this Supplement e) The pump and control units to be adopted for the project. f) Nomination of the discharge point including any limitations on the flow rate at the point of discharge. g) The duration of the power outage to be adopted for power outage recovery assessment where historical records cannot be obtained from the local power authority. <p>The output of the pressure sewer hydraulic design shall comply with the output requirements of Sydney Water’s Wastewater System Planning Guideline.</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>a) No point in the pressure sewerage system shall have the ability to drain during normal operation without specific approval by Sydney Water.</p> <p>b) During planning and concept design stages, system analysis will be undertaken to ensure the system is robust. System analysis will include assessment of the following scenarios:</p> <ul style="list-style-type: none"> i. Dry weather operation ii. Dry weather sensitivity (20% higher and lower flows) iii. Wet weather operation iv. Power outage recovery <p>It is possible that pumps may run against closed valves (intentional or otherwise). The Designer is to ensure the system can withstand the potential pressures associated with such an event. This will be based on the maximum pressure that the pumps can generate.</p> <p>Where PE pipeline systems is specified, surge and fatigue analysis are not required.</p> <p>c) The relationship between System Pressure and Component Pressure Relationship is depicted in Figure 4.1.</p>
<p>4.4.1 Sanitary Flows</p>	<p><i>Replace clause with:</i></p> <p>Sanitary flows are to be determined as per Appendix E of this Supplement and Clauses 2.3.1, 2.3.2, 2.3.3 and Section 3 of WSA-02 for the strategic and concept design.</p>
<p>4.4.2 Infiltration and Inflows</p>	<p><i>Replace clause with:</i></p> <p>Sydney Water requires the likely impact of wet weather inflows on system performance to be investigated as part of the design process. The extent of I/I into the system will depend on a range of factors including compliance of plumbing standards at and after construction, illegal connections, swimming pool pump downs after rainfall. Reducing the potential for the wet weather flows is also related to the ability and level of enforcement following evidence of non-compliance issues.</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>Preliminary wet weather assessment of pressure sewerage systems shall be undertaken by adding the following flows to the system for residential, commercial and industrial buildings:</p> <p>For residential properties:</p> <ul style="list-style-type: none"> a) 0.015 L/s to be added to each pump unit (as flow into the tank) over the assessment period b) Pump pressures not to exceed manufacturers recommended maximum operating pressure for a 5% probability. <p>For commercial and industrial properties:</p> <ul style="list-style-type: none"> a) Part 1 - Appendix B of WSA 02-2002.2 Sydney Water edition 2017 V4 – Leak tight sewer approach <p>After the preliminary wet weather assessment, MOUSE modelling shall be carried out based on 1% I&I for all types of developments (residential, commercial, industrial etc).</p>
<p>4.4.3 Peak flows from homes and required pumping rates</p>	<p><i>Replace clause with:</i></p> <p>Any properties with a swimming pool will not be permitted to drain their pool directly to the pressure sewer unit. The customer will be required to either:</p> <ul style="list-style-type: none"> a) Retain their pool existing drainage arrangement, council permitting (if a backlog property). b) Install a system to ensure that discharge from the pool does not exceed 0.5L/s and pressure sewer pump capacity, e.g. provide storage, pump at intermittent cycles; or c) Install a soakage pit to drain the pool to stormwater, local regulations permitting. <p>Customers who install a pool after they have received a pressure sewer connection will not be permitted to drain their pool to their pressure sewer unit and will be required to comply with local authority requirements. In cases where this is not possible, the customer will be required to install a system to ensure that discharge from the pool does not exceed 0.5L/s and pressure sewer pump capacity.</p> <p>Customers with a spa are to install a flow restrictor to the drain to ensure the discharge rate does not exceed 0.5L/s. This flow restrictor shall be installed by a licensed plumber.</p>

Code References	Amendments to WSA 07-2007 V1.1						
<p>4.4.4.1 General</p>	<p><i>Add at the end of clause:</i></p> <p>Unless specified otherwise, for small systems (maximum 100 EP) and where pipe lengths are no greater than 200m, probability method can be used. The system must have a free discharge to the receiving sewer and the downstream system must have adequate capacity confirmed.</p> <p>The default pipe sizes required per connected property are detailed below:</p> <p>Table 4.1 Default Pipe Sizes</p> <table border="1" data-bbox="608 685 1428 947"> <thead> <tr> <th data-bbox="608 685 1042 797">No. of EP connected</th> <th data-bbox="1042 685 1428 797">Default reticulation pipe size</th> </tr> </thead> <tbody> <tr> <td data-bbox="608 797 1042 871">1-60</td> <td data-bbox="1042 797 1428 871">DN50</td> </tr> <tr> <td data-bbox="608 871 1042 947">61-100</td> <td data-bbox="1042 871 1428 947">DN63</td> </tr> </tbody> </table>	No. of EP connected	Default reticulation pipe size	1-60	DN50	61-100	DN63
No. of EP connected	Default reticulation pipe size						
1-60	DN50						
61-100	DN63						
<p>4.4.4.2 Simplified design flow equation</p>	<p><i>Delete clause. Not used.</i></p>						
<p>4.5.3.1 General</p>	<p><i>Add at the end of clause:</i></p> <p>Pipe sizing may need to be increased to reduce head losses during wet weather so that collection tanks do not overflow. Increasing pipe sizes to mitigate the risk of overflow at the collection tank does not mitigate the need to satisfy other hydraulic requirements.</p> <p>Only pipe sizes as per AS4130 are to be used. Availability of pipe sizes nominated in the design are to be confirmed by the Designer.</p>						
<p>4.5.3.3 Hydraulic Roughness Values</p>	<p><i>Replace “of 0.75” with “as per WSA 04 SW Edition Drg. SPS-1608-S”.</i></p>						

Code References	Amendments to WSA 07-2007 V1.1
<p>4.5.3.4 Required Flow Velocities in Pressure Sewers</p>	<p><i>Replace 2nd and 3rd paragraphs with:</i></p> <p>For pressure sewers ≤250mm OD, the minimum design velocity is 0.6m/s (for a minimum cumulative duration of 15 minutes per day), although the preferred minimum velocity is 1 m/s for slime control. Where a small number of properties discharging into pressure sewers ≤50mm OD, maximum velocity lower than 0.6m/s may be experienced. In this case, a minimum velocity of 0.4m/s is acceptable.</p> <p>For bores where maintenance is considered a high risk, the flushing velocity shall occur for sufficient duration to move particles at the lowest point in the bore to the downstream end. This will occur in a single flushing event at least once a day. Bores which meet the following requirements are considered a high risk:</p> <ul style="list-style-type: none"> • Bores with diameters greater than DN63 and longer than 100m; and • Have crossings under rivers, obstructions, railways; or • have a “U” shaped profile.

Code References	Amendments to WSA 07-2007 V1.1
<h2 style="margin: 0;">5. Pressure Sewer Design</h2>	
<p>5.1.3 Location of Network Systems</p>	<p><i>Replace item (b) with:</i></p> <p>(b) as detailed in the Guide to Codes and Practices for Streets Opening (www.streetsopening.com.au).</p>
<p>5.1.4 Alignment of Pressure Sewers</p>	<p><i>Add item (d) to the list:</i></p> <p>(d) located to avoid 90° bends where possible. Alternatives to 90° bends include bending pipe (in the case of smaller diameters) and the use of 2 No. 45° bends with a minimum of 300mm between bends.</p>
<p>5.2.1 Profile Design</p>	<p><i>Insert after 1st paragraph:</i></p> <p>Pipework shall generally be laid at minimum depth. However, depths and pipe alignment shall be engineered to ensure that the system remains fully pressurised at all times, siphoning is prevented, and the requirement for air valves is minimised. Designer shall consider multi-catchment PSS system layouts or alternative hydraulic control systems (e.g. barometric loops) to avoid drain down sections of pipework.</p>
<p>5.3.1 Valves Design</p>	<p><i>In item (c), replace the word “Reflux” with “Non-return”</i></p> <p><i>Insert at the end of this clause:</i></p> <p>Use only those valves listed on the Sydney Water’s EPS 500 - Engineering Product Specification for Standard Pipes and Fittings for Networks.</p>
<p>5.4.1 General</p>	<p><i>Replace the first sentence with:</i></p> <p>Isolation valves on pressure sewers shall be minimum PN 16 and comply with Sydney Water’s Mechanical Technical Specification.</p>
<p>5.4.2 Isolation Valve Locations</p>	<p><i>Add items (d) and (e) to the clause:</i></p> <p>(d) at incoming reticulation pressure lines, i.e. at Tee’s, excluding property laterals</p> <p>(e) one upstream and one downstream of scour valves, when the system volume between scour points exceeds 9m³.</p>
<p>5.4.3 Isolation Valve Covers and Surrounds</p>	<p><i>Add at the end of the clause:</i></p> <p>Traffolyte tags shall be installed on the underside of the surface fitting covers and be affixed with a secure fastener.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>5.5.1 Installation Design Criteria</p>	<p><i>Add at the end of the clause:</i></p> <p>The Designer is to ensure that air release valves have a minimum 2 metres sealing pressure at the valve at all times.</p> <p>Equal tees of the same DN as the pressure sewer shall be provided to allow air in the main to collect at the point where the air release valve is fitted. A flange plate shall be connected to the tee and its centre drilled to suit the size of air valve assembly.</p>
<p>5.5.2 Types</p>	<p><i>Insert at the beginning of this clause:</i></p> <p>Air release/vacuum break valves shall be of the automatic type. Manual air valves are subject to Sydney Water’s approval and will only be considered for instances where the need for the automatic release of air from the system is considered low, or if the valve is specifically for air movement associated with pipe filling/draining activities.</p> <p>Flushing points shall not be used for the release of air from a pressure sewer system, except for the application of draining a section of line.</p>
<p>5.5.4 Locations</p>	<p><i>Insert at the end of the clause:</i></p> <p>In addition to the above, the following factors are to be considered in the placement of automatic air valves:</p> <ul style="list-style-type: none"> a) proximity to properties b) venting requirements and the potential odour impact on the surrounding residents (both existing and potential future residents) c) aesthetics and safety requirements of any odour control infrastructure required, including any venting or carbon odour filters d) potential visual impact on the surrounding residents (both existing and potential future residents) <p>Depending on the potential for nuisance odours, odour control facilities may include:</p> <ul style="list-style-type: none"> a) a carbon canister, or b) a vent shaft, or c) a carbon canister and vent shaft

Code References	Amendments to WSA 07-2007 V1.1
<p>5.6.2 Flushing Points and Scours</p>	<p><i>Replace 1st and 2nd paragraphs with:</i></p> <p>All dead ends of a pressure sewer branches shall be provided with an end flushing point, regardless of the number of connections on the branch.</p> <p>All flushing point connections to the main shall be via side mounted (not top) 45 degree 'Y' junctions with double isolation as indicated on drawing PSS-1007-V.</p> <p><i>Replace (c) with:</i></p> <p>(c) at intervals not exceeding 200 m.</p> <p><i>Insert the following paragraph at the end of this clause:</i></p> <p>In locating flushing points, consider how mains will be flushed during the construction phase, and if there is likely to be staged connections to the system. Flushing points for interim development scenarios should be located to allow for cleaning the lines and minimising potential blockages and odour generation.</p> <p>Flushing fittings are to have Camlock connections and be sufficiently robust to avoid damage through normal operational use.</p>
<p>5.7 Flowmeters</p>	<p><i>Replace clause with:</i></p> <p>The Designer shall propose locations of flowmeters in consultation with Sydney Water. As a minimum, flowmeters will be required at the connection of a pressure system to the downstream system (e.g. sewage pumping station, gravity maintenance hole or wastewater treatment facility). Consideration should also be given to locate flowmeters to monitor or control the system where more than 100 properties are connected to the pressure system or in areas with substantial (greater than 1.5 hectares) commercial or industrial properties.</p> <p>The flowmeter shall be of a magnetic flow type and comply with Sydney Water IICATS Instrumentation and Control Standards. The positioning of the flowmeter shall consider the manufacturers recommended straight length of pipe upstream and downstream of the meter position, graded to ensure there is no air trap and any other requirements specified by the manufacturer. Other considerations in locating flowmeters shall include the power source, method of data capture and downloading, and any need for telemetry.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>5.8 Discharge Maintenance Holes – New Clause</p>	<p><i>Insert new clause after clause 5.7:</i></p> <p>5.8 Discharge Maintenance Holes</p> <p>The pressure sewer system shall connect to a dedicated gravity sewer discharge maintenance hole or pumping station inlet maintenance hole. The proposed discharge rate shall not exceed two-thirds of the capacity of the downstream gravity sewer. An emergency relief system shall be constructed from the gravity sewer or inlet maintenance hole as per WSA02 – Sewerage Code of Australia (Sydney Water Edition) or WSA04 – Sewage Pumping Station Code of Australia (Sydney Water Edition) respectively.</p> <p>The turbulent discharge of effluent from the pressure sewerage system into the downstream sewer system is to be avoided. Connection to the discharge maintenance hole is to be made by grading the incoming pipework over a sufficient distance (no less than 6m) and/or increasing the diameter of the pressure sewer so that the flow does not become turbulent when transitioning to a gravity flow. No gravity connections other than the pressure main shall be made to the discharge maintenance hole, although provision may be made for future duplication of the pressure main where this is anticipated.</p> <p>Drop inlets are not permitted without written permission from Sydney Water.</p> <p>A vent shaft shall be constructed at discharge maintenance holes where the diameter of the incoming pressure sewer is DN75 or larger. Vent shafts shall have a diameter equal to the diameter of the outgoing gravity sewer they ventilate, up to a maximum vent size of DN 300. The vent shall be in accordance with the requirements of clause 7.5.2 of WSA-02 Sewerage Code of Australia – Sydney Water Edition 2017 V4.</p> <p>The discharge maintenance hole (including underside of cover) and downstream two maintenance holes shall be lined with a protective surface coating complying with WSA 201 Manual for Selection and Application of Protective Coatings and Sydney Water’s Supplement to WSA 201.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>5.9 Operating Protocol – New Clause</p>	<p><i>Insert new clause after clause 5.8:</i></p> <p>5.9 Operating Protocol</p> <p>In developing the pressure sewerage system, the operational protocols will need to be determined. These protocols may include:</p> <ul style="list-style-type: none"> a) Control of pump operation to reduce peak flows b) Proactive pumping prior to wet weather periods to minimise the impact of wet weather flows downstream c) Wet weather operating protocol (change to operating parameters for properties not experiencing inflow/infiltration) d) Staged pumping during power recovery e) Limitation on pump duration to protect pumps during wet weather periods or unintended valve closure f) Flushing requirements <p>Some of the above requirements will require remote monitoring and control systems. All privately owned pressure sewer equipment that discharge to Sydney Water infrastructure must have remote monitoring capability compatible with Sydney Water’s IICATS Instrumentation and Control Standards.</p>

Code References	Amendments to WSA 07-2007 V1.1
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6. On-Property Design

6.2 Clearances

Add at the end of clause:

Minimum horizontal clearance between the property side boundary and any pressure sewer system component shall be at least 600mm for pipework and 1000mm for collection tanks as detailed in Drawings PSS-1150-S, PSS-1151-S and PSS-1152-S.

Control panels, generator connection points (if any), isolation switches and pump units shall maintain the following clearances:

- a) Minimum 1.0 m to any natural gas meter; and
- b) Outside Gas Bottles Hazard Zones as shown in Table 6.1

Table 6.1 Gas Bottles Hazard Zones

	Exchange Cylinder	In-situ fill cylinder
Horizontal Exclusion Zone from centreline of top cylinder valve (mm)	500	1500
Horizontal Exclusion Zone at ground level measured from centre of cylinder (mm)	1500	3500

Reference should also be made to Sydney Water’s Technical Guidelines-Building Over and Adjacent to Pipe Assets, including Zone of Influence requirements.

6.4 Existing Property Data Collection

Add to list of items:

(q) Electrical distribution box material (potential for asbestos). If the electrical distribution box contains asbestos, an Asbestos Management Plan will be required for the site.

Code References	Amendments to WSA 07-2007 V1.1
<p>6.5 Design and Layout of New On-Property Components</p>	<p><i>Replace this entire clause with the following:</i></p> <p>The Pressure Sewer Unit (PSU) shall be installed in accordance with the manufacturers recommended installation instructions.</p> <p>The collection tank shall be installed in a location and at a level that facilitates collection of every existing or future property sanitary lines serving existing and future building(s) on the site, as required by current codes and standards.</p> <p>For greenfield developments, the collection tank and property discharge lines shall be located as shown in drawings PSS-1150-S, PSS-1151-S and PSS-1152-S.</p> <p>The collection tank shall be located within 10m line of sight of the control panel due to standard pump control cable lengths (15m). Longer distance may be allowed where longer length control cables (no joints) can be used where confirmed with supplier. The collection tanks shall not be located within buildings or other enclosed areas.</p> <p>The collection tank shall be installed with a minimum separation of:</p> <ol style="list-style-type: none"> a) 1m level clear working area around the outer edge of the tank. The working area shall be sloped at max 1% slope away from the tank to prevent ponding. b) 1m horizontal clearance from the outer edge of the tank to any property boundary c) 1m clearance from the outer edge of the tank to driveways d) 2m horizontal clearance from the outer edge of the tank to building walls (nearest point of approved building envelope) or other structures (including retaining walls) to clear the 45 degree zone of influence on the foundation. This is based on a collection tank depth of 2m and should be increased if deeper tanks or non-standard installations are employed. e) 3m from the nearest potential opening windows <p>The collection tanks shall be installed clear of local ground depressions, or areas which could be subject to flooding. The top of the collection tank shall be at least 300mm above the 1 in 100 year flood level.</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>Tanks installed during the early stages of a greenfield development shall ensure the finished lot level is approx. 150mm below the tank burial line. This will allow for future landscaping. No backing filling or landscaping shall be placed above this line. The top of the collection tank shall be minimum 150mm above the finished landscape level.</p> <p>The location of the tank shall allow access to and ongoing maintenance of equipment installed. A preferred access width of 4m is desirable. If not feasible, a minimum access width of 1200mm is required to access the tank.</p>
<p>6.6 Control and Alarm Panels</p>	<p><i>Replace the 1st and 2nd paragraph of this clause with:</i></p> <p>The control panel shall be in a direct line-of-sight and within 10m of the collection tank. It is preferable that the panel is attached to the external wall of the main building on the property being serviced, close to the switchboard, and at a height of between 1.2m and 1.5m above the ground.</p> <p>Where this is not possible, the control panel is to be mounted on a free-standing, fully galvanised post, located within 4 m from the centre of the collection tank and at a height between 1.2m and 1.5m. Control panels and their installation shall comply with the current requirements of AS/NZ 3000 Electrical Installations.</p> <p>All gas bottle/hazard zones (including potential zones) shall be identified on Design Drawings and control panels shall not be permitted in these zones.</p> <p>An IP56 rated, local lockable isolation switch shall be installed at a distance no greater than 300mm from the control panel.</p> <p>General requirements for the layout of the control panel and electricals with respect to the collection tank are shown on drawing PSS-1101-V. Typical details for a free-standing control panel mounting post are shown in Drawing PSS-1156-S.</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>All control panels shall contain pump protection features as follows:</p> <ul style="list-style-type: none"> a) Shut pump off due to high pressure b) Pump shut-off head to be adjustable c) Limit continuous pump run time to 15mins (approx. 1 day's usage) (adjustable function) and switch off pump for 45mins (adjustable function) before pump start d) Shut pump off after three consecutive '15 minute run cycles' in a 3 hour period and raise critical alarm e) Limit the maximum number of pump starts to 10 per hour f) Capable of operating via a level transducer and redundant high level float switch
<p>6.7 Signage</p>	<p><i>Add at the end of the clause:</i></p> <p>A Sydney Water approved sticker identifying the property specific asset number and Sydney Water's emergency contact details shall be located on the outside door of the control panel.</p>

Code References	Amendments to WSA 07-2007 V1.1
<h2 style="text-align: left; margin-left: 10px;">7. Collection/Pump Units</h2>	
<p>7.2 Emergency Storage</p>	<p><i>Include at the beginning of the clause:</i></p> <p>Emergency storage volume shall be the volume contained in the collection tank and incoming gravity sanitary sewer from the high level alarm to the lowest ground level at any point of system relief (e.g. overflow relief gully, collection tank vent). A minimum emergency storage of 24 hours will be required for residential properties.</p>
<p>7.3 Location</p>	<p><i>Replace 2nd paragraph with:</i></p> <p>Collection tanks shall be within 5m of the front (main) access property boundary, refer drawings PSS-1150-S and PSS-1151-S.</p> <p>Where the ground level of the tank is higher than the dwelling being drained, and the tanks emergency storage volume is reduced then a riser or larger tank is to be used to ensure adequate emergency storage.</p> <p>Where location of the collection tank in the front is not practical, the Designer shall consult with Sydney Water and demonstrate why the collection tank needs to be located at the rear of the lot. The Designer is expected to consider regrading of land and the use of terraced lots to overcome this problem.</p> <p>For low density dwellings (not including granny flats) with individual land titles, separate tanks will be provided for each dwelling. Low density dwellings include duplex, triplex or terrace style dwellings but not townhouse developments.</p>
<p>7.5 Flotation</p>	<p><i>Replace 1st sentence with:</i></p> <p>Empty collection tanks shall be designed to prevent floatation with a safety factor of at least 1.5.</p> <p><i>Add at the end of clause:</i></p> <p>This may be achieved with a concrete ballast. Concrete anchor ballast must extend minimum 180mm above the base of tank, or as per manufacturer's specifications (whichever is higher) to achieve the safety factor.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>7.6 Covers and Frames</p>	<p><i>In 1st paragraph replace 150mm with 300mm.</i></p> <p><i>Replace 2nd paragraph with:</i></p> <p>Collection tanks shall not be in flood prone areas, overland drainage paths or in areas which are prone to local flooding.</p> <p>Provide ventilation (through the lid) so that sewage can fill to the top of the tank and empty without causing pressure build-up or suction in the tank. The tank lid shall be orientated to ensure the vent is located on the low side of any slope to prevent water from entering the tank. If not possible, the supplied tank vent shall be sealed and a new vent point shall be positioned near the top of the tank sidewall with a vent pipe routed to the building wall and up to a vent point above the existing roofline, in accordance with AS3500.</p>
<p>7.8 Grinder Pump (Renamed Clause)</p>	<p><i>Rename this clause as Grinder Pump and replace clause with:</i></p> <p>7.8 Grinder Pump</p> <p>7.8.1 General</p> <p>As pump unit wear is partially related to the operating pressure of the pump unit, the maximum design head for each pump shall be no more than 75% of the manufacturers' recommended maximum normal operating pressure under dry weather. No pump shall operate for more than 15min continuously or 30min total in any one day.</p> <p>Chemicals in industrial/trade waste may adversely affect the rubber stators in the pumps causing premature failure. When determining an appropriate pump for properties with potential industrial/trade waste, the Designer will need to consider the impact of this waste on the pump.</p> <p>7.8.2 Identification</p> <p>Pump identification will be in accordance with Sydney Water requirements:</p> <p>Each property serviced by Sydney Water-owned pressure sewerage infrastructure shall be assigned with a unique serial number issued by Sydney Water. A label with this serial number shall be installed on the front cover or side of the control panel. The serial number shall also be recorded in the property installation information and Work-As-Constructed drawings.</p>

Code References	Amendments to WSA 07-2007 V1.1
<h2 style="text-align: center;">8. Service Connection Pipe Work</h2>	
<p>8.1 Property Discharge Line</p>	<p><i>Replace the word '(Optional)' in the first sentence with '(fitted with pressure relief mechanism)'.</i></p> <p><i>Add at the end of the clause:</i></p> <p>The maximum distance of property discharge line from the tank to the property boundary assembly shall be 100m.</p> <p>The property discharge line shall not cross on to any adjacent property or collect the discharge from any other property. Exceptions will be allowed where the property discharge line crosses a common area (owned jointly by properties served) such as townhouse developments.</p> <p>The boundary assembly shall not be installed in trafficable areas and must be 1m minimum away from trafficable areas.</p> <p>Property boundary assembly shall be within 600mm to 1000mm from side and front boundaries. For battle-axe lots, it must be close to the street.</p> <p>Live connections of property discharge lines required after system commissioning shall be undertaken by appropriately qualified personnel in accordance with Sydney Water's Procedure Pressure Sewerage Systems-Connections and Extensions.</p>
<p>8.2 Laterals</p>	<p><i>Add at the end of the clause:</i></p> <p>Pressure sewer laterals shall only be directly connected to pressure sewers that are less than or equal to DN160. Where connection to a pressure sewer greater than DN160 is necessary, a separate smaller reticulation pressure sewer main (rider main) will be required to reduce the need to shut off a large main if maintenance is required on laterals or boundary assembly.</p> <p>Laterals crossing a retaining wall shall be protected by a carrier pipe.</p>
<p>A3 Required Flow Velocities</p>	<p><i>Replace "S is the grade of the pipe in %" with "S is the grade of the pipe in m/m".</i></p>

Code References	Amendments to WSA 07-2007 V1.1
<h2 style="margin: 0;">Appendix B Specific Water Agency Requirements</h2>	
<p>B1.1 Easements</p>	<p><i>Replace this clause with the following:</i></p> <p>For Sydney Water works, easements shall be obtained in accordance with requirements set out in:</p> <ul style="list-style-type: none"> a) Asset Creation Developer Process b) Instructions to Water Service Co-ordinators (Major Works) c) Easement/Land Operational Guidelines available at www.sydneywater.com.au
<p>B1.2 Vacant Lots</p>	<p><i>Delete. Not used.</i></p>
<p>Appendix E (new Appendix)</p>	<p><i>Add Appendix E - Flow Estimation after Appendix D.</i></p>

Part 2: Products and Materials

Code References	Amendments to WSA 07-2007 V1.1
<h3>10. Products and Materials Overview</h3>	
<p>10.1 Purpose</p>	<p><i>Insert at the end of clause:</i></p> <p>Only those products listed in Sydney Water's EPS-500 - Engineering Product Specification for Standard Pipes and Fittings for Networks and Sydney Water's EPS-501 - List of Approved Non-Standard Products for Networks suitable for use with the pressure sewer systems equipment shall be used.</p> <p>Sydney Water will advise if specific pumps, control units or tanks are to be used for any specific project.</p>
<p>10.3.3 Constructor</p>	<p><i>Replace this clause with:</i></p> <p>Contractors shall use only products that are nominated in the Design and Sydney Water's EPS-500 -Engineering Product Specification for Standard Pipes and Fittings for Networks and Sydney Water's EPS-501 - List of Approved Non-Standard Products for Networks.</p>
<p>10.7.2 Polyethylene (PE) pipes and fittings</p>	<p><i>Delete the 4th paragraph.</i></p>
<p>10.7.3 Pipeline Identification</p>	<p><i>Replace this clause including Table 10.2 with:</i></p> <p>PE pipes shall have cream stripes and comply with AS4130. PE fittings shall be black PE100 electrofusion fittings complying with WSA PS-208 or fabricated fittings suitable for butt welding complying with WSA PS-208.</p> <p>Mechanical fittings are only to be used for connection of property boundary assemblies and shall be PE100 complying with WSA PS-208.</p>

Part 3: Construction

Code References	Amendments to WSA 07-2007 V1.1
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13. General Construction

13.7 Alteration of Existing Services

Replace this clause with:

13.7.1 Location of Services

Details of services shown on the Contract Drawings are not to be taken as indicating all existing services or exact locations. Verify the exact location of all services which may be affected by construction activities, and positively locate in the field all services impacted by excavation works prior to commencing.

Notify the owner of any services that may be affected by construction activities in accordance with the notification requirements of the service owner. Adhere to any work and reporting requirements the service owner instructs on.

13.7.2 Protection and Maintenance of Services

Protect and maintain existing services to the satisfaction of the service owner including, if necessary, relocation, temporary diversion or support of the service.

The clearance requirements of the proposed pipeline to existing services are as specified in clause 3.12.4 of WSA 07.

13.7.3 Repair of Services

If a service is damaged during excavation work, arrange or perform repairs to the satisfaction of the service owner.

14. Product and Materials

14.2 Authorised Product and Materials

Replace this clause with:

Only those products listed on Sydney Water's EPS-500- Engineering Product Specification for Standard Pipes and Fittings for Networks and EPS-501 - List of Approved Non-Standard Products for Networks suitable for use with pressure sewer systems can be used.

16. Excavation

16.2 Limits of Excavation

Insert at the end of clause:

Minimum trench widths and depths shall be in accordance with Standard Drawing PSS-1000-V.

Code References	Amendments to WSA 07-2007 V1.1
	Where required, the Contractor must make an allowance for the widening of the trench at PE pipe weld locations and for concrete encasement.
<p>16.9 Surplus Excavated Materials</p>	<p><i>Insert at the end of clause:</i></p> <p>Surplus material and excess spoil must be stockpiled, tested, classified (in accordance with Schedule 1 of the Protection of Environment Operations Act 1997 (POEO Act)) and disposed of in accordance with the waste classification requirements.</p>
<h2 style="text-align: center;">17. Bedding for Pipes and Collection Tanks</h2>	
<p>17.3 Placement of Bedding</p>	<p><i>Insert after the 2nd paragraph:</i></p> <p>Keep all dewatering systems operating during backfilling so that no fill material is placed or compacted under water. At all times ensure that the pipes are not damaged or moved during placement and compaction of fill.</p> <p>Where the pipe is supported on concrete or is concrete encased, do not place overlay material until the concrete has attained its initial set and a minimum of 24 hours after pouring.</p> <p><i>Replace reference drawing with:</i></p> <p>Reference: Standard Drawing PSS-1000-V</p>
<h2 style="text-align: center;">18. System Installation and Jointing</h2>	
<p>18.1 General</p>	<p><i>Add at the end of the clause:</i></p> <p>The use of compression fittings shall be kept to a minimum, and only to be used for on-property works following consultation with the Designer and approval by Sydney Water. Permissible locations for these fittings are where the pipe connects to the collection tank and either side of the property boundary assembly. The pressure rating of the fittings shall be PN16 as a minimum, or to match the class of the associated pipework.</p>
<p>18.2.1 Live Connections to Pressure Sewer Systems - New Clause</p>	<p><i>Add new sub-clause 18.2.1 to Clause 18.2:</i></p> <p>18.2.1 Live Connections to Pressure Sewer Systems</p> <p>Connections to live sewers should not take place unless approved by Sydney Water.</p> <p>All tapplings shall be clean with no damage occurring to the surrounding structures.</p> <p>To connect into existing main, wet tapping via branch saddle with an offtake size min DN40 shall be used. The branch saddle shall be an electrofusion</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>polyethylene fitting with a Tee connection to the side of the main (90 degree bends or connections to the top of main are not acceptable). An isolating valve shall also be located on the branch line at no more than 400mm from the Tee connection.</p> <p>All electrofusion weld shall be pressure tested prior to tapping into the pipe. For property discharge lines, installation must be complete prior to pressure testing. This includes the installation of the collection tank, the property discharge line, the boundary assembly and the connection to the reticulation line (without the tapping). Only after the pressure testing has passed, can the final tapping into the reticulation pipe proceed.</p> <p>Tapping of the main will be undertaken by drilling through the open bore of the isolation valve using an appropriate tapping machine/tool ensuring that there is no discharge from the receiving pipe. Ensure a clean hole is made through the receiving pipe to form the connection and there is no damage to the receiving pipe.</p> <p>Where branch saddle for DN50 is not available, the main shall be cut in with an electrofusion tee with an offtake size min DN40. Alternatively, if main cannot be isolated, squeeze-off method as per WSA07 and WSA01 is acceptable.</p>
<p>18.3 PE Welding Pre-Qualification</p>	<p><i>Add to start of clause:</i></p> <p>All welding shall be undertaken by trained and certified welders in accordance with WSA 01-2004 clause 5.2 and the manufacturer's welding requirements and recommendations. Training courses shall be Plastic Industry Pipe Association (PIPA) approved. Test welds shall be conducted at the commencement of the works and at frequent intervals throughout the works for both electrofusion welding and butt welding to confirm both weld procedures and personnel.</p> <p>If the PE pipe is to be pulled through HDD bores, electrofusion welding will only be permitted if it can be demonstrated that deformations of the pipe are within the allowable range for electrofusion welding.</p>
<p>18.4 Open Trench Installation</p>	<p><i>Replace the 3rd paragraph with:</i></p> <p>Where curvature of the pipe is to be achieved by cold bending, cold bend the pipe with a uniform radius along the length of the pipe in accordance with manufacturer's instructions. Do not exceed bending radii specified in the Plastics Industry Association of Australia Limited POP202 – 'PVC, PP, and PE Pipe Installation on Curved Alignments'. Under no circumstances is the curvature of a pipe to be more than 25 times the outside diameter of the pipe.</p> <p>90-degree bends shall be accomplished by installing two 45-degree bends with a separation of 300 mm, or by installing a long radius bend. Minimum ground cover shall be in accordance with Standard Drawing PSS-1000-V.</p>

Code References	Amendments to WSA 07-2007 V1.1
<p>18.6 Jointing</p>	<p><i>Replace this entire clause with:</i></p> <p>18.6.1 Electrofusion and Butt Fusion Jointing Methods All installation of PE pipe fittings and jointing shall be undertaken in accordance with AS/NZS 4129 Fittings for PE Pipes for Pressure Applications, and the manufacturer’s requirements. PE pipes are to be joined by electrofusion techniques or flanged connections.</p> <p>Sydney Water allows butt-welding of pipes for diameter greater than DN90 by persons with the appropriate qualifications, equipment and experience.</p> <p>Electrofusion jointing shall be undertaken in accordance with the Plastics Industry Pipe Association of Australia Limited document (POP001) 'Electrofusion jointing of PE pipe and fittings for pressure applications'.</p> <p>Butt fusion jointing shall be undertaken in accordance with the Plastics Industry Pipe Association of Australia Limited's document 'Butt Fusion jointing of PE pipes and fittings - Recommended Parameters' in addition to AS 2033.</p> <p>The weld test requirements of WSAA Polyethylene Pipeline Code WSA 01-2004 for butt and electrofusion welding are to be strictly enforced, including destructive testing.</p> <p>18.6.2 Compression Fittings</p> <p>The use of compression fittings shall only be allowed for connection of pipework at the property boundary assembly as shown in Standard Drawing PSS-1102-V.</p> <p>The pressure rating of the fittings shall be PN 16 as a minimum, or to match the class of the associated pipework. The fittings shall be installed and tightened to the manufacturers’ recommendations.</p>
<p>18.9.1 Collection/Pump Units</p>	<p><i>Add at the end of clause:</i></p> <p>Prior to pouring of the concrete ballast, the tank will be filled with water to the level recommended by the manufacturer to ensure floatation of the tank does not occur.</p> <p>The tank lid shall be orientated to ensure the vent is located on the low side of any slope.</p> <p>If such installation cannot be avoided, the supplied tank vent shall be sealed and a new vent point shall be positioned near the top of the tank sidewall with a vent pipe routed to the building wall and up to a vent point above the existing roofline, in accordance with AS3500.</p> <p>The tank must not be dropped or rolled at any point during the shipping, unloading, storing, or installation process.</p> <p>The tank material is sensitive to ultraviolet radiation and must therefore be protected from sunlight during storage and after installation. The tanks shall</p>

Code References	Amendments to WSA 07-2007 V1.1
	<p>be covered during storage and only be stored in sunlight for short durations. Only the lids should be exposed after installation.</p>
<p>18.9.3 Property Discharge Lines</p>	<p><i>Insert the following new items after item (c):</i></p> <p>(d) Property discharge lines are to be one continuous pipe between the property boundary assembly and the collection tank with no pipe joints between these points.</p>
<p>18.10 Pipeline Tracer Wires and Detectable Marking Tapes</p>	<p><i>Add at the end of clause:</i></p> <p>Prior to placement of trench fill detectable marking tape is to be placed over the embedment material.</p> <p>Pipelines installed by open trench excavation shall use Sydney Water approved detectable marking tape with a 316 stainless steel tracer wire in accordance with WSA PS-318.</p> <p>Bare wires from the tape are to be connected by a 316 SS ‘U Clamp’ to the next available termination feature. Splicing of two ends of tracer wire by hand twisting alone, or “twitching,” shall not be acceptable under any circumstances. Termination points for the tracer wire shall be located at in-line fittings and features such as isolation valves, air valves, flushing points, pressure sewer pumping unit, the property boundary assembly, etc and shall be readily accessible at these points such as to allow energising of the trace wire for location purposes. Different tracer tapes are required for pipelines with different uses.</p>
<p>18.15 Location Markers</p>	<p><i>Add at the end of clause:</i></p> <p>Location markers are also required where pressure sewer pipes are installed at varying offsets or in locations that may make it difficult to locate the pipes in the future. Location markers are required at changes of direction, valves, fittings and at max. 200m centres.</p>

Code References | Amendments to WSA 07-2007 V1.1

19. Pipe Embedment and Support

19.2 Embedment Materials

Replace item (b)

(b) Comply with the Purchase Specifications (WSA PS 350 and WSA PS 351) for pipe embedment materials as nominated in the Design Drawings or Specifications.

In Table 19.1 replace the line:

≤100	10
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with

≤63	7
>63 to <100	10

Code References	Amendments to WSA 07-2007 V1.1
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21. Inspection and Acceptance Testing

<p style="color: #003366;">21.4.2 System test pressure</p>	<p><i>Add at end of clause:</i></p> <p>Test the reticulation and property service lines to the manual isolation valve (property boundary assembly) to a pressure of 1600 kPa, and from the wastewater collection tank to the manual isolation valve at a pressure of 1000kPa.</p> <p>The details of the system test procedure including the system test pressure and the specific sections to be isolated to allow progressive testing of the system shall be detailed in the Commissioning Plan and the design drawing.</p>
<p style="color: #003366;">21.7 Collection/Pump Units</p>	<p><i>Add at the end of clause:</i></p> <p>Testing and commissioning of the pumping unit shall be in accordance with the following:</p> <ul style="list-style-type: none"> a) Any commissioning instructions from the manufacturer b) Sydney Water’s PSS commissioning operation checklist <p>The manufacturers may have their own requirements before they will formally certify the pump is commissioned, and any installer will need to make themselves aware of these requirements before commissioning commences.</p> <p>Where the installation of the control panel and pump is undertaken separately from the collection tank, then commissioning of the pump and control unit shall be done separately.</p> <p>All operational tests are to be conducted using potable or recycled water with the pressure sewer pumping unit only being connected to the sewer system after these tests have been successfully carried out. The tests required for the on-property testing are to include, but are not be limited to:</p> <ul style="list-style-type: none"> a) Liquid leakage Test b) Simulated Power Failure Test c) A time-based operational test to confirm pump performance including maximum pump run time limit d) Liquid levels test (on, off and alarm) e) A Pump Protection Test (e.g. over pressure protection test) f) Visual Inspection <p>Quality Assurance records shall be prepared and submitted to Sydney Water prior to asset handover. An electrical and plumbing Certificate of Compliance is required for each individual pump installation.</p>

Code References	Amendments to WSA 07-2007 V1.1																				
<p>21.9 Electrical/Control System – New Clause</p>	<p><i>Insert new clause after clause 21.8:</i></p> <p>21.9 Electrical/ Control System</p> <p>The following tests shall be carried out to ensure correct installation and proper functionality of the electrical/control system.</p> <table border="1" data-bbox="488 501 1481 1263"> <thead> <tr> <th data-bbox="488 501 833 573">Test Items</th> <th data-bbox="833 501 1168 573">Method</th> <th data-bbox="1168 501 1481 573">Acceptance Criteria</th> </tr> </thead> <tbody> <tr> <td data-bbox="488 573 833 730">Conduits and cables installed in accordance with AS 3000</td> <td data-bbox="833 573 1168 730">Inspect by licensed electrician</td> <td data-bbox="1168 573 1481 730">AS 3000</td> </tr> <tr> <td data-bbox="488 730 833 887">Terminations tight and as per connection diagrams</td> <td data-bbox="833 730 1168 887">Inspection and Test</td> <td data-bbox="1168 730 1481 887"></td> </tr> <tr> <td data-bbox="488 887 833 999">Insulation Resistance Supply Cable</td> <td data-bbox="833 887 1168 999">500 V Test</td> <td data-bbox="1168 887 1481 999">>2 Meg ohms</td> </tr> <tr> <td data-bbox="488 999 833 1111">Insulation Resistance Motor Cable</td> <td data-bbox="833 999 1168 1111">500 V Test</td> <td data-bbox="1168 999 1481 1111">>2 Meg ohms</td> </tr> <tr> <td data-bbox="488 1111 833 1263">Confirm voltage at Pump connection point under load conditions</td> <td data-bbox="833 1111 1168 1263">Voltmeter on Simulation Box</td> <td data-bbox="1168 1111 1481 1263">216-264 Volts</td> </tr> </tbody> </table>			Test Items	Method	Acceptance Criteria	Conduits and cables installed in accordance with AS 3000	Inspect by licensed electrician	AS 3000	Terminations tight and as per connection diagrams	Inspection and Test		Insulation Resistance Supply Cable	500 V Test	>2 Meg ohms	Insulation Resistance Motor Cable	500 V Test	>2 Meg ohms	Confirm voltage at Pump connection point under load conditions	Voltmeter on Simulation Box	216-264 Volts
Test Items	Method	Acceptance Criteria																			
Conduits and cables installed in accordance with AS 3000	Inspect by licensed electrician	AS 3000																			
Terminations tight and as per connection diagrams	Inspection and Test																				
Insulation Resistance Supply Cable	500 V Test	>2 Meg ohms																			
Insulation Resistance Motor Cable	500 V Test	>2 Meg ohms																			
Confirm voltage at Pump connection point under load conditions	Voltmeter on Simulation Box	216-264 Volts																			

Code References	Amendments to WSA 07-2007 V1.1
<h2 style="text-align: center;">24. Asset Documentation and Work As Constructed Details</h2>	
<p>24.1 Asset Documentation</p>	<p><i>Add at the beginning of clause:</i></p> <p>Documentation (drawings, specifications and supporting documentation) shall be sufficient to enable guarantee of the design.</p>
<p>24.2 Work As Constructed Details</p>	<p><i>Add at the end of the clause:</i></p> <p>Where pipelines are installed by directional drilling, the contractor shall supply copies of the borehole profiles recorded by the drilling rigs. The borehole profiles shall form part of the as-constructed information, recording depths along the main. For property discharge lines and small diameter reticulation mains this information is not required.</p> <p>If the drilling rig is not equipped with a system for producing these profiles the contractor shall take depth readings to the “sonde” at a maximum of 20m intervals and include the depths and chainages on the as-constructed information.</p>

Part 4: Standard Drawings

Code References		Amendments to WSA 07-2007 V1.1	
26. Listing of Standard Drawings			
<i>Replace list of drawings with:</i>			
Drawing Number	Activity	Title	
PRESSURE SEWERAGE NETWORK			
PSS-1000-V	Embedment and Trench Fill	Typical Arrangement	
PSS-1001-V	Special Embedments	Concrete and Cement Stabilised Systems	
PSS-1002-V	Buried Crossings	Major Roadways	
PSS-1003-V	Buried Crossings	Under Obstructions	
PSS-1004-V	Buried Crossings	Railways	
PSS-1005-V	Typical Valve Installation	Isolation Valve Details	
PSS-1006-V	Not Used		
PSS-1007-V	Typical Appurtenances	Flushing Point	
PSS-1050-S	Marking Systems	Indicator Plates for Locating Appurtenances	
ON-PROPERTY COMPONENTS			
PSS-1100-V	Design Layout	Typical Locality and Site Plan	
PSS-1101-V	On-Property Layout	Typical Arrangement and Sanitary Drainage Detail	
PSS-1102-V	Property Boundary Assembly	Typical Installation	
PSS-1150-S	Typical Residential On-Lot Infrastructure	Layout Plan	
PSS-1151-S	Typical Residential On-Lot Infrastructure	Sloping Lots - Tank in Front of Property	
PSS-1152-S	Typical Residential On-Lot Infrastructure	Sloping Lots - Tank in Rear of Property	
PSS-1153-S	Typical Residential On-Lot Infrastructure	Reduced Area Lots	
PSS-1154-S	Property Sewerage Servicing	Non-Residential and Non-Standard Residential General Arrangement	
PSS-1155-S	Property Sewerage Servicing	Super Lot Connection Detail	
PSS-1156-S	Control Panel Support Post	Typical Installation	
PIPELINE LAYOUT			
WAT-1102-V	Typical Mains Construction	Reticulation Main Arrangements	
WAT-1106-V	Property Services	Single Service Main to Meter	
WAT-1108-V	Not Used for PSS		
EMBEDMENT / TRENCHFILL AND RESTRAINTS			
WAT-1200	Soil Classification Guidelines	Allowable Bearing Pressures for Anchors and Thrust Blocks	
WAT-1205	Thrust Block Details	Concrete Blocks	
WAT-1207-V	Thrust and Anchor Blocks	Gate Valves and Vertical Bends	
WAT-1208-V	Restrained Joint System	DN 100 to DN 375 DI Mains	
WAT-1209	Trench Drainage	Bulkheads and Trenchstop	

Code References		Amendments to WSA 07-2007 V1.1	
WAT-1210	Trench Drainage	Typical Systems	
INSTALLATION PRACTICES / STRUCTURE			
WAT-1307-V	Typical Appurtenance Installation	Scour Arrangements	
WAT-1312	Aerial Crossings	Bridge Crossing Concepts	
FABRICATION DETAILS			
WAT-1409	Hydrant Installation Fittings	PE Assemblies	
HYDRAULIC DESIGN			
SPS-1608-S	Hydraulic Design	Pipe Absolute Roughness Versus Mean Velocity Chart	

Ownership

Role	Title
Author	Pressure System Solutions - Craig Kennedy, Wayne Kennedy
Controller	Nana Keong (Senior Engineer, ETS)
Owner	Norbert Schaeper (Manager Engineering, ETS)

Change history

Version No.	Prepared by	Date	Approved by	Issue date
1	Craig Kennedy, Wayne Kennedy (Pressure Sewer Solutions)	18/05/2021	Norbert Schaeper (Manager Engineering, ETS)	18/05/2021
2	Nana Keong	30/06/2021	Norbert Schaeper (Manager Engineering, ETS)	30/06/2021

Appendices

Attachment	Title
Appendix E	Flow Estimation

Appendix E - Flow Estimation

Residential Dwellings

	Residential Development Type						
	Single Dwelling	Single Dwelling plus Granny Flat in a single lot	Duplex/Triplex Dwellings	Terrace lots	Townhouse Development	Unit Development Medium Density	Unit Development High Density
Estimate of Sanitary Flows - ADWF (L/d) @ 150L/EP/day	3.5 EP/lot	5 EP/lot	3 EP/dwelling unit	3 EP/dwelling unit	3 EP/dwelling unit	3 EP/dwelling unit	2.5 EP/dwelling
Residential Flow Curve (Appropriate residential flow pattern to be adopted)							
Wet Weather Flow Contribution	Refer Clause 4.4.2 of Sydney Water's Supplement to WSA-07						
Swimming Pool/ Swim Spas							
Backwash	Assumed to be included in sanitary flows estimation	Not applicable due to size constraints	Not applicable due to size constraints	Not Applicable	Not Applicable	Assumed to be included in sanitary flows estimation	
Discharge pump down	Included in general wet weather allowance						An additional flow equivalent to 0.5 l/s shall be added to the collection tank during wet weather
Typical Collection Tank Type	Standard Single Tank	Standard Duplex Tank (1 pump)	Standard Single Tank per Dwelling	Standard Single Tank per Dwelling	Development specific design	Development specific design	Development specific design
Storage Size (based on ADWF)	Min 24 hours of Emergency Storage						
Pump Performance ¹	Standard Pump	Standard Pump	Standard Pump	Standard Pump	Generally based on SWC version of WSA-04. Two Standard Pumps minimum	Generally based on SWC version of WSA-04. Two Standard Pumps minimum	Generally based on SWC version of WSA-04. Two Standard Pumps minimum
Operating Volume ²	Designer to determine (nominally 100 L)	Designer to determine (nominally 100 L)	Designer to determine (nominally 100 L)	Designer to determine (nominally 100 L)	Based on minimising volume and limiting pump starts	Based on minimising volume and limiting pump starts	Based on minimising volume and limiting pump starts

Notes:

- Standard pumps to be identified as part of a assessment/procurement process.
- Control volume between pump start and stop

Non-Residential Dwellings

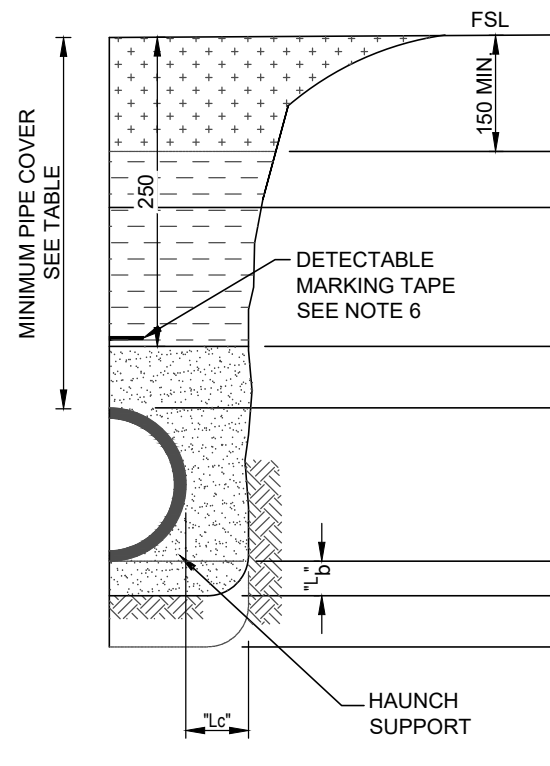
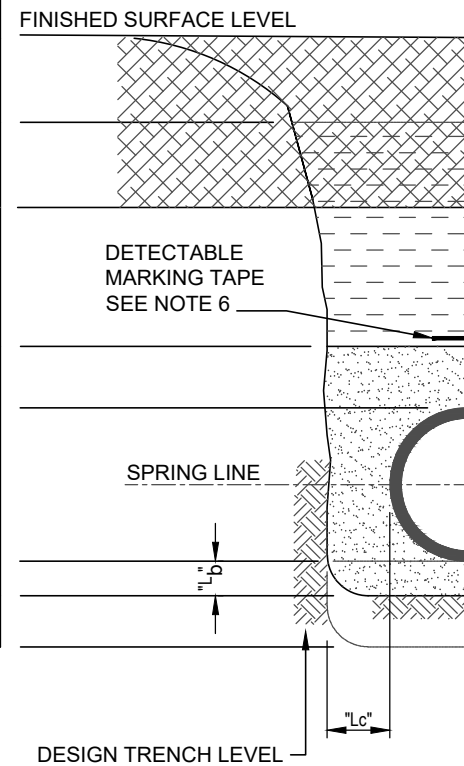
	Non-Residential Development Type									
	Commercial	High Density Commercial	Schools	Educational Institutions	Clubs	Hospitals and Nursing Homes	Mixed Commercial/Residential	Light Industrial	Heavy Industrial	Recreational Areas
Estimate of Sanitary Flows - ADWF (L/d) @150L/EP/day	75 EP/Gha	300-800 EP/ Gha	0.2 EP/student	0.2 EP/student	0.25 EP/max occupants	3.4 EP/bed	Use combined Commercial and Residential	30-50 EP/ Gha	150 EP/Gha	20 EP/ha
Commercial Flow Curve	Commercial Flow Curve	Commercial Flow Curve	Commercial Flow Curve	Commercial Flow Curve	Commercial Flow Curve	Hospital Flow Curve	Residential or Commercial Flow Curve, depending on which is dominant	Industrial Curve	Industrial Curve	Commercial or Industrial Flow Curve (dependent on type of reserve)
Appropriate commercial flow pattern to be adopted based on usage (eg restaurant/cafe/office) and allowable densities	Appropriate commercial flow pattern to be adopted based on usage (eg restaurant/cafe/office) and allowable densities	Appropriate commercial flow pattern to be adopted based on usage (eg restaurant/cafe/office) and allowable densities	Appropriate commercial flow pattern to be adopted	Appropriate commercial flow pattern to be adopted	Appropriate commercial flow pattern to be adopted	Appropriate hospital flow pattern to be adopted	Appropriate residential or commercial flow pattern to be adopted, depending on which is dominant	Appropriate industrial flow pattern to be adopted	Appropriate industrial flow pattern to be adopted	Appropriate commercial or industrial flow patterns to be adopted based on proposed facilities
Wet Weather Flow Contribution	Refer Clause 4.4.2 of Sydney Water's Supplement to WSA-07									
Typical Collection Tank Type	Development specific design									
Storage Size (based on ADWF)	Min 24 hours of Emergency Storage									
Operating Volume	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	Based on SWC version of WSA-04	For relatively small facilities (eg flows less than 1000 L/day adopt duplex units, otherwise a specific design is required)
Pump Performance	Pumps to be semi positive displacement pumps or equivalent flow/head characteristics									

Notes:

- Privately owned units will be required to have monitoring capability so that SWC can remotely access data on agreed basis.

MATERIAL		ZONE
ROAD SURFACE	VERGE & TRACK	
ROAD SURFACE LAYER	TO MATCH EXISTING	SURFACE COURSE
TO MATCH EXISTING ROAD BASE	TO COMPLY WITH WSA 07	ROAD BASE
TO COMPLY WITH WSA 07		
EMBEDMENT MATERIAL OR COMPACTION SAND SEE NOTES 6 & 7		OVERLAY
		SIDE SUPPORT
		BEDDING
		OVER - EXCAVATION

VEHICULAR LOADING



ZONE	MATERIAL
TOP SOIL OR FOOTWAY SURFACE	ORIGINAL MATERIAL OR IMPORTED MATERIAL OF EQUIVALENT QUALITY
TRENCH FILL	TO COMPLY WITH WSA 07
OVERLAY	SEE NOTES 6 & 7
SIDE SUPPORT	
BEDDING	
OVER - EXCAVATION	

NON-VEHICULAR LOADING

(INCLUDES LOCATIONS WHERE OCCASIONAL VEHICLES LOADINGS OCCUR eg. FOOTWAYS)

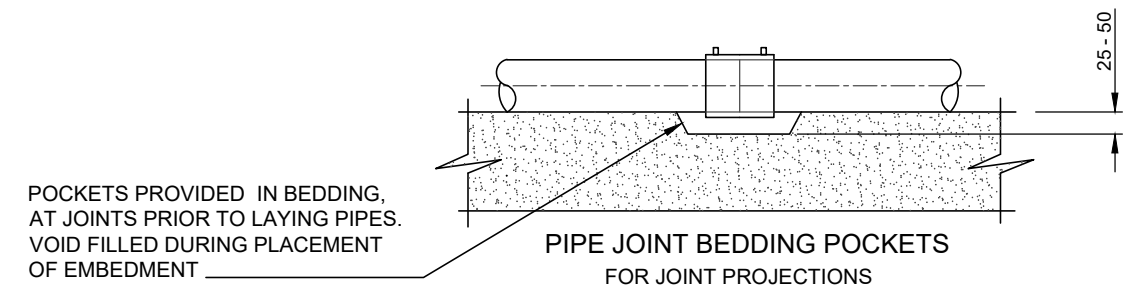
NOTES:

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
- BEDDING DESIGNER TO SPECIFY SPECIAL BEDDING TO SUIT CONDITIONS IF TRENCH FLOOR HAS:
 - IRREGULAR OUTCROPS OF ROCK.
 - ALLOWABLE BEARING PRESSURE OF <50kPa, (SEE SEW-1200) OR
 - BEEN DISTURBED BY UNCONTROLLED GROUND WATER.
- KEEP SIDES OF EXCAVATION VERTICAL TO AT LEAST 150 ABOVE PIPE.
- FOR PRIVATE PROPERTY MINIMUM COVER MAY BE REDUCED TO 300 WITH MECHANICAL PROTECTION WHEN IN ROCK.
- ALTERNATE TRENCHING TECHNIQUES E.G. NARROW TRENCHING USING "DITCHWITCH" TYPE EXCAVATORS SHALL BE SUBMITTED TO WATER AGENCY FOR CONSIDERATION AND ACCEPTANCE. PROPOSALS SHOULD ADDRESS THE METHOD OF COMPACTION OF THE EMBEDMENT SUPPORT ZONE.
- MATERIAL AND PRODUCT TO BE IN ACCORDANCE WITH SYDNEY WATERS EPS500 ACCEPTABLE PRODUCT SPECIFICATIONS. DETECTABLE MARKING TAPE WITH SS316 TRACER WIRE MIN 150mm ABOVE TOP OF PIPE.
- MAXIMUM AGGREGATE SIZE 7mm.

MINIMUM PIPE COVER	
LOCATION	MINIMUM COVER
PRIVATE PROPERTY	450
NON-VEHICULAR LOADING	SEE NOTE 4
PRIVATE PROPERTY VEHICULAR LOADING FOOTWAYS, PUBLIC PROPERTY, SEALED ROADS	600 SEE NOTE 4
MAJOR ROADWAYS/ EMBANKMENTS AND SEALED ROADS	750
FREEWAYS, STATE & NATIONAL HIGHWAYS	1200

SPRING LINE TRENCH CLEARANCE		
NOMINAL SIZE (DN)	MINIMUM CLEARANCE "Lc" TO AS/NZS 2566.1	"Lb"
≤75	60	75
>75, ≤110	70	75
>110, ≤140	100	75
>140, ≤315	150	100
≥315	200	100

TRENCH WIDTH TO BE SUFFICIENT TO SAFELY LAY PIPE AND COMPACT SIDE SUPPORT ZONE (SEE NOTE 5)



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WITH ACKNOWLEDGMENT TO



APPROVED
NORBERT SCHAEFER
MANAGER, ENGINEERING

PREPARED BY
ENGINEERING &
TECHNICAL SUPPORT

A	ORIGINAL ISSUE	NS	16/04/21
LETTER	DETAILS OF VERSION / AMENDMENT	APP'D	DATE

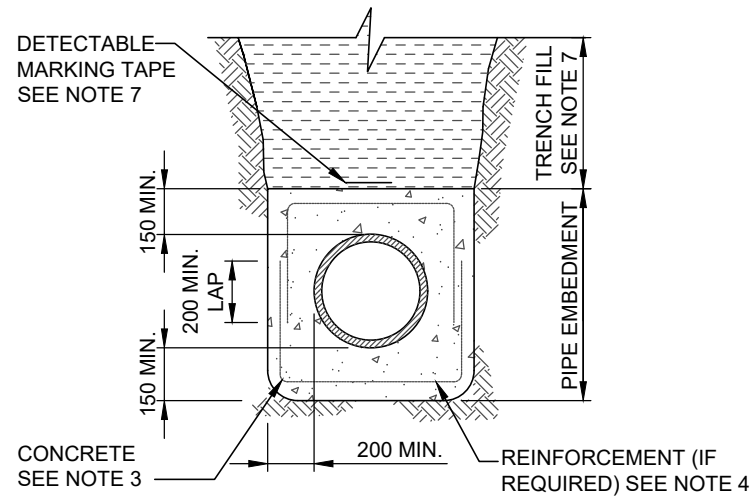
PRESSURE SEWERAGE CODE WSA 07

**EMBEDMENT AND TRENCH FILL
TYPICAL ARRANGEMENT**

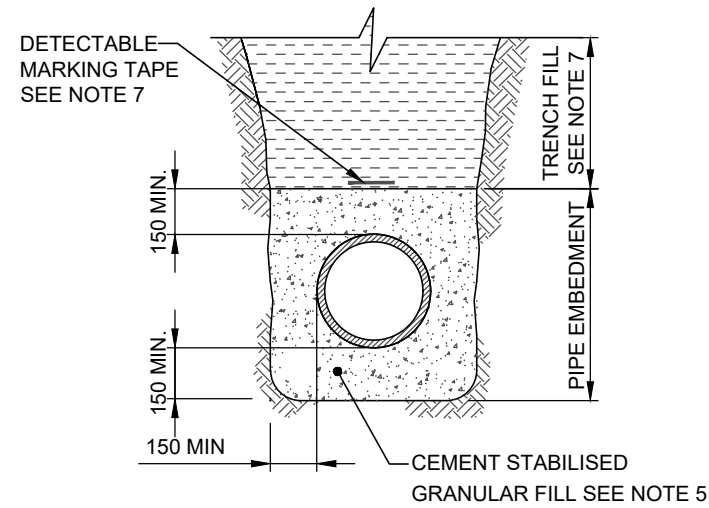
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PSS-1000-V

ISSUE: A	DATE: 16/04/2021
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TYPICAL SECTION
CONCRETE ENCASED

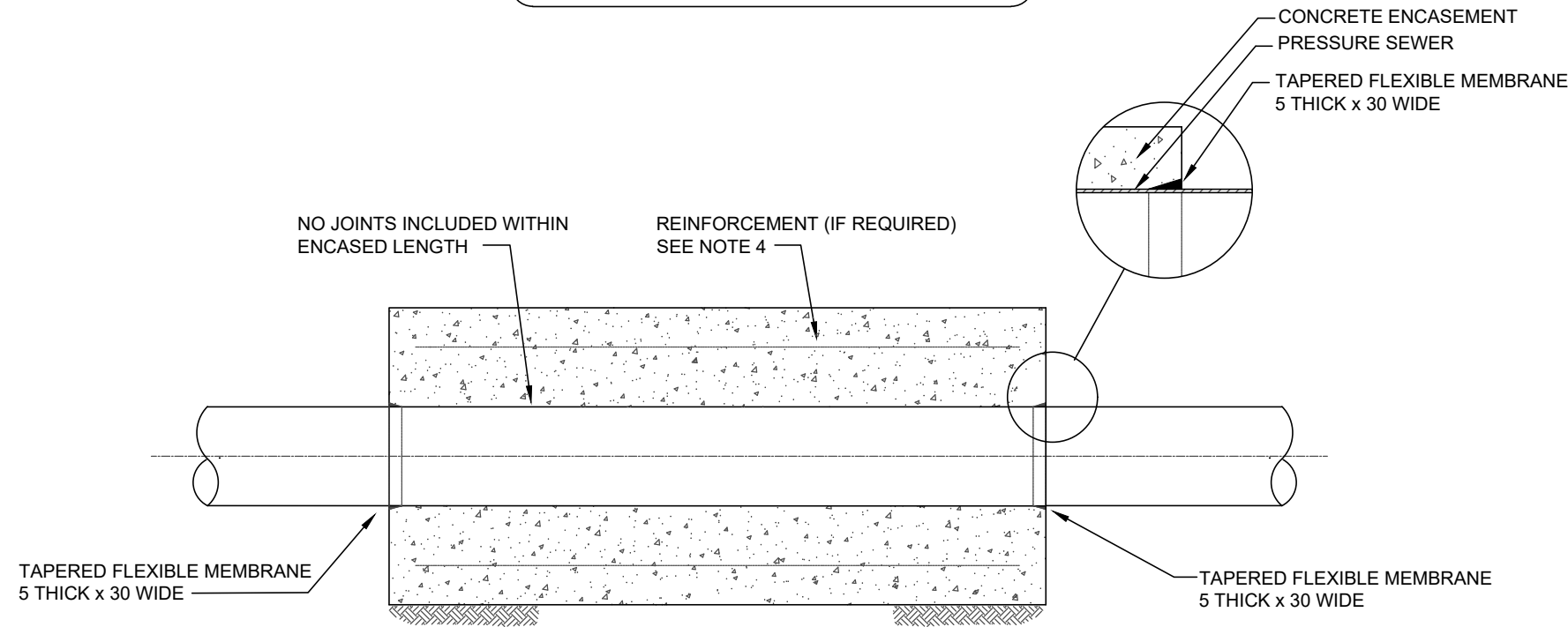


TYPICAL SECTION
CEMENT STABILISED EMBEDMENT

NOTES:

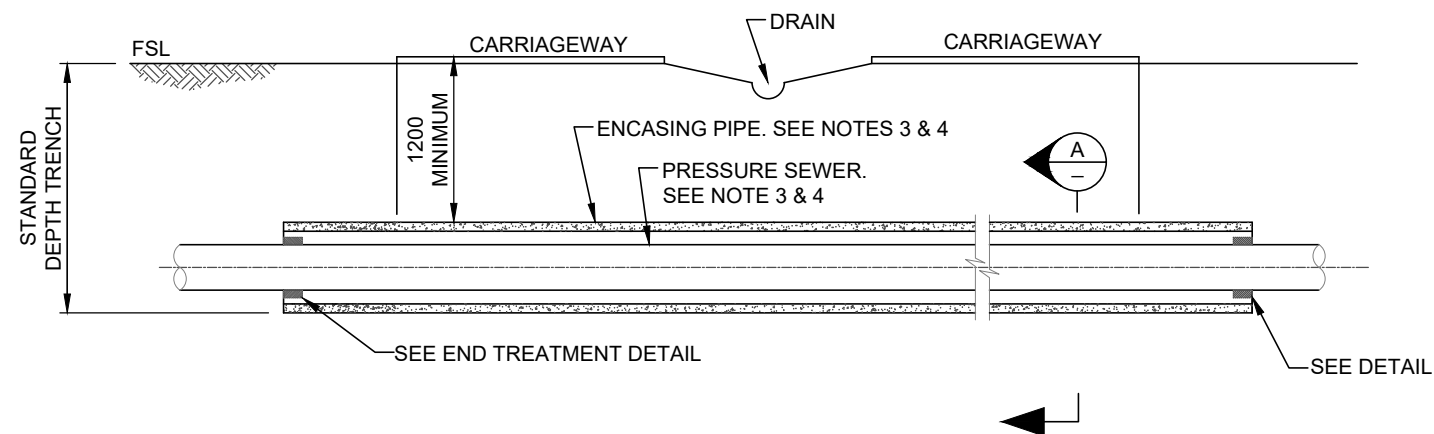
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. DESIGNER TO SPECIFY EMBEDMENT TYPE.
3. UNREINFORCED CONCRETE TO BE CLASS N20 AND REINFORCED CONCRETE TO BE N25. FOR AGGRESSIVE CONDITIONS, USE SPECIAL CLASS CONCRETE.
4. CENTRALLY PLACE STEEL REINFORCEMENT OF 0.4 % OF CONCRETE CROSS SECTION AND WITH MINIMUM COVER OF 65 TO EXTERNAL FACE. SPECIFY REINFORCEMENT FOR APPLICABLE LOADING IN DESIGN DRAWINGS.
5. CEMENT STABILISED GRANULAR FILL TO HAVE MINIMUM 5 % CEMENT (BY VOLUME). PLACE DRY.
6. RESTRAIN PIPES DURING ENCASEMENT TO PREVENT MOVEMENT AND/OR FLOTATION.
7. MATERIAL AND PRODUCT TO BE IN ACCORDANCE WITH SYDNEY WATERS EPS 500 ACCEPTABLE PRODUCT SPECIFICATIONS.

EMBEDMENT TYPES TO BE SPECIFIED IN DESIGN DRAWINGS



CONCRETE ENCASEMENT SYSTEM

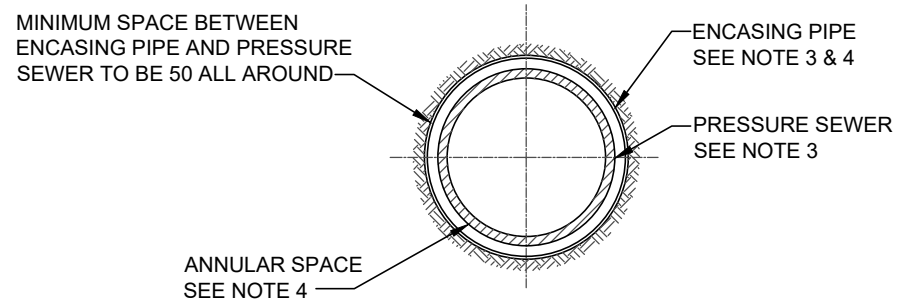
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		<p>PREPARED BY</p> <p>ENGINEERING & TECHNICAL SUPPORT</p>	<p>SPECIAL EMBEDMENTS CONCRETE AND CEMENT STABILISED SYSTEMS</p>				<p>PSS-1001-V</p>	
		<p>A ORIGINAL ISSUE NS 16/04/21</p>	<p>LETTER DETAILS OF VERSION / AMENDMENT APP'D DATE</p>			<p>ISSUE: A</p>	<p>DATE: 16/04/2021</p>	



BORED OR JACKED ENCASING PIPE METHOD

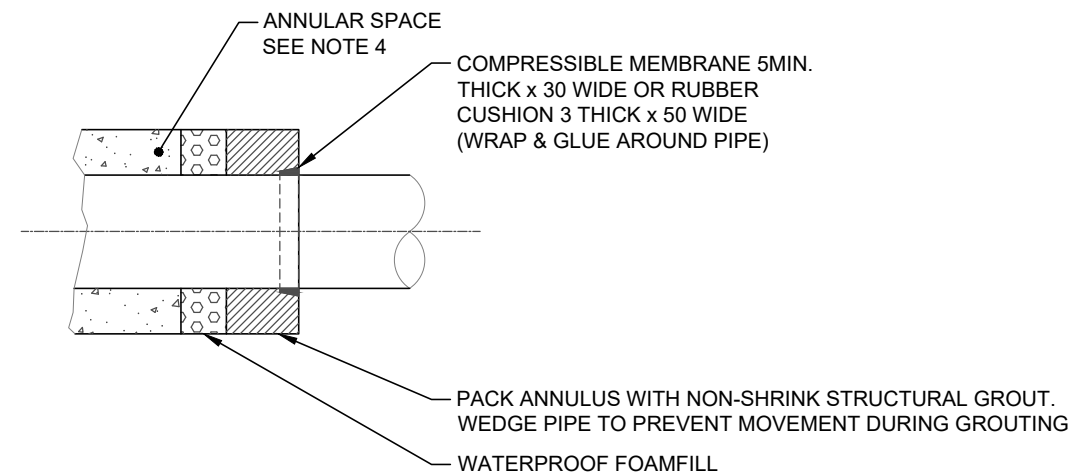
NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. ADOPT METHODS OF INSTALLATION, AS SHOWN, FOR ALL STATE ROADS, MAIN THOROUGHFARES AND OTHER ROADS WHERE REQUIRED BY THE WATER AGENCY. PROVIDE MINIMUM COVER OF 1200 UNDER FINISHED ROAD LEVEL.
3. BORED ENCASING PIPE METHOD.
HORIZONTAL BORING
 ENCASING PIPE
 - REINFORCED CONCRETE CLASS 4 BUTT JOINTED WITH STEEL LOCATING BANDS, STEEL, GRP OR BUTT WELDED PIPE.
 PRESSURE SEWER
 - POLYETHYLENE PE 100 TO WSA PS-207S.
4. ANNULAR SPACE (SPACE BETWEEN BOREHOLE & SLEEVE (IF SLEEVED) OR BETWEEN BOREHOLE & CARRIER PIPE (IF NOT SLEEVED) AND GROUTING REQUIREMENTS:
 - a. GROUTING BETWEEN SLEEVE & CARRIER PIPE IS GENERALLY NOT REQUIRED. WHERE REQUIRED, INSTALL PLASTIC SPACERS AT 1000mm MAX SPACING, BETWEEN THE PRESSURE SEWER MAIN & ENCASING PIPE.
 - b. IT IS PREFERRED THE OVERCUT DIAMETER DOES NOT EXCEED 30mm.
 - c. WHEN ANNULUS EXCEEDS THIS LIMIT, GROUT THE ANNULUS (I.E USE A FLOWABLE GROUT, E.G. LIQUAFILL OR BENTONITE OR EQUIVALENT).
 - d. GROUTING SHOULD COMMENCE AS SOON AS POSSIBLE AFTER PIPE INSTALLATION (TO PREVENT MATERIAL COLLAPSING INTO THE ANNULUS).
 - e. ENSURE GROUTING PRESSURES DO NOT EXCEED THE BUCKLING CAPABILITY OF THE SLEEVE/PIPE WHEN EMPTY.
5. INSTALL AIR RELIEF AND ISOLATION VALVES WHERE SHOWN IN DESIGN DRAWINGS.



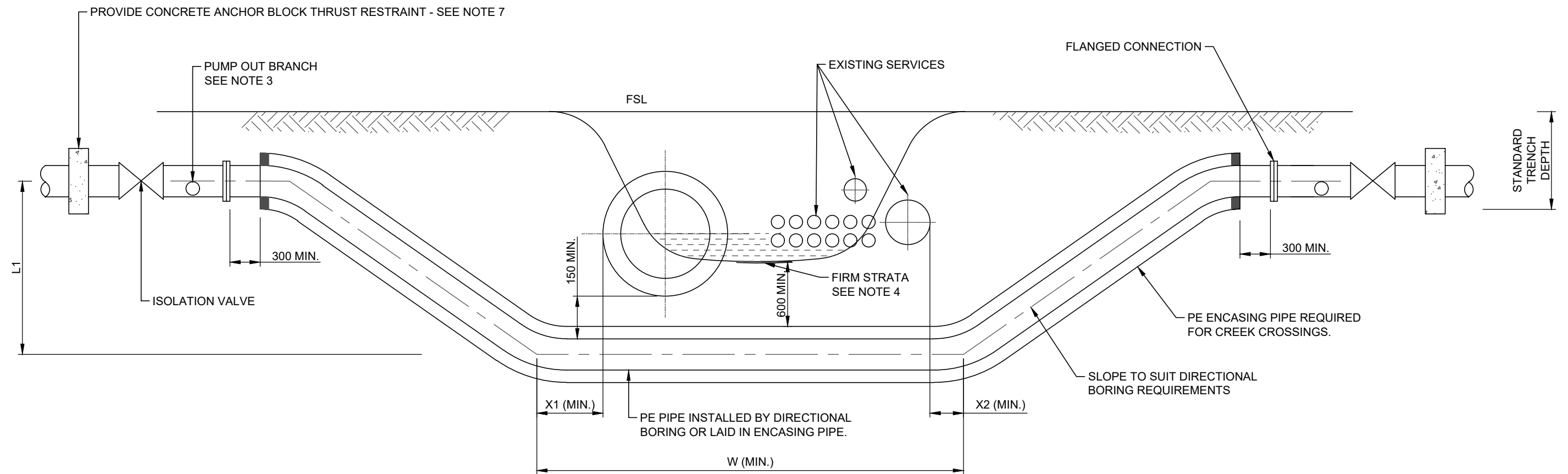
TYPICAL SECTION

BORED ENCASING PIPE & SEWER

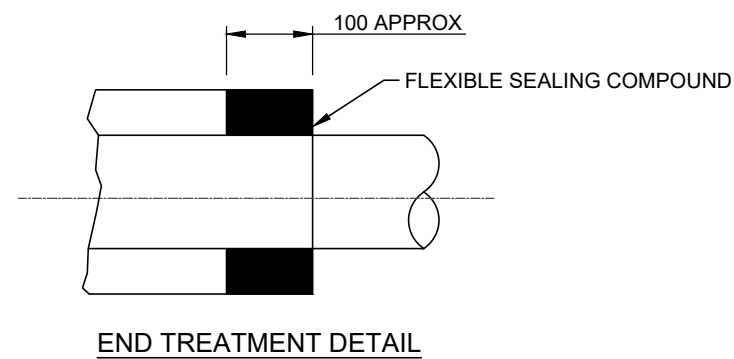


END TREATMENT DETAIL

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		<p>PREPARED BY</p> <p>ENGINEERING & TECHNICAL SUPPORT</p>	<p>BURIED CROSSING MAJOR ROADWAYS</p>				<p>PSS-1002-V</p>	
		<p>A ORIGINAL ISSUE NS 16/04/21</p>	<p>LETTER DETAILS OF VERSION / AMENDMENT APP'D DATE</p>			<p>ISSUE: A</p>	<p>DATE: 16/04/2021</p>	

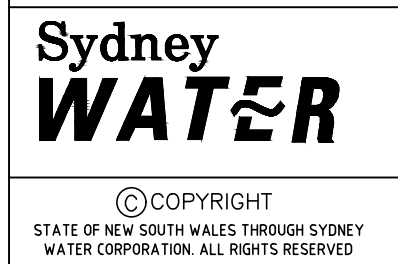


TYPICAL CREEK, STORMWATER/CULVERT AND BURIED SERVICES CROSSING USING TRENCHLESS TECHNOLOGY



NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. DIMENSIONS L1, W, X1, X2, TO BE AS SHOWN IN DESIGN DRAWINGS.
3. WHERE REQUIRED, PROVIDE SCOUR OR PUMP-OUT BRANCH AS DETAILED IN DESIGN DRAWINGS.
4. FOR SIGNIFICANT WATERWAYS AND THOSE SUBJECT TO DREDGING OR NAVIGATION, INCREASE COVER BASED ON CONSULTATION WITH WATERWAYS AUTHORITY.
5. NO JOINTS PERMITTED IN PIPE SECTION UNDER THE OBSTRUCTION WITHOUT WATER AGENCY APPROVAL.
6. INSTALL AIR RELIEF AND ISOLATION VALVES IN ACCORDANCE WITH DESIGN DRAWINGS.
7. PROVIDE THRUST RESTRAINTS WHERE PIPEWORK IS CONNECTED TO RRJ PIPEWORK (SEE WAT-1205).



WITH ACKNOWLEDGMENT TO

WATER SERVICES
ASSOCIATION
of Australia

APPROVED
NORBERT SCHAEFER
MANAGER, ENGINEERING

PREPARED BY
ENGINEERING &
TECHNICAL SUPPORT

LETTER	DETAILS OF VERSION / AMENDMENT	APP'D	DATE
A	ORIGINAL ISSUE	NS	16/04/21

PRESSURE SEWERAGE CODE WSA 07

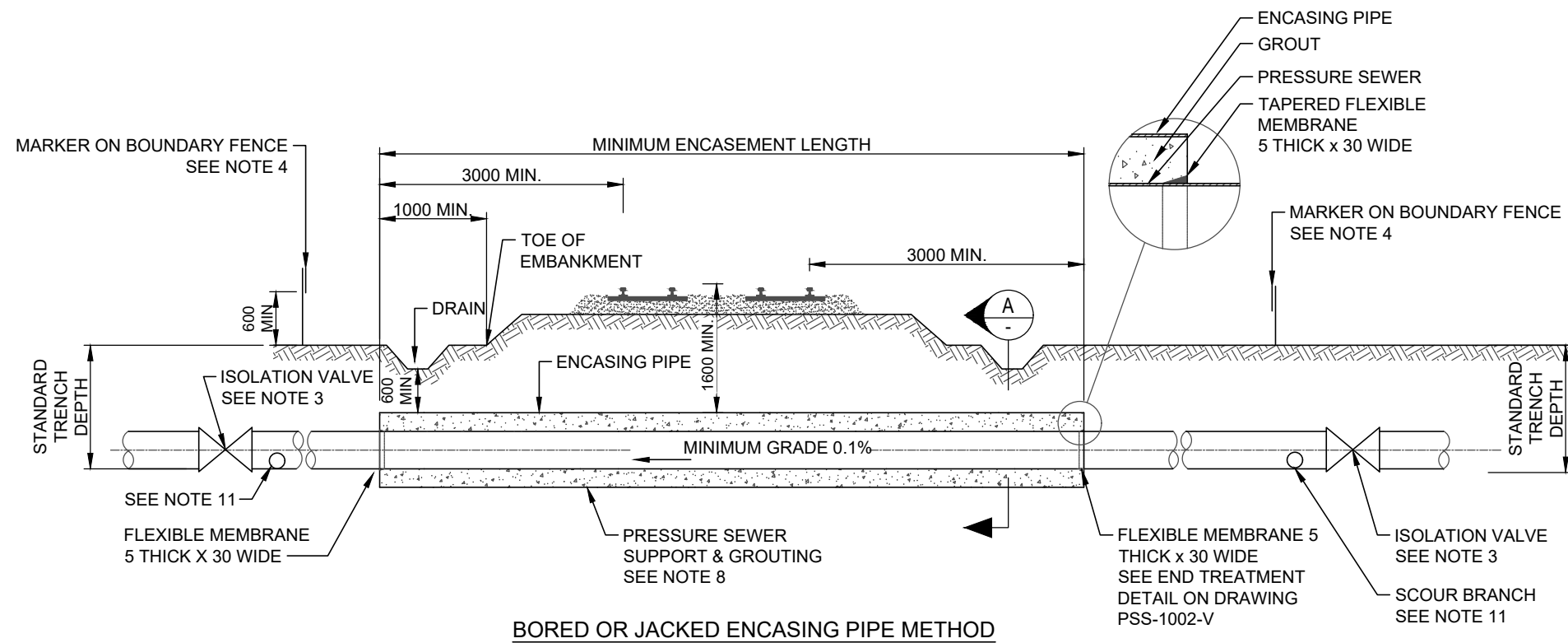
**BURIED CROSSING
UNDER OBSTRUCTIONS**

NOT TO SCALE

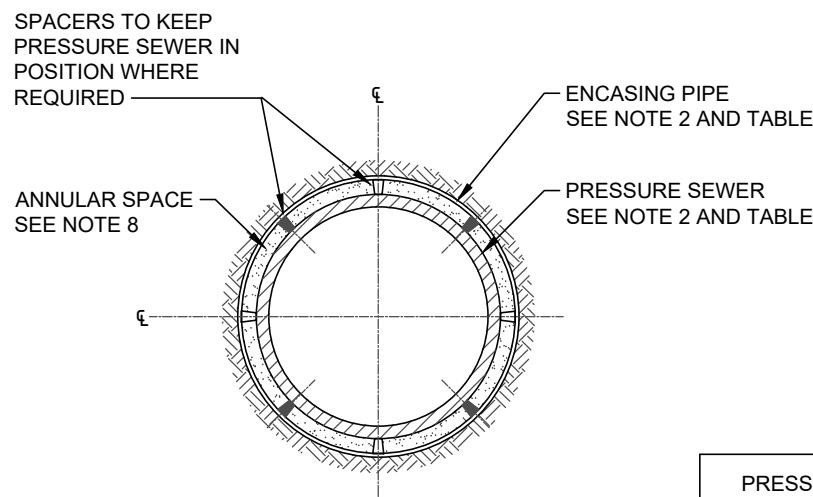
PSS-1003-V

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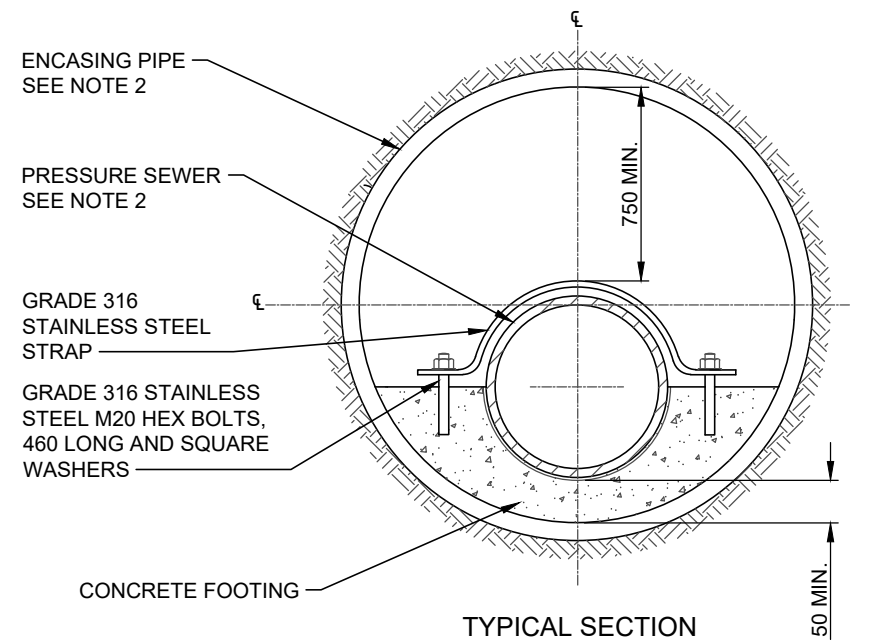


BORED OR JACKED ENCASING PIPE METHOD



TYPICAL SECTION (A)
BORED ENCASING PIPE & PRESSURE SEWER
(PREFERRED INSTALLATION METHOD)

PRESSURE SEWER (DN)	≤ 110	140	200	250	315
BORED ENCASING PIPE (DN) MIN	300	375	375	450	525
JACKED ENCASING PIPE (DN)	1200 MIN SEE NOTE 9				



TYPICAL SECTION
JACKED ENCASING PIPE & PRESSURE SEWER

NOTES:

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
- BORED OR JACKED ENCASING PIPE METHOD.
HORIZONTAL BORING.
ENCASING PIPE
 - REINFORCED CONCRETE CLASS 4 BUTT JOINTED WITH STEEL LOCATING BAND, GRP, AS APPROVED BY RAILWAY OWNER.
 PRESSURE SEWER
 - PE100 WITHOUT JOINTS TO WSA PS-207S JACKING.
 ENCASING PIPE
 - REINFORCED CONCRETE CLASS 4 BUTT JOINTED WITH STEEL LOCATING BAND OR GRP, AS APPROVED BY RAILWAY OWNER.
 PRESSURE SEWER
 - PE100 WITHOUT JOINTS TO WSA PS-207S.
- LOCATE ISOLATION VALVES AT LEAST 6 000 FROM TOE OF EMBANKMENT OR TOP OF CUT AND AT LEAST 1000 OUTSIDE RAILWAY PROPERTY.
- PLACE MARKERS ABOVE BURIED PIPELINE AT THE POINTS WHERE IT ENTERS AND LEAVES RAILWAY PROPERTY.
- PROVIDE ADDITIONAL STRAY CURRENT PROTECTION AS DIRECTED BY RAILWAY OWNER. ELECTRICAL CONTINUITY AND INSULATION TO BE AS SPECIFIED IN DESIGN DRAWINGS.
- DESIGN TO BE IN ACCORDANCE WITH AS 4799.
- MINIMUM COVER FOR ALL PIPELINES BELOW RAILWAY LINES
 - NOT LESS THAN 1600 BELOW RAIL LEVEL;
 - NOT LESS THAN 600 BELOW FORMATION LEVEL, ie THE GROUND LEVEL IMMEDIATELY BELOW THE RAILWAY BALLAST.
- ANNULAR SPACE (SPACE BETWEEN BOREHOLE & ENCASING PIPE (IF ENCASED) OR BETWEEN BOREHOLE & CARRIER PIPE (IF NOT ENCASED) AND GROUTING REQUIREMENTS:-
 - GROUTING BETWEEN ENCASING PIPE & CARRIER PIPE IS GENERALLY NOT REQUIRED.
 - IT IS PREFERRED THE OVERCUT DIAMETER DOES NOT EXCEED 30mm.
 - WHEN ANNULUS EXCEEDS THIS LIMIT, GROUT THE ANNULUS i.e USE A FLOWABLE GROUT, eg, LIQUAFILL OR BENTONITE OR EQUIVALENT).
 - GROUTING SHOULD COMMENCE AS SOON AS POSSIBLE AFTER PIPE INSTALLATION (TO PREVENT MATERIAL COLLAPSING INTO THE ANNULUS).
 - ENSURE GROUTING PRESSURES DO NOT EXCEED THE BUCKLING CAPABILITY OF THE ENCASING PIPE/CARRIER PIPE WHEN EMPTY.
- JACKED ENCASING PIPE SIZED TO PERMIT PERSON ENTRY TO CONFINED SPACE FOR MAINTENANCE.
- ALL DETAILS SUBJECT TO ACCEPTANCE BY RAILWAY OWNER.
- PROVIDE SCOUR OR PUMP OUT BRANCH AS DETAILED ON THE DESIGN DRAWINGS. SCOURS TO BE LOCATED OUTSIDE RAIL CORRIDOR.

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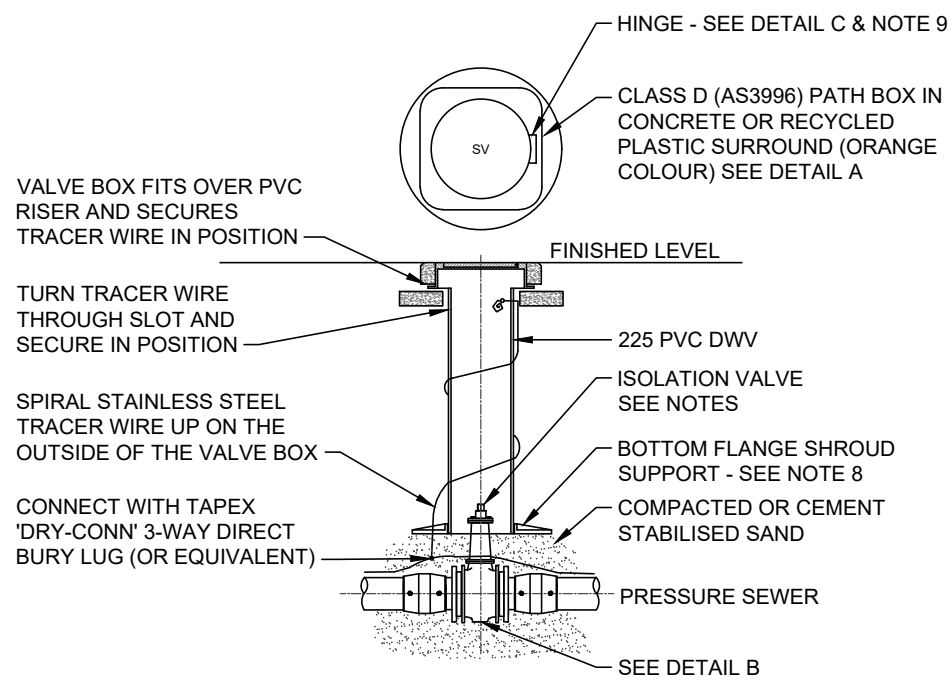
**BURIED CROSSING
RAILWAYS**

NOT TO SCALE

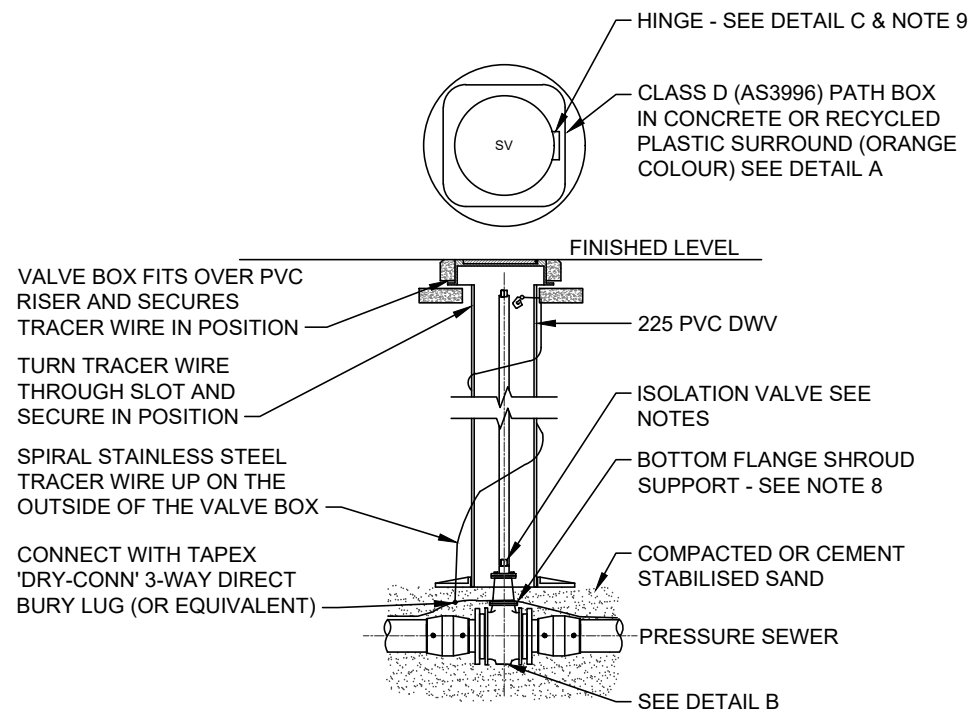
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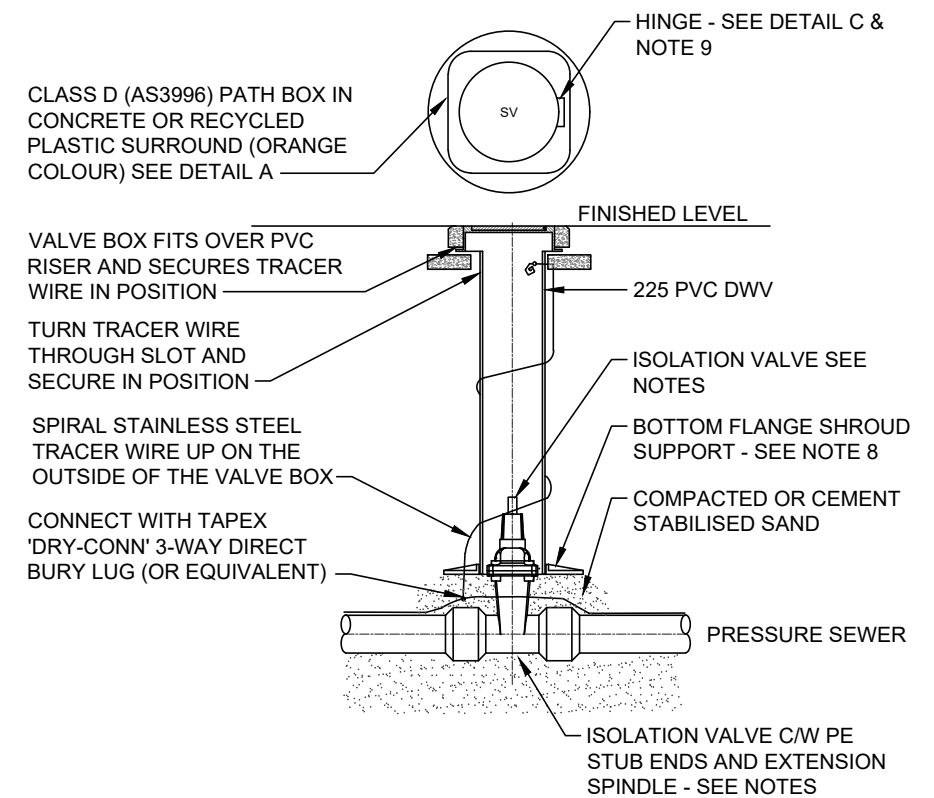
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TYPICAL BURIED ISOLATION VALVE

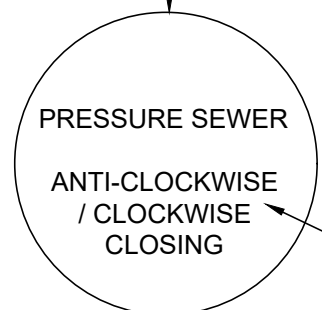


TYPICAL BURIED ISOLATION VALVE ≥ 1000mm DEEP

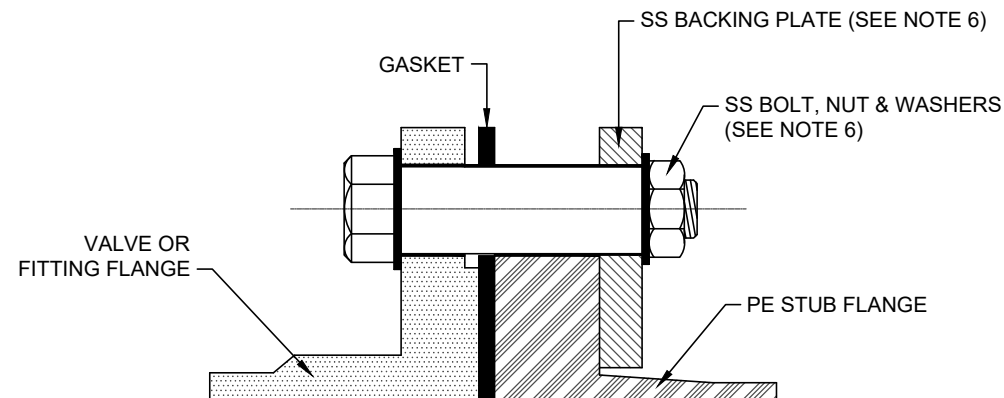


ALTERNATIVE: TYPICAL PE ENDED RESILIENT SEATED ISOLATION VALVE

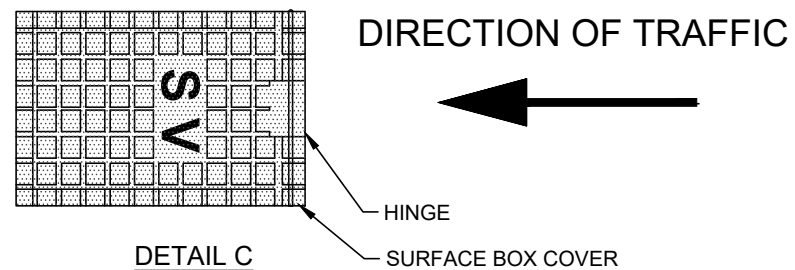
CIRCULAR CORROSION RESISTANT PLATE, (316 S/S OR TRAFFOLYTE) FIX WITH ADHESIVE (MASTIC) TO UNDERSIDE OF VALVE COVER. SIZED TO SUIT UNDERSIDE OF VALVE COVER LID.



DETAIL A - VALVE CAP NAMEPLATE



DETAIL B - PE BOLTED CONNECTION DETAIL



DETAIL C

NOTES:

- ISOLATION VALVES TO BE RESILIENT SEATED, PN16 RATED, FBE COATED AND ANTI-CLOCKWISE CLOSING.
- TO PREVENT TRANSFER OF TRAFFIC LOAD TO THE MAIN, ENSURE PVC SHROUD PIPE & SHROUD SUPPORT DO NOT COME IN CONTACT WITH VALVE FLANGES.
- INSTALL EXTENSION SPINDLE TO 50mm BELOW UNDERSIDE OF SURFACE BOX COVER WHERE DEPTH FROM SURFACE TO TOP OF VALVE SURFACE EXCEEDS 350mm.
- DEPTH OF MAIN MAY BE LOCALLY INCREASED TO ACHIEVE REQUIRED MINIMUM VALVE SPINDLE COVER.
- INSTALL PLASTIC IDENTIFICATION COVERS. PAINT TOPS OF IDENTIFICATION COVERS AND SURFACE BOX COVERS WITH ORANGE ROAD MARKING PAINT.
- ALL BACKING RINGS, NUTS, BOLTS AND WASHERS TO BE A MINIMUM GRADE 316 STAINLESS STEEL. COAT THE THREADED SECTIONS OF ALL STAINLESS STEEL BOLTS WITH AN ANTI-SEIZE LUBRICANT. ASSEMBLE VALVES AT LEAST 24 HOURS PRIOR TO IN-SITU INSTALLATION. RE-TIGHTEN AFTER IN-SITU INSTALLATION.
- GASKET MATERIAL TO COMPLY WITH AS4087 AND IN ACCORDANCE WITH WSA 109.
- PLACE 20 THICK ASPHALT PREMIX SEAL BETWEEN THE VALVE AND SHROUD.
- IN NON-TRAFFIC AREAS, HINGE COVERS TO CLOSE IN THE DIRECTION OF FALL OF THE LAND.

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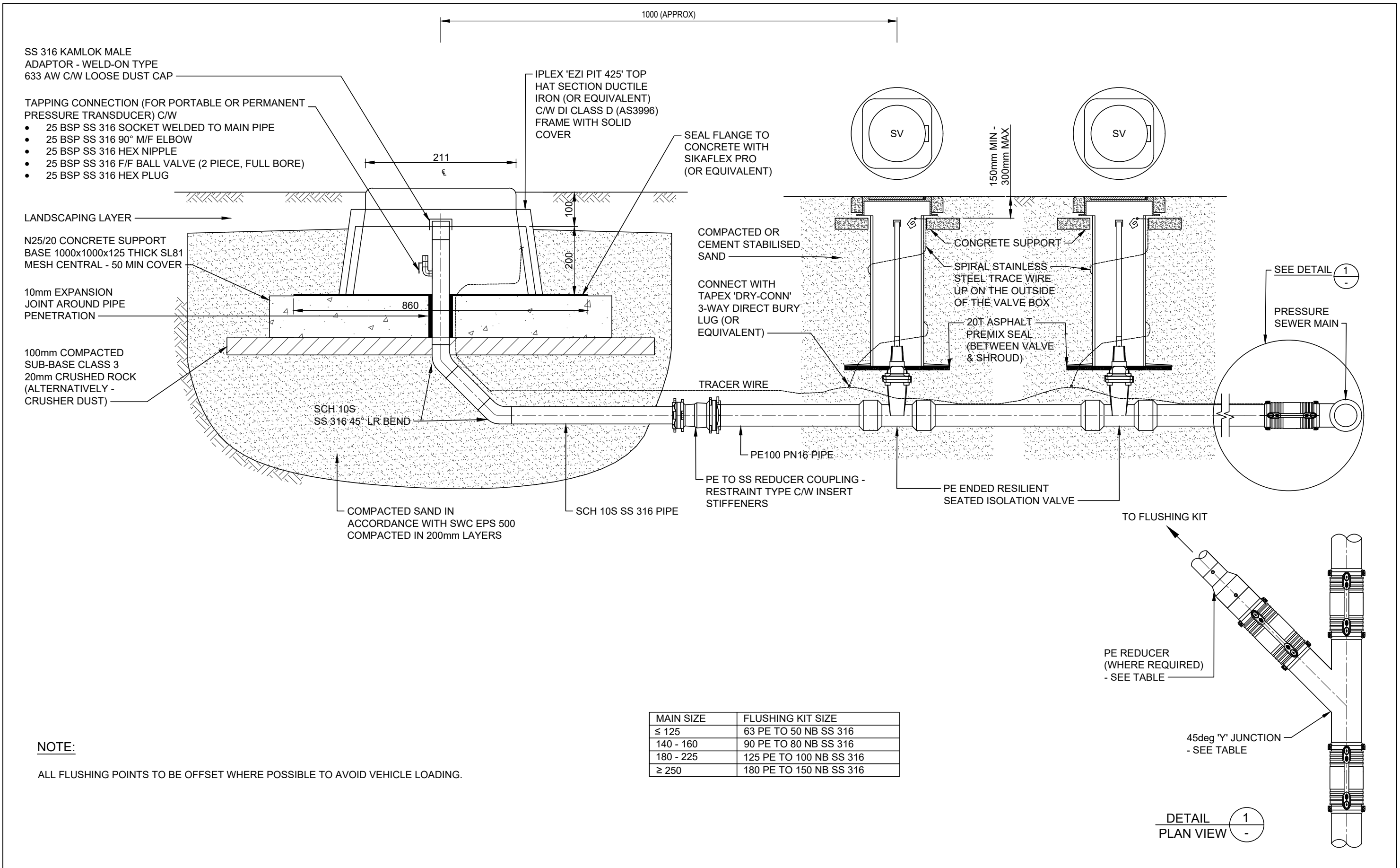
PRESSURE SEWERAGE CODE WSA 07

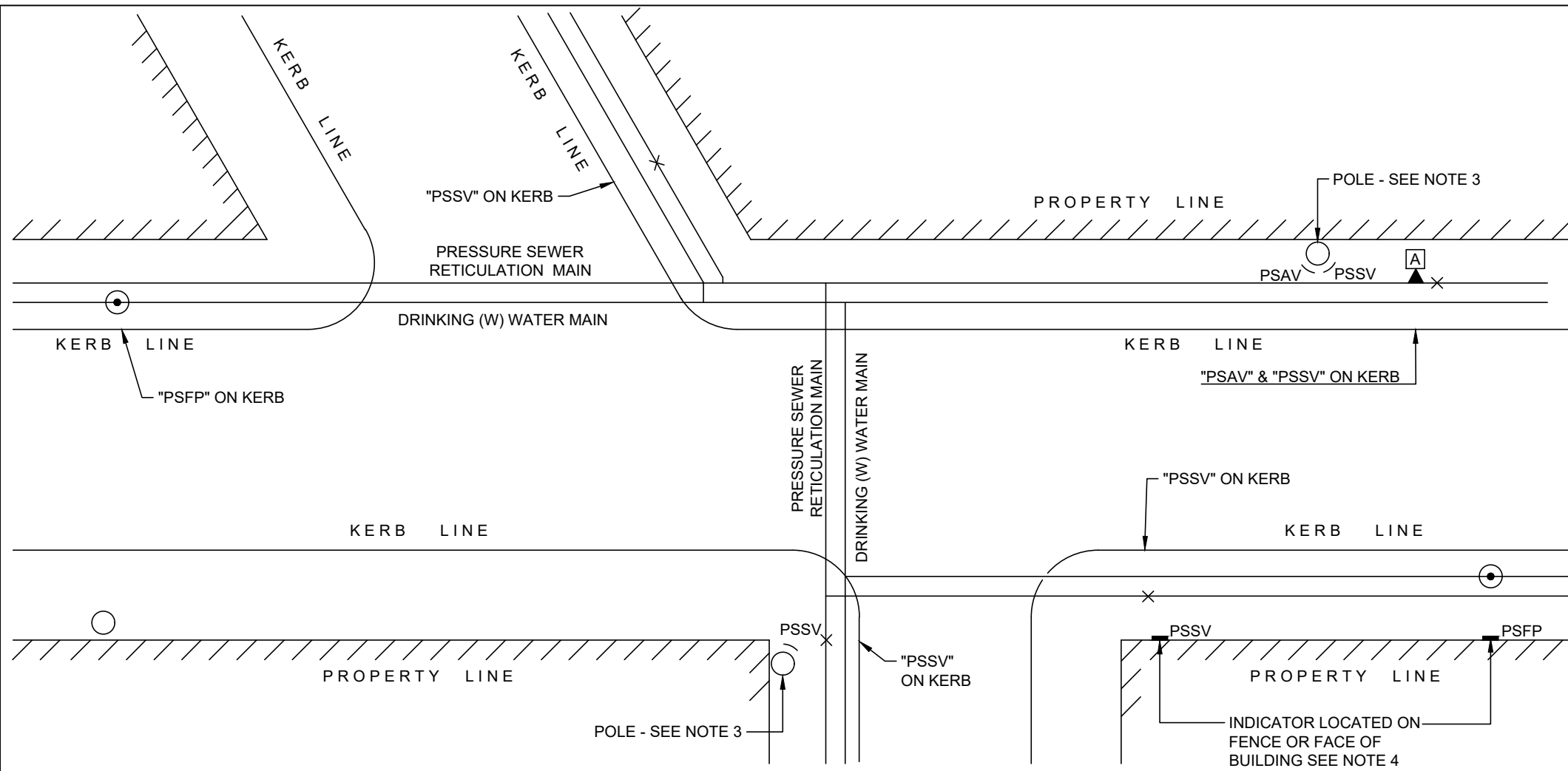
**TYPICAL VALVE INSTALLATION
ISOLATION VALVE DETAILS**

NOT TO SCALE

PSS-1005-V

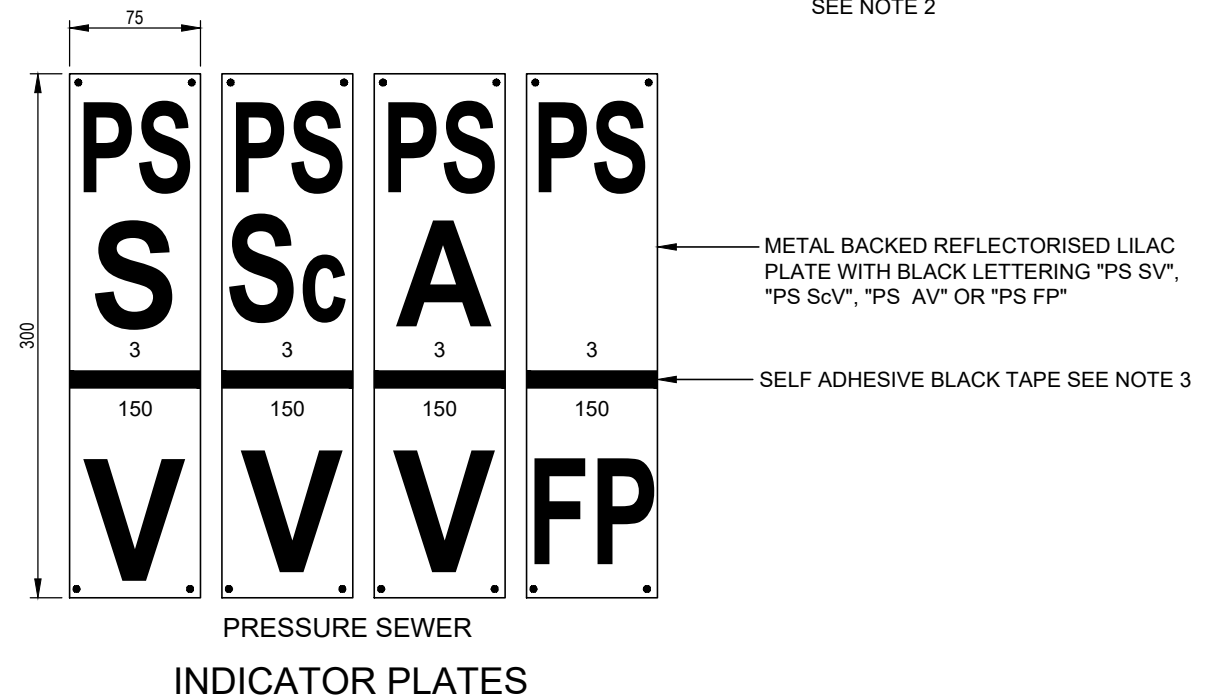
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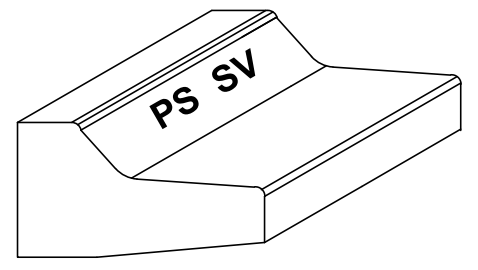


TYPICAL POSITIONING OF INDICATOR PLATES

SEE NOTE 2



PRESSURE SEWER INDICATOR PLATES



KERB MARKING SEE NOTE 5

MARKINGS IN AREAS WITH KERBS

SEE NOTE 5

NOTES

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
- THE PROCEDURES DETAILED APPLY TO INDICATOR PLATES FOR STOP VALVES, SCOUR VALVES, AIR VALVES AND FLUSHING POINTS.
- MARKING OF SURFACE FITTINGS IN AREAS WITH POLES:
PLACE INDICATOR PLATE SUCH THAT IT FACES DIRECTION OF THE APPURTENANCE.

PRIMARY INDICATORS.
PUNCH PRIMARY INDICATOR PLATES WITH TWO SETS OF NUMBERS. TOP NUMBER TO GIVE DISTANCE IN METRES FROM PLATE TO APPURTENANCE AND THE BOTTOM NUMBER TO GIVE NOMINAL SIZE OF MAIN ON WHICH THE APPURTENANCE IS LOCATED.

APPLY SELF ADHESIVE BLACK TAPE TO PLATE BETWEEN THE TWO PUNCHED NUMBERS IF APPURTENANCE IS ON OPPOSITE SIDE OF ROAD TO PLATE. RETURN INDICATOR TAPE AROUND EDGES OF PLATE WHERE PRACTICABLE.

PLACE INDICATOR PLATES 2.1m ABOVE GROUND LEVEL. POSITION INDICATORS ABOVE RATHER THAN BELOW 2.1m IF AN OBSTACLE PREVENTS FIXING AT SPECIFIED HEIGHT. ALL INDICATORS ON ONE POLE TO BE AT ONE HEIGHT.

PUNCH PLATES ON HARD METAL SURFACE WITH 12 HIGH DIE STAMPS BEFORE PLATES ARE ATTACHED TO POLE. TAKE CARE NOT TO PUNCH STAMP THROUGH PAINTED SURFACE OF PLATE TO BARE METAL.

WHERE IT IS NOT POSSIBLE TO USE METAL PLATE INDICATORS, USE APPROVED SELF ADHESIVE INDICATORS.
- IN AREAS WHERE APPURTENANCE INDICATORS CANNOT BE PLACED ON POLES, PLACE A PRIMARY INDICATOR DIRECTLY OPPOSITE THE APPURTENANCE ON A PROPERTY BOUNDARY FENCE OR FACE OF A BUILDING ON THE PROPERTY BOUNDARY, SUBJECT TO AGREEMENT WITH THE PROPERTY OWNER AND SYDNEY WATER.
- MARKING OF SURFACE FITTINGS IN AREAS WITH KERBS.

PROVIDE KERB MARKINGS ETCHED ON THE FACE OF NEAREST KERB, DIRECTLY OPPOSITE THE APPURTENANCE. USE LETTERS AS PER INDICATOR PLATES TO INDICATE APPURTENANCE TYPE. "SV" MAY BE MARKED AS "V".

KERB MARKINGS TO BE IN LETTERS OF APPROXIMATELY 100 HIGH, NEATLY CHASED (CUT) INTO KERB AND PAINTED USING AN APPROVED ROAD MARKING PAINT. LETTER GROOVES TO BE AT LEAST 3 DEEP AND 5 WIDE. PAINTED LETTERS TO BE 80 HIGH x 80WIDE x 15 STROKE WIDTH.

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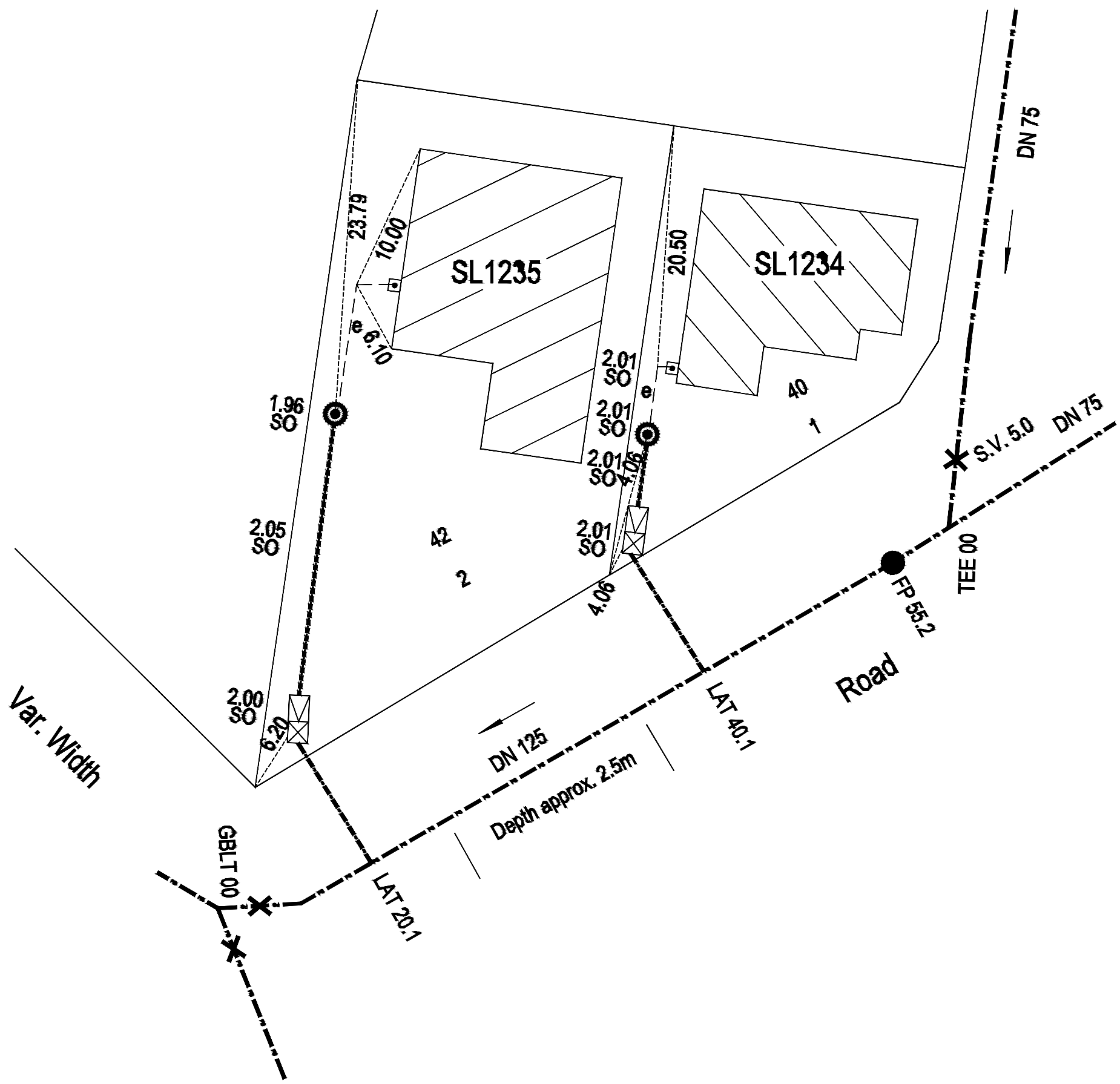
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MARKING SYSTEMS INDICATOR PLATES FOR LOCATING APPURTENANCES

NOT TO SCALE
PSS-1050-S
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NOTES:

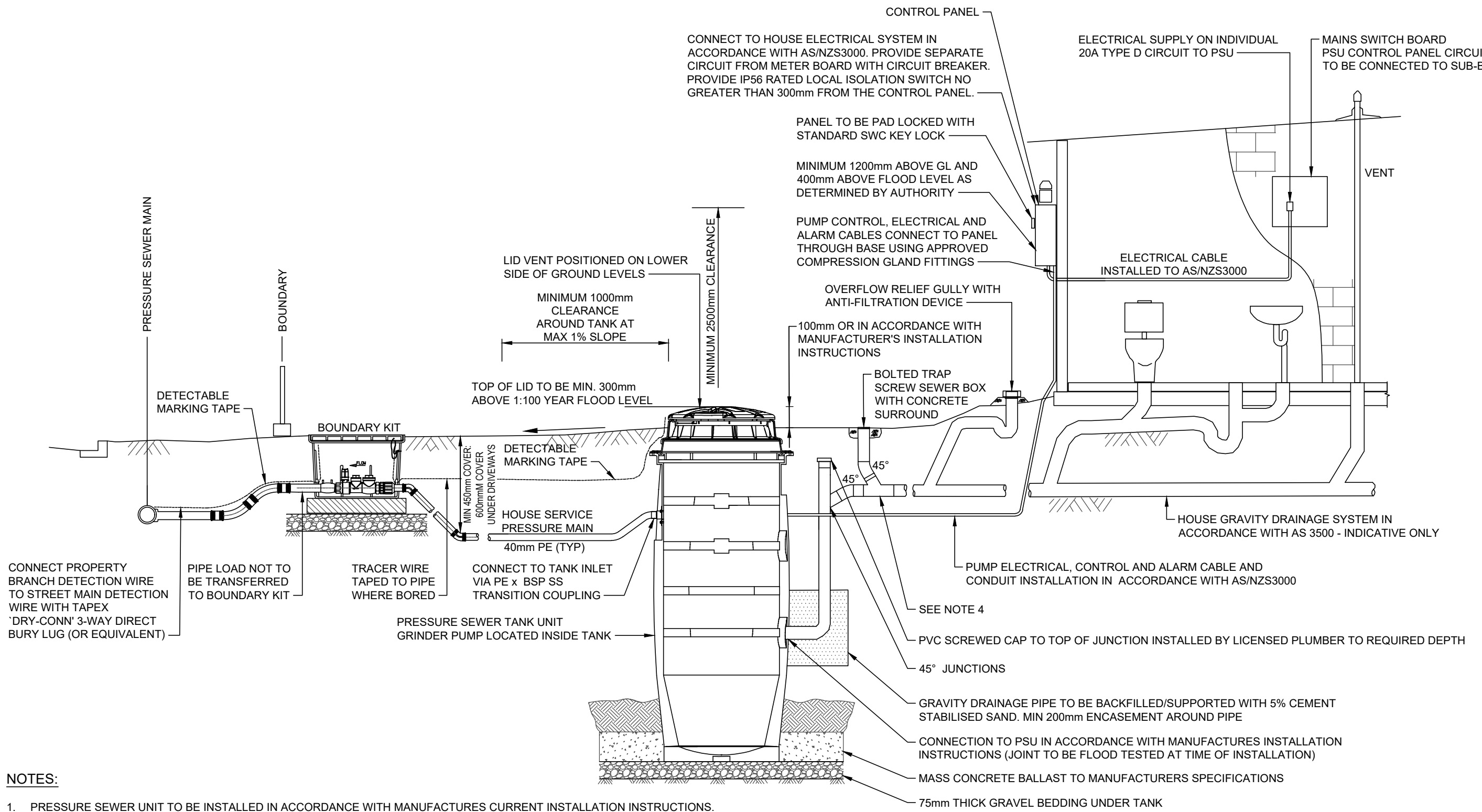
1. PRESSURE SEWER LAID AT STANDARD DEPTH TO PSS-1000-V EXCEPT WHERE OTHERWISE SHOWN.
2. THIS PLAN SHOWS TYPICAL DETAILS THAT SHOULD BE INCLUDED IN "WORK AS CONSTRUCTED" DRAWINGS. SEE THE WATER AGENCY FOR WORK AS CONSTRUCTED REQUIREMENTS.



LEGEND:

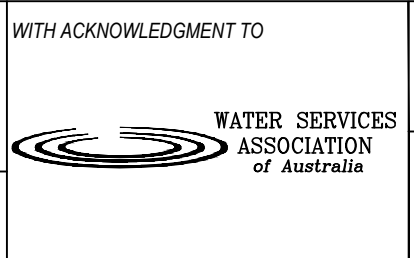
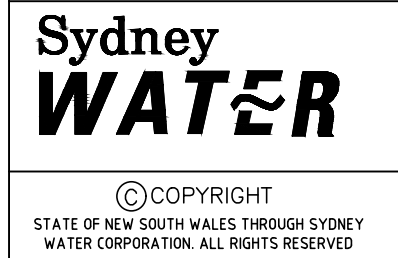
- FLUSHING POINT
- ✕ ISOLATION VALVE
- ✕ PROPERTY BOUNDARY ASSEMBLY
- ⊙ COLLECTION TANK
- ⊠ MAIN SWITCH BOARD
- e- PUMP CONTROL / POWER CABLE
- LAT PRESSURE RETICULATION SEWER / LATERAL CONNECTION POINT
- PRESSURE RETICULATION SEWER
- - - - - PRESSURE SEWER LATERAL
- PROPERTY DISCHARGE LINE
- TIES

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		<p>PREPARED BY</p> <p>ENGINEERING & TECHNICAL SUPPORT</p>	<p>DESIGN LAYOUT</p> <p>TYPICAL LOCALITY AND SITE PLAN</p>		<p>PSS-1100-V</p>	
		<p>A ORIGINAL ISSUE NS 16/04/21</p>			<p>ISSUE: A</p>	<p>DATE: 16/04/2021</p>
		<p>LETTER DETAILS OF VERSION / AMENDMENT APP'D DATE</p>				



NOTES:

1. PRESSURE SEWER UNIT TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURES CURRENT INSTALLATION INSTRUCTIONS.
2. PUMP CABLE AND ELECTRICAL SUPPLY MUST BE CONNECTED USING COMPRESSION CABLE GLAND FITTINGS VIA THE BOTTOM OF THE PANEL. CONNECTION THROUGH BACK OF PANEL IS NOT PERMISSIBLE.
3. A COPY OF WAE DIAGRAM / SKETCH CLEARLY SHOWING ALL UNDERGROUND WIRING SYSTEMS ON THE PROPERTY IS TO BE RETAINED IN THE CONTROL PANEL.
4. JUNCTION TO BE INSTALLED IN REVERSE DIRECTION TO PREVENT RODDING EQUIPMENT INTERFERING WITH PUMP AND LEVEL SENSOR IN STORAGE TANK.
5. SEE SYDNEY WATERS TECHNICAL GUIDELINES - BUILDING OVER AND ADJACENT TO PIPE ASSETS, INCLUDING ZONE OF INFLUENCE REQUIREMENTS.



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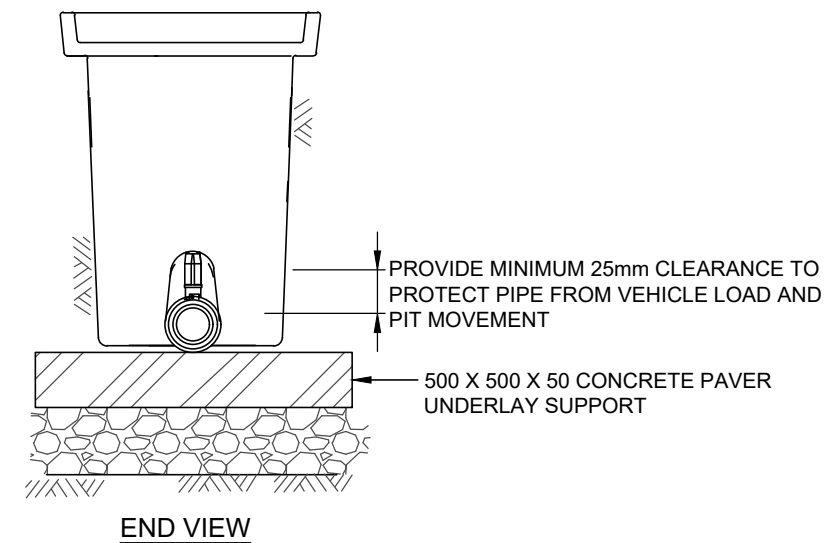
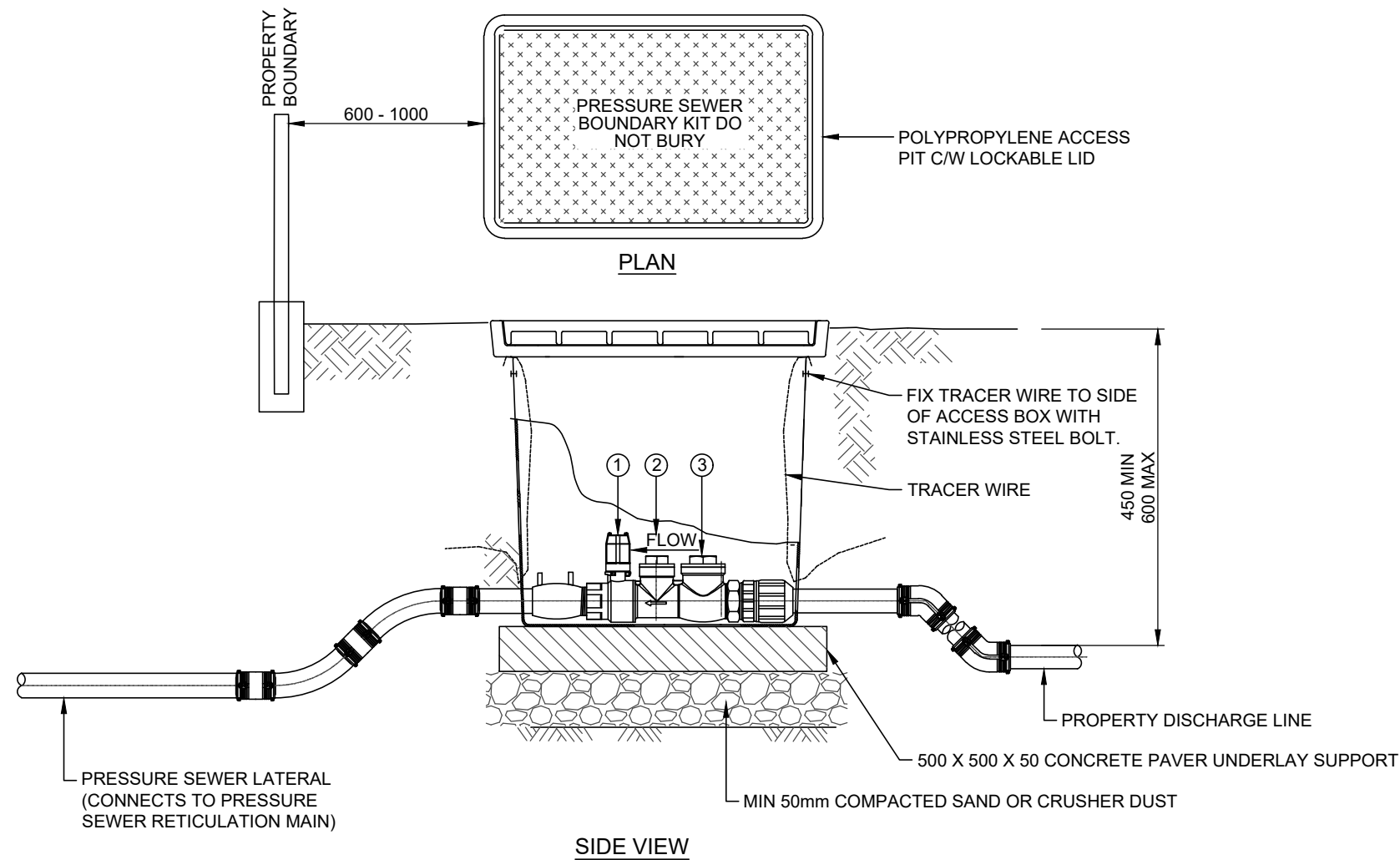
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**ON-PROPERTY LAYOUT
 TYPICAL ARRANGEMENT AND
 SANITARY DRAINAGE DETAILS**

NOT TO SCALE

PSS-1101-V

ISSUE: A DATE: 16/10/2021



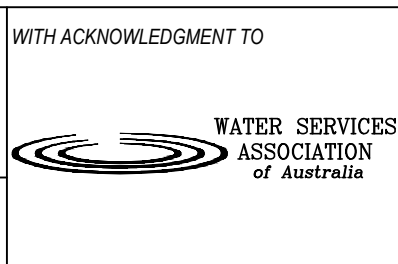
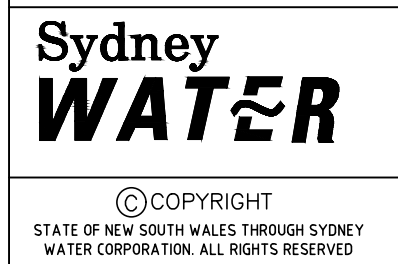
BOUNDARY KIT DETAIL

PIPE AND VALVE MATERIAL SCHEDULE

ITEM	DESCRIPTION	QTY	MATERIAL	COMMENTS
1	BALL VALVE	1	SS 316	FULL BORE, FITTED WITH VALVE KEY SPINDLE
2	INSPECTION TEE	1	SS 316	FITTED WITH HEX PLUG AND PRESSURE RELIEF MECHANISM
3	NON RETURN VALVE	1	SS 316	SWING CHECK TYPE

BOUNDARY KIT NOTES:

- BOUNDARY KIT TO BE INSTALLED IN 'NON-TRAFFICABLE' AREA.
- ENSURE THAT LID OF BOUNDARY KIT IS MARKED AS SHOWN. WHERE THE WARNING/NAME PLATE IS NOT CAST OR MOULDED INTO THE LID AFFIX AN ENGRAVED SS NAMEPLATE USING SS FASTENERS.
- PREPARE BEDDING UNDER BOUNDARY KIT TO SYDNEY WATER TECHNICAL SPECIFICATIONS.
- INSTALL BOUNDARY KIT 10mm PROUD OF SURFACE SO THAT FSL CAN BE GRADED AWAY FROM LID.
- TEST ASSEMBLY AND CONNECTING PRESSURE SEWERS HYDROSTATICALLY AFTER INSTALLATION IN ACCORDANCE WITH PRESSURE SEWER CODE WSA-07.
- ALL PRESSURE PIPEWORK ITEMS TO BE PE100 PN 16.
- ALL STAINLESS STEEL VALVES & FITTINGS TO BE GRADE 316, MIN PN16.
- ALL PE JOINTS TO BE ELECTROFUSION WELDED.
- CONNECTION FROM STREET MAINS TO BOUNDARY KIT TO BE AT 90°



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PROPERTY BOUNDARY ASSEMBLY
TYPICAL INSTALLATION

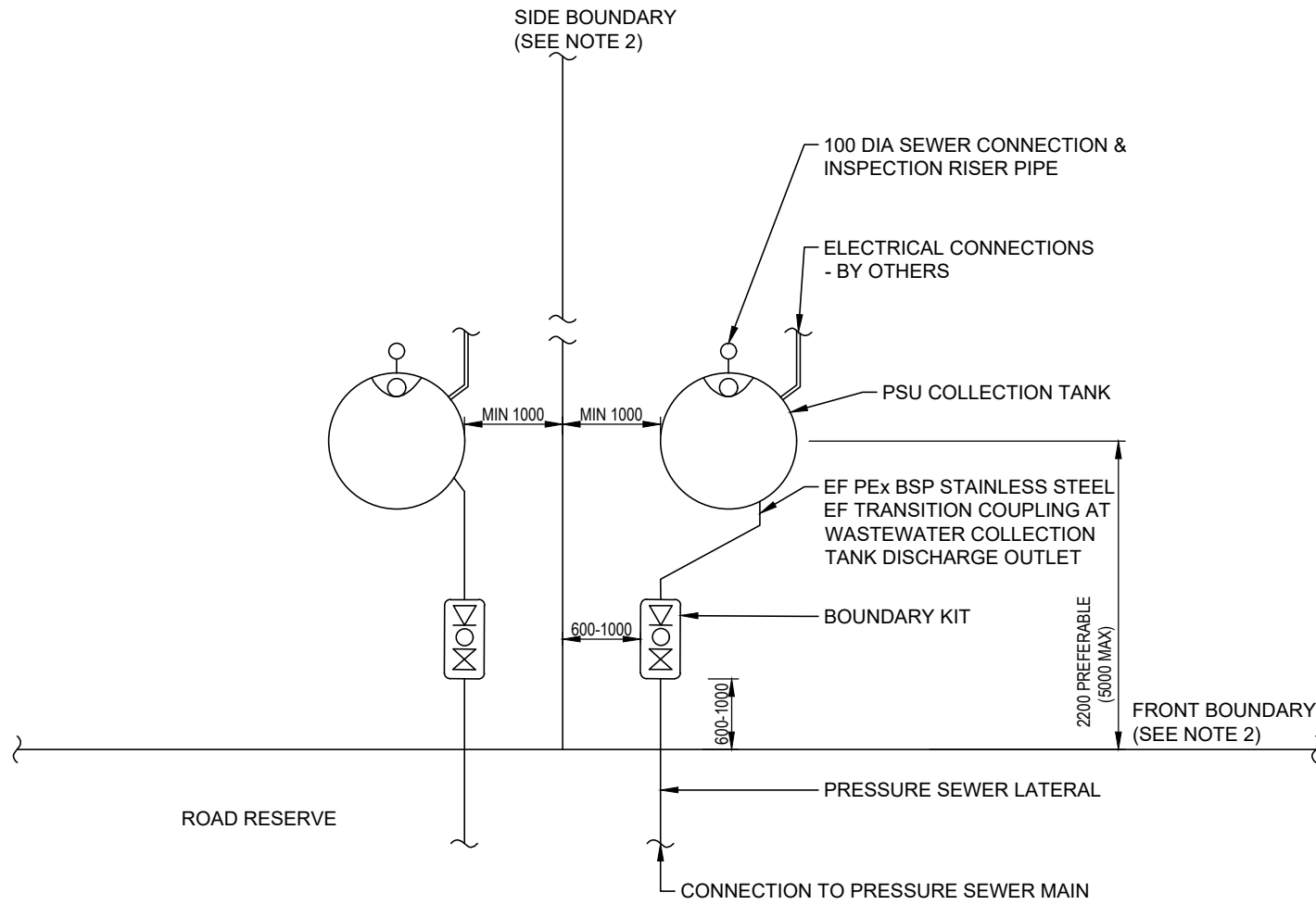
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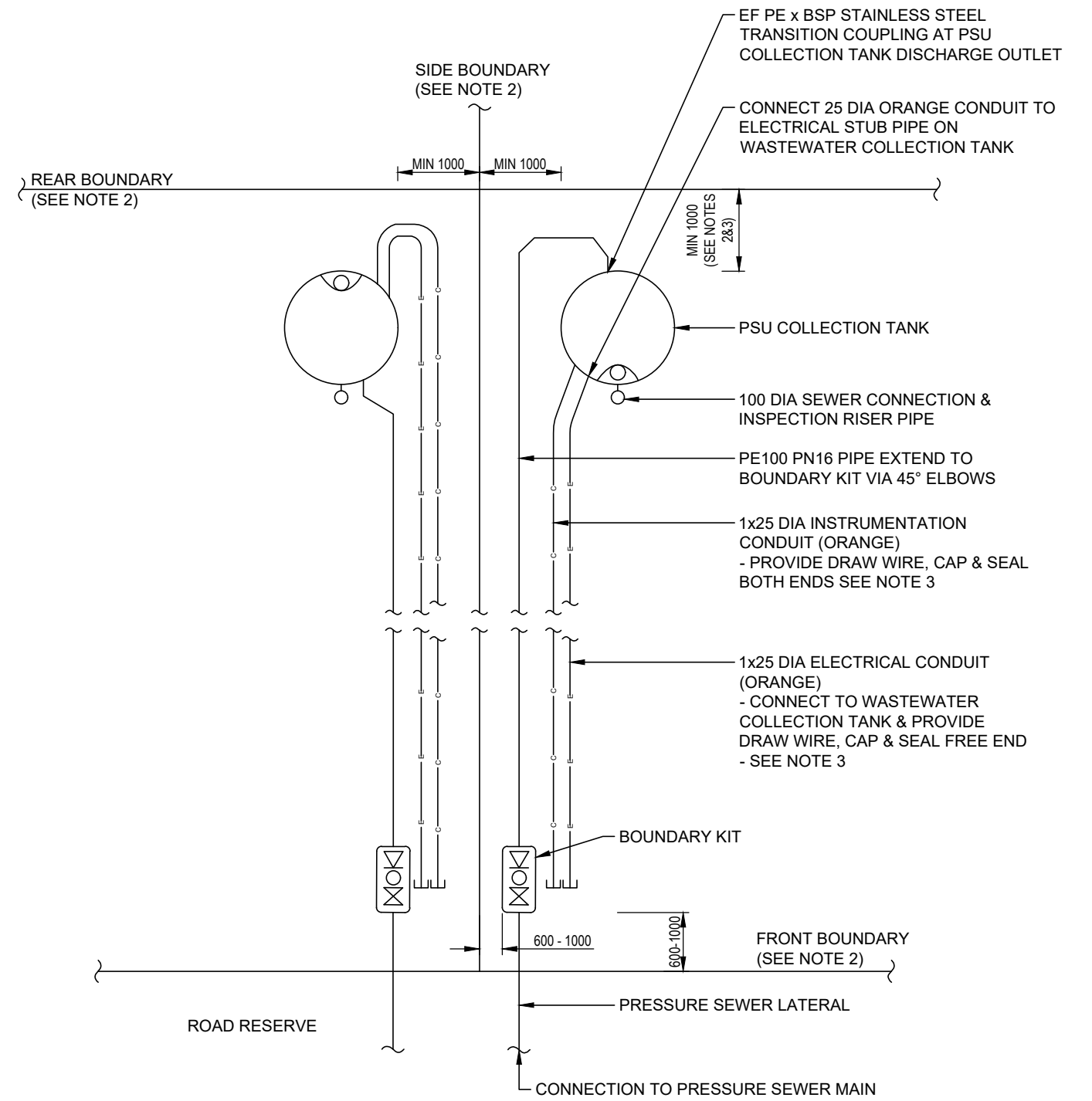
NOTES:

1. WHERE RETAINING WALLS ARE INSTALLED, SEE DRAWINGS PSS-1151-S & PSS-1152-S.
2. WHERE STORMWATER EASEMENTS EXIST CLEARANCE DIMENSIONS SHALL BE IN ACCORDANCE WITH LOCAL COUNCIL REQUIREMENTS.
3. ALL CONDUIT BENDS TO BE LONG RADIUS SWEEP TYPE.
4. MINIMUM DISTANCE BETWEEN WASTEWATER TANK AND HOUSE TO BE 2m.
5. MINIMUM DISTANCE BETWEEN PROPERTY DISCHARGE LINE AND HOUSE TO BE 450mm.



TYPICAL LAYOUT PLAN - FRONT OF PROPERTY

PREFERRED OPTION



TYPICAL LAYOUT PLAN - REAR OF PROPERTY

SUBJECT TO APPROVAL BY SYDNEY WATER

NON-PREFERRED OPTION

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<p>PREPARED BY ENGINEERING & TECHNICAL SUPPORT</p>	<p>TYPICAL RESIDENTIAL ON-LOT INFRASTRUCTURE LAYOUT PLAN</p>		<p>PSS-1150-S</p>										
				<p>ISSUE: A</p>	<p>DATE: 16/04/2021</p>								

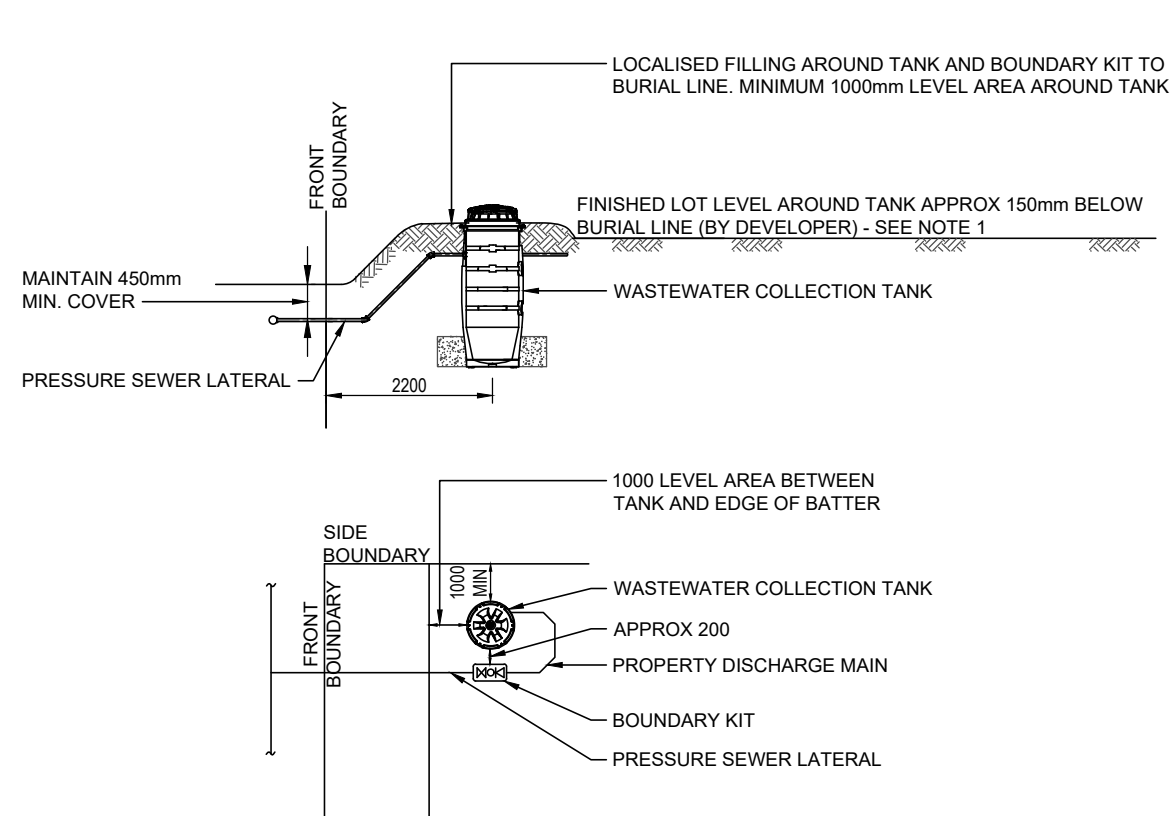


FIGURE 1 - TANK LOCATION: FRONT OF PROPERTY - IN PROPERTY
BATTER WITH NO RETAINING WALLS - (SEE NOTES)

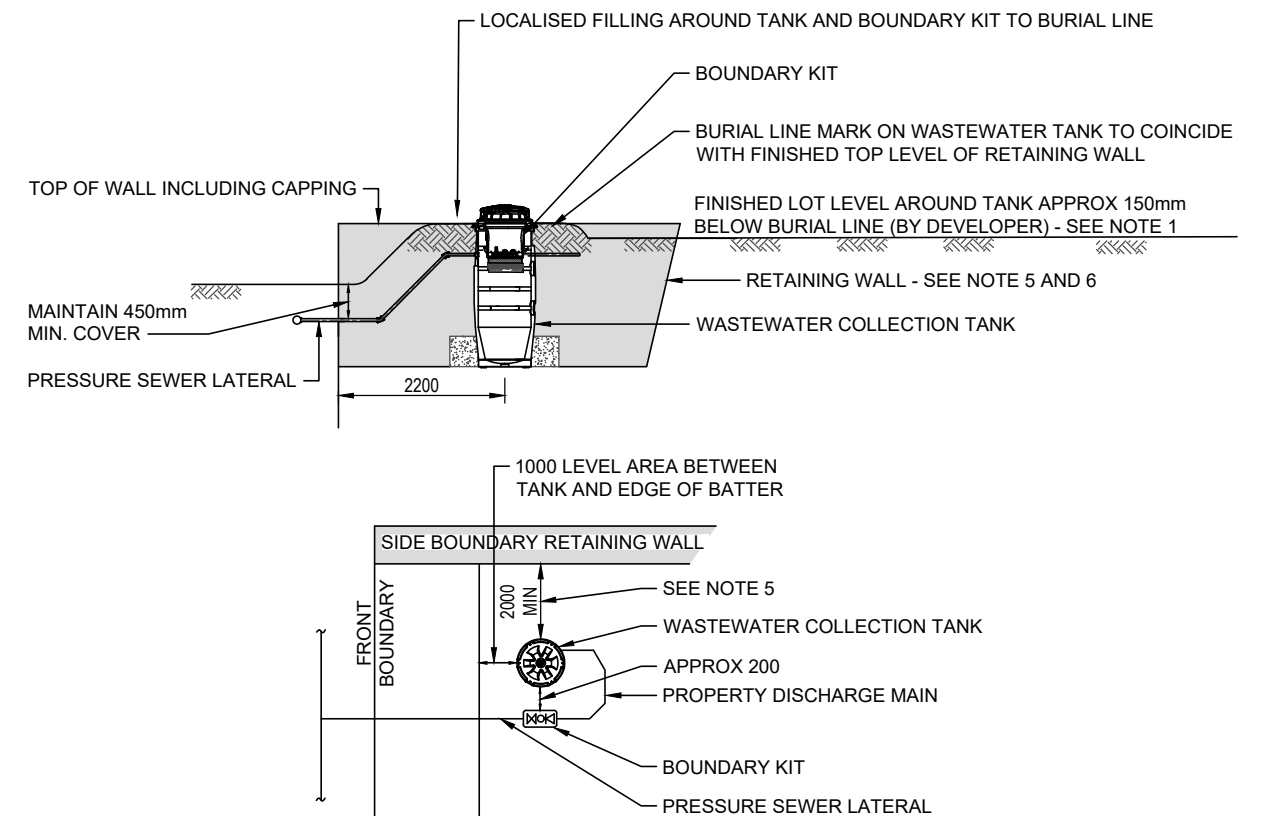


FIGURE 2 - TANK LOCATION: FRONT OF PROPERTY - IN PROPERTY
BATTER WITH SIDE RETAINING WALL - (SEE NOTES)

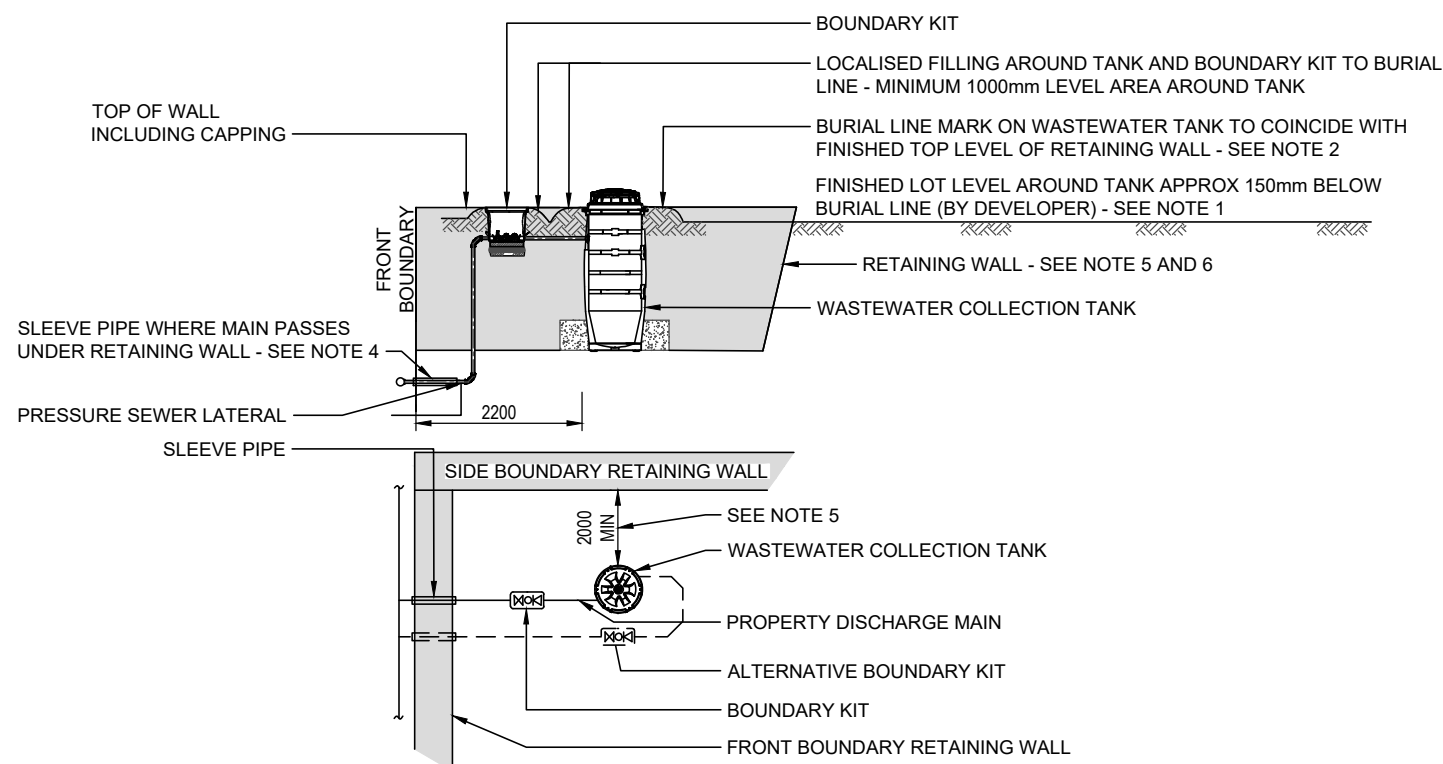


FIGURE 3 - TANK LOCATION: FRONT OF PROPERTY - IN PROPERTY
BATTER WITH FRONT AND SIDE RETAINING WALLS - (SEE NOTES)

NOTES:

- WHERE TANK RISERS ARE FITTED, FINISHED LOT LEVELS SHALL BE ADJUSTED TO SUIT RISER DEPTH. FINISH LOT LEVELS (BY DEVELOPER) ARE PROVIDED TO ALLOW FLEXIBILITY IN FINISHED LANDSCAPING LEVELS (BY HOMEOWNER).
- WHERE THERE ARE TWO RETAINING WALLS AT DIFFERENT LEVELS THE SHALLOWER OF THE TWO SHOULD BE REFERENCED.
- DIAGRAMS ARE INDICATIVE ONLY. RETAINING WALL AND BATTER DETAILS SHALL COMPLY WITH RELEVANT LOCAL COUNCIL REQUIREMENTS, CODES & WHS REQUIREMENTS. BATTER SLOPES SHOULD BE MIN 1V:3H.
- SLEEVE PIPE: PN16 PVC OR PN16 PE100. INTERNAL DIAMETER TO ENSURE MIN 30mm ANNULUS AROUND PRESSURE SEWER LATERAL.
- MIN DISTANCE TO WALL BASED ON COLLECTION TANK OF 2m DEPTH AND SHOULD BE INCREASED IF DEEPER TANKS ARE USED.
- SEE SYDNEY WATERS TECHNICAL GUIDELINES - BUILDING OVER AND ADJACENT TO PIPE ASSETS, INCLUDING ZONE OF INFLUENCE REQUIREMENTS IF RETAINING WALL IS CONSTRUCTED BY HOMEOWNER.

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**TYPICAL RESIDENTIAL ON-LOT
INFRASTRUCTURE
- SLOPING LOTS
TANK IN FRONT OF PROPERTY**

NOT TO SCALE

PSS-1151-S

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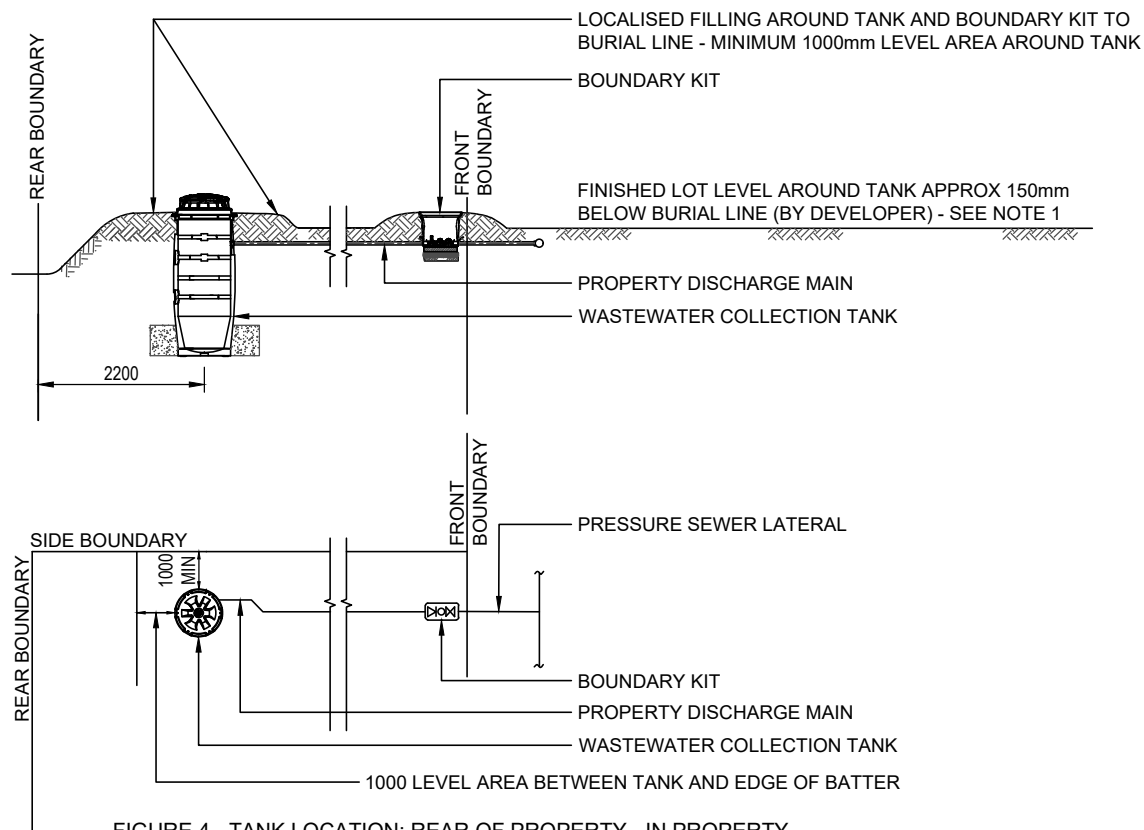


FIGURE 4 - TANK LOCATION: REAR OF PROPERTY - IN PROPERTY BATTER WITH NO RETAINING WALLS - (SEE NOTES)

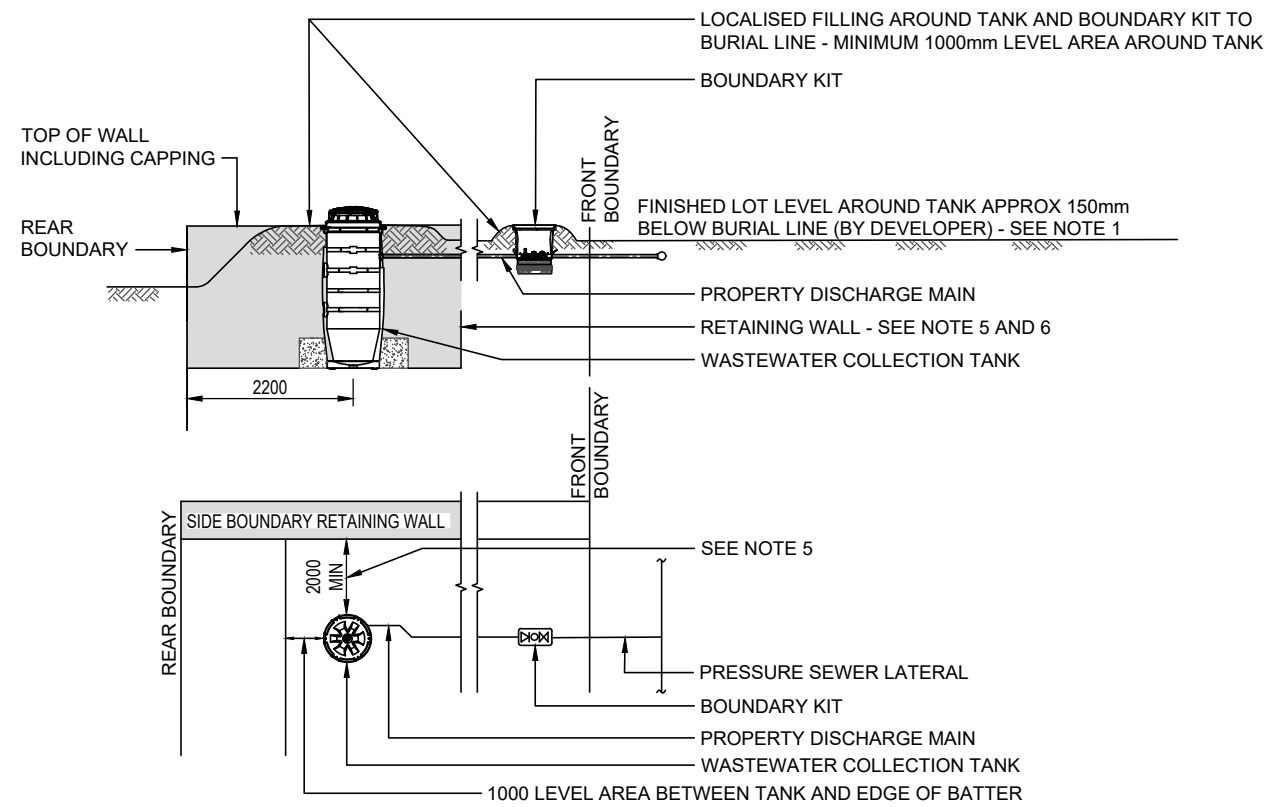


FIGURE 5 - TANK LOCATION: REAR OF PROPERTY - IN PROPERTY BATTER WITH SIDE RETAINING WALL - (SEE NOTES)

NOTES:

- WHERE TANK RISERS ARE FITTED, FINISHED LOT LEVELS SHALL BE ADJUSTED TO SUIT RISER DEPTH. FINISH LOT LEVELS (BY DEVELOPER) ARE PROVIDED TO ALLOW FLEXIBILITY IN FINISHED LANDSCAPING LEVELS (BY HOMEOWNER).
- WHERE THERE ARE TWO RETAINING WALLS AT DIFFERENT LEVELS THE SHALLOWER OF THE TWO SHOULD BE REFERENCED.
- DIAGRAMS ARE INDICATIVE ONLY. RETAINING WALL AND BATTER DETAILS SHALL COMPLY WITH RELEVANT LOCAL COUNCIL REQUIREMENTS, CODES & WHS REQUIREMENTS.
- SLEEVE PIPE: PN16 PVC OR PN16 PE100. INTERNAL DIAMETER TO ENSURE MIN 50mm ANNULUS AROUND PRESSURE SEWER LATERAL.
- MIN DISTANCE TO WALL BASED ON COLLECTION TANK OF 2m DEPTH AND SHOULD BE INCREASED IF DEEPER TANKS ARE USED.
- SEE SYDNEY WATERS TECHNICAL GUIDELINES - BUILDING OVER AND ADJACENT TO PIPE ASSETS, INCLUDING ZONE OF INFLUENCE REQUIREMENTS IF RETAINING WALL IS CONSTRUCTED BY HOMEOWNER.

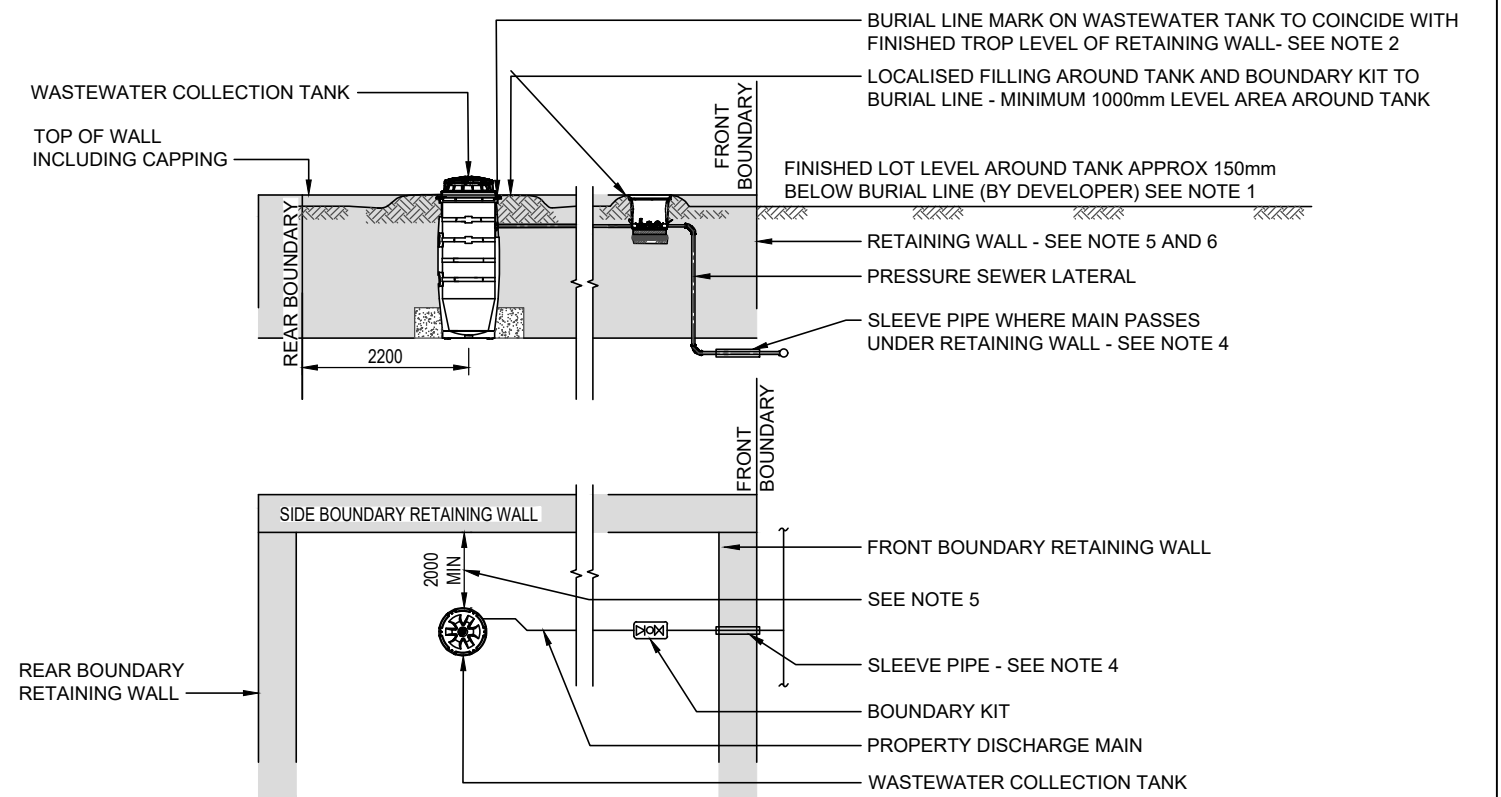


FIGURE 6 - TANK LOCATION: REAR OF PROPERTY - IN PROPERTY BATTER WITH REAR, FRONT AND SIDE RETAINING WALLS - (SEE NOTES)

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**TYPICAL RESIDENTIAL
ON-LOT INFRASTRUCTURE
- SLOPING LOTS
TANK IN REAR OF PROPERTY**

NOT TO SCALE

PSS-1152-S

ISSUE: A	DATE: 16/04/2021
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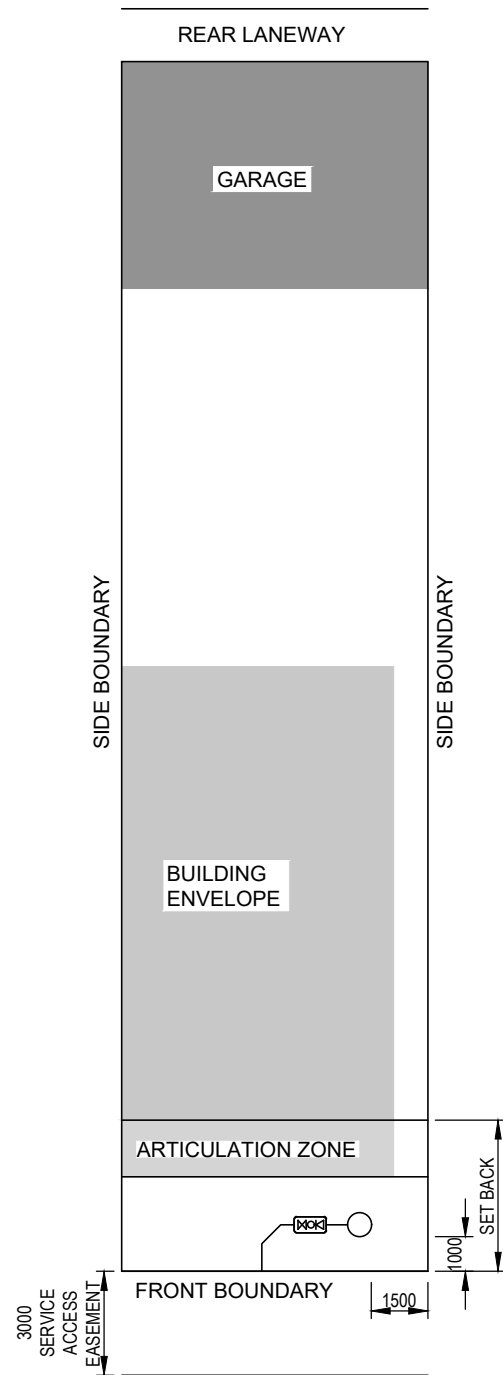


FIGURE 1: NOT PREFERRED, SYDNEY WATER APPROVAL REQUIRED

- LOT TYPE: TERRACE / ABUTTING / SEMI-DETACHED LOT
- REAR LOADED FRONTING PARKLAND / OPEN SPACE WITH 3.0m SERVICE EASEMENT PROVIDED.
 - TYPICAL LOT SIZE = APPROX 120m² to 350m².

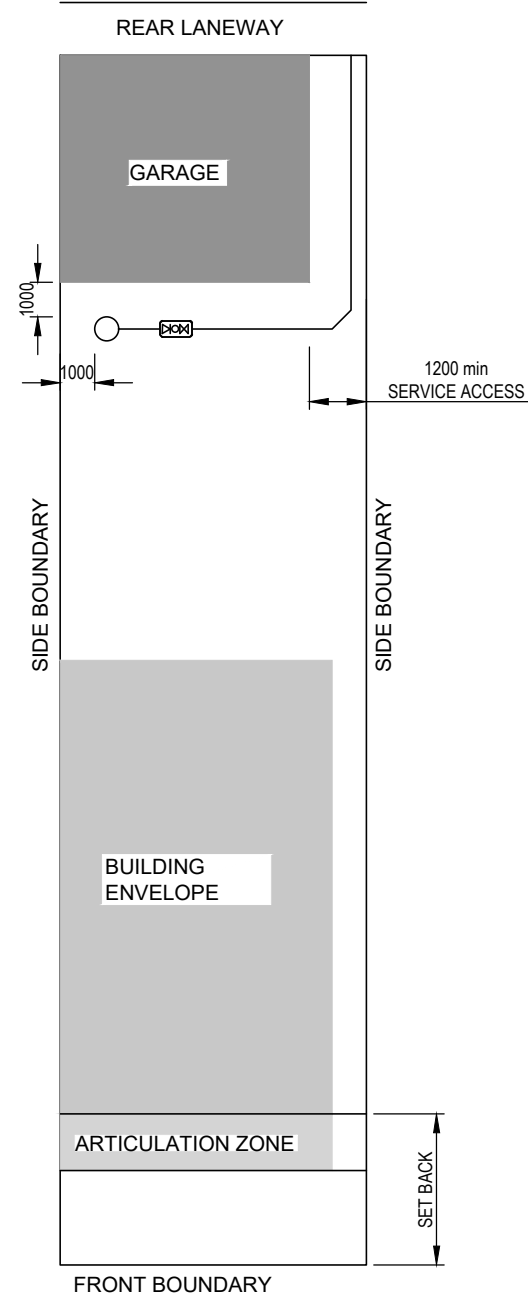


FIGURE 2: NOT PREFERRED, SYDNEY WATER APPROVAL REQUIRED

- LOT TYPE: TERRACE / ABUTTING / SEMI-DETACHED LOT
- REAR LOADED
 - TYPICAL LOT SIZE = APPROX 120m² to 350m²

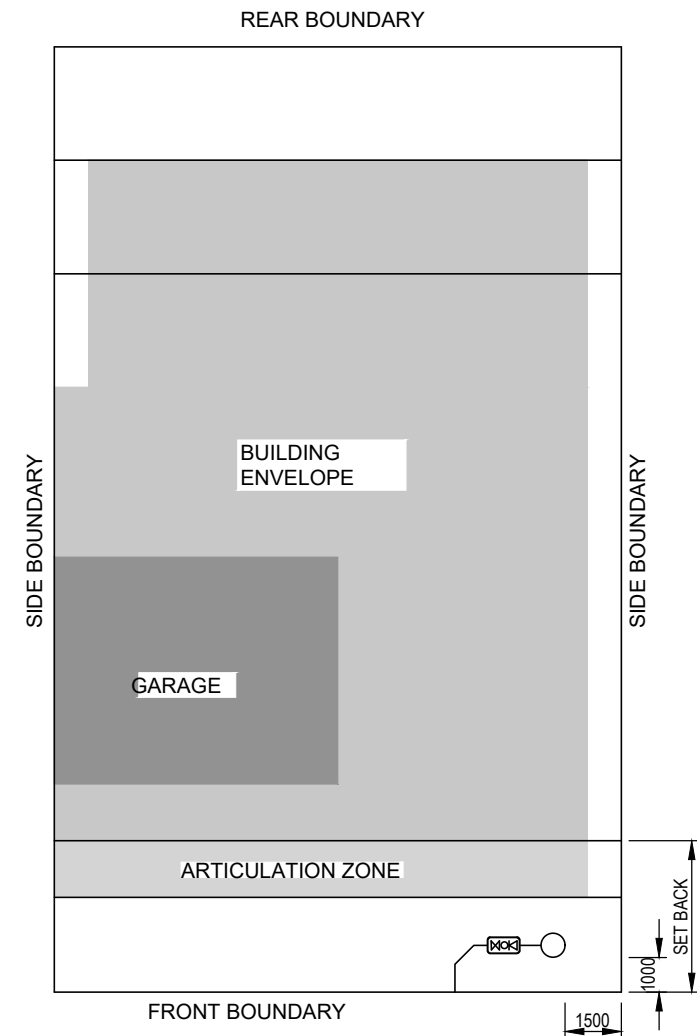
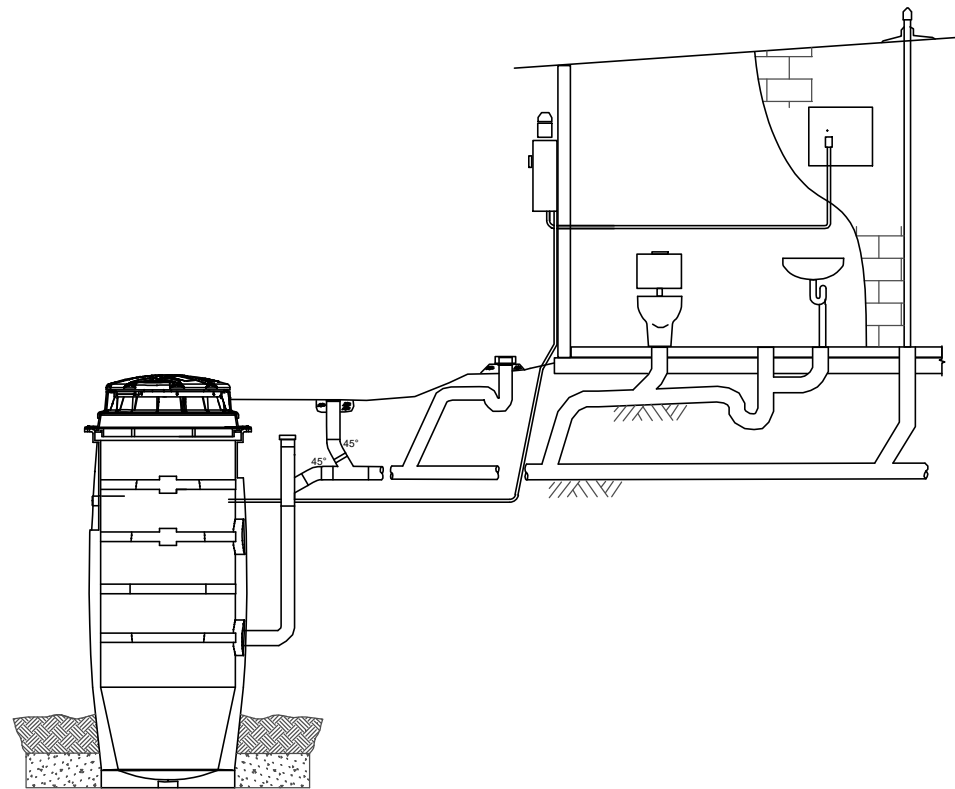


FIGURE 3

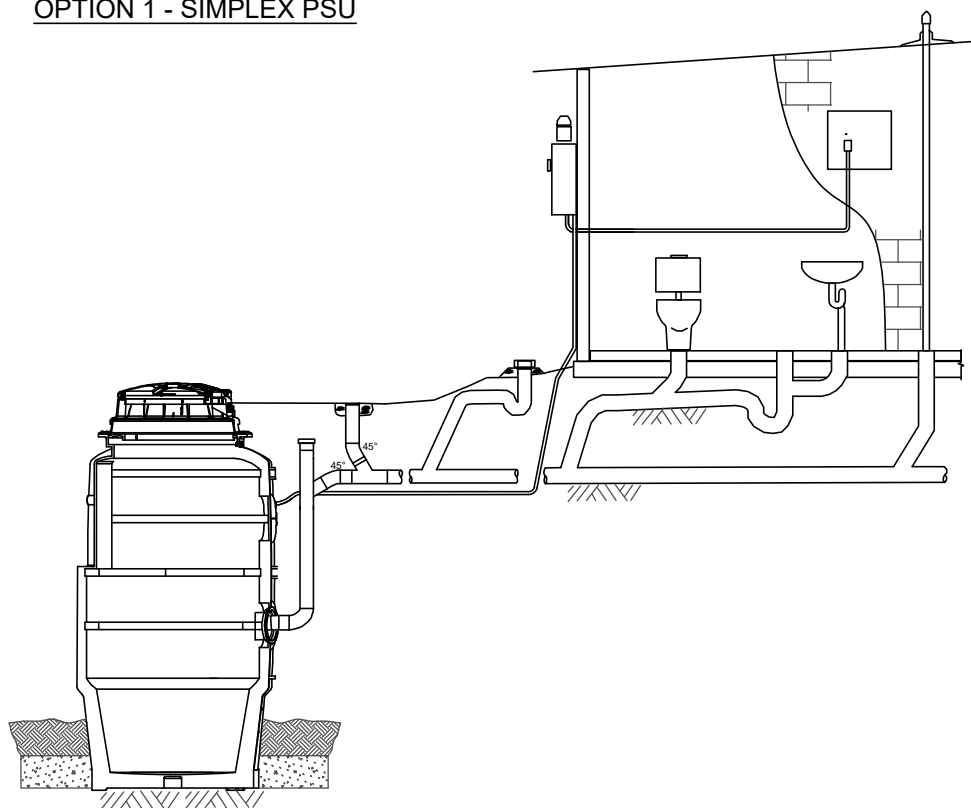
- LOT TYPE: SMALL / COMPACT LOTS
- FRONT LOADED
 - TYPICAL LOT SIZE = APPROX 250m² to 450m²

NOTES
1. LOT SIZES ARE INDICATIVE ONLY

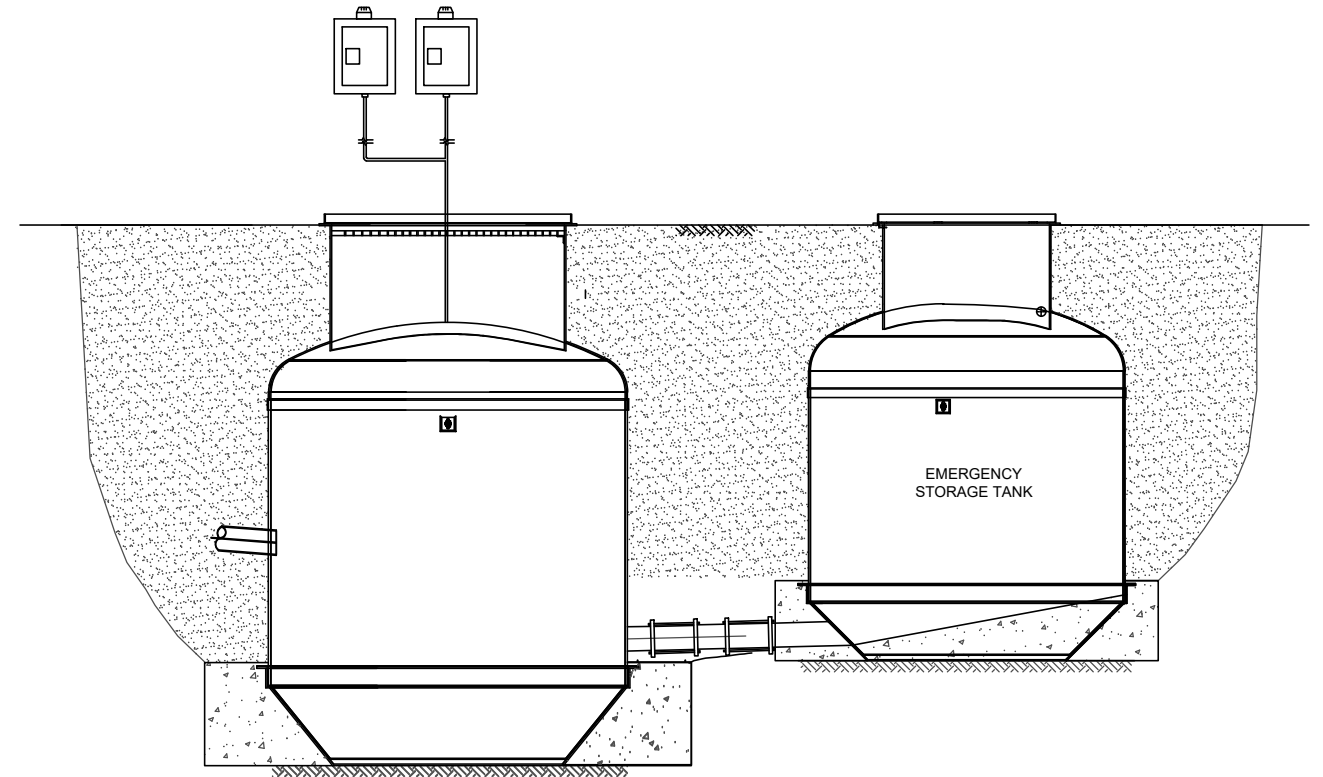
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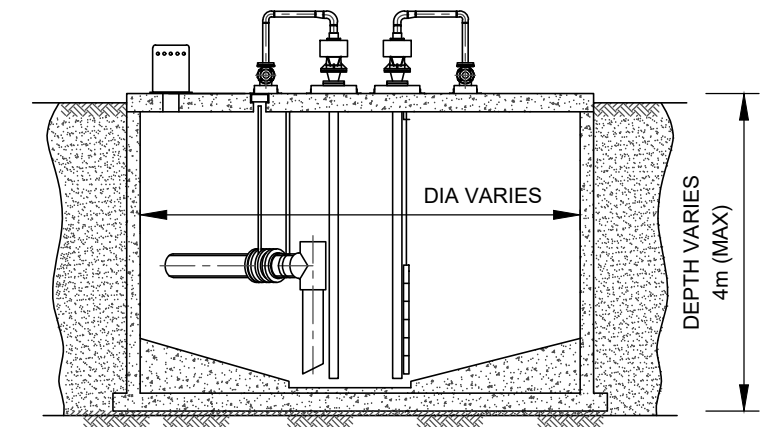
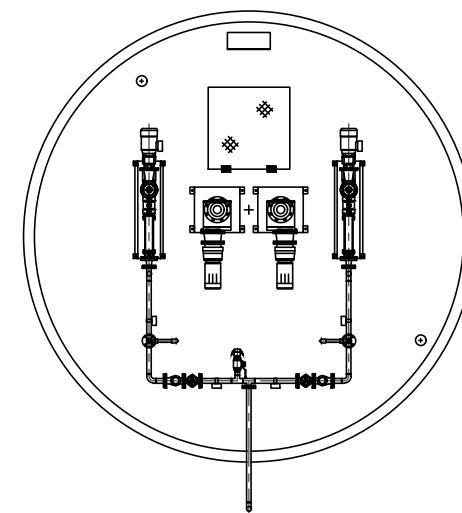
OPTION 1 - SIMPLEX PSU



OPTION 2 - DUPLEX PSU



OPTION 3 - QUAD OR TRIPLEX PSU C/W EMERGENCY STORAGE TANK



CONCRETE WET WELL

OPTION 4 - DUPLEX DRY MOUNTED INDUSTRIAL P.C. MUNCH PUMPS

NOTES:

1. THESE OPTIONS ARE INDICATIVE EXAMPLES OF THE TYPE OF SEWERAGE INFRASTRUCTURE THAT COULD BE EMPLOYED ON NON-STANDARD RESIDENTIAL AND NON-RESIDENTIAL DEVELOPMENTS. VARIOUS COMBINATIONS OF PSU STORAGE TANKS AND EMERGENCY STORAGE TANKS COULD BE EMPLOYED.
2. THE TYPE OF INFRASTRUCTURE WILL BE SITE SPECIFIC AND GENERALLY GOVERNED BY SITE USAGE, AVERAGE DAILY FLOW, BUILDING FOOTPRINT AND NETWORK HYDRAULICS.

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APPROVED
NORBERT SCHAEFER
MANAGER, ENGINEERING

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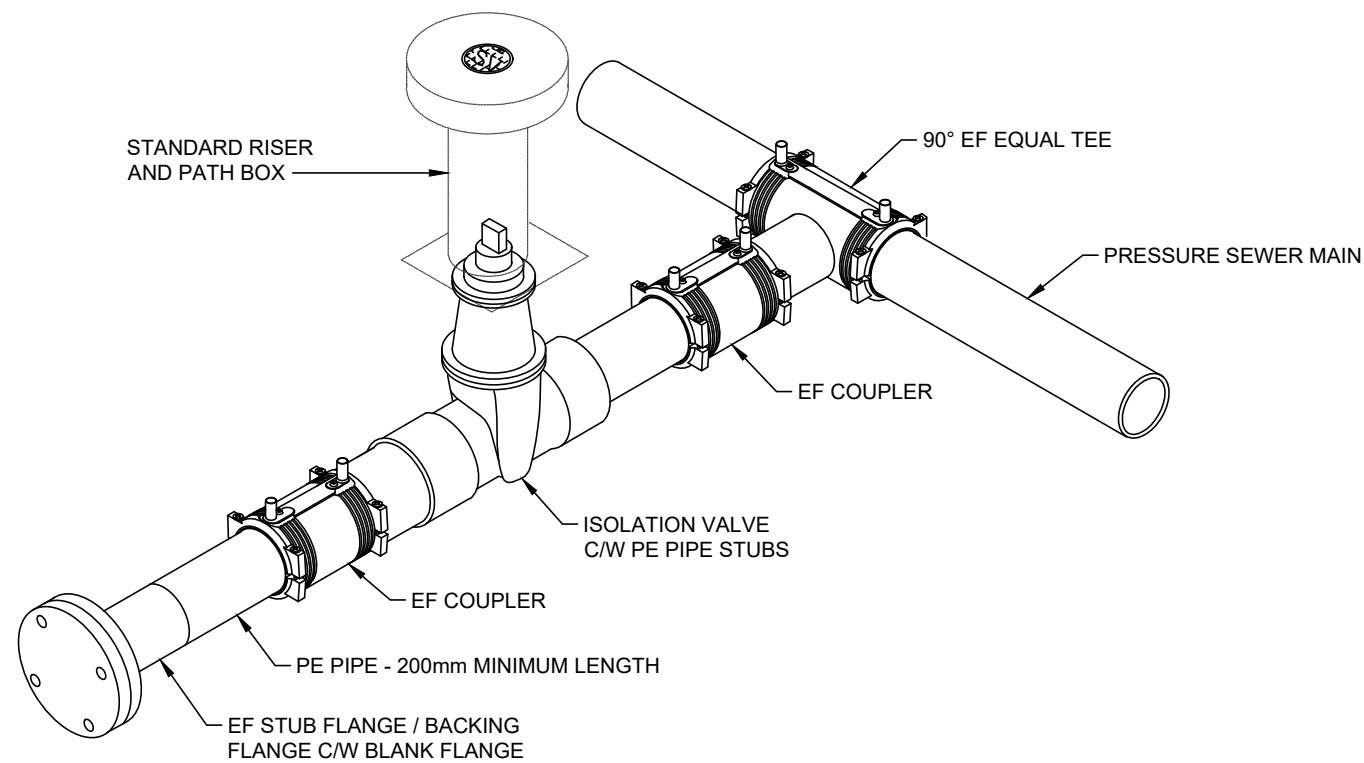
PRESSURE SEWERAGE CODE WSA 07

**PROPERTY SEWERAGE SERVICING -
NON-RESIDENTIAL AND
NON-STANDARD RESIDENTIAL
GENERAL ARRANGEMENT**

NOT TO SCALE

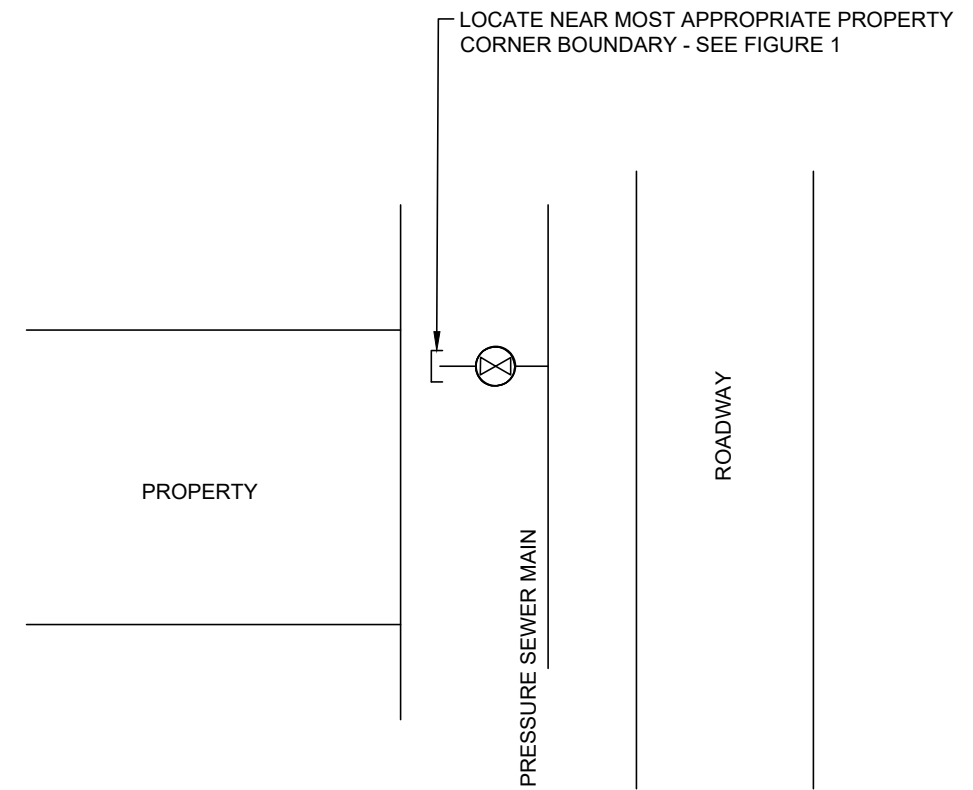
PSS-1154-S

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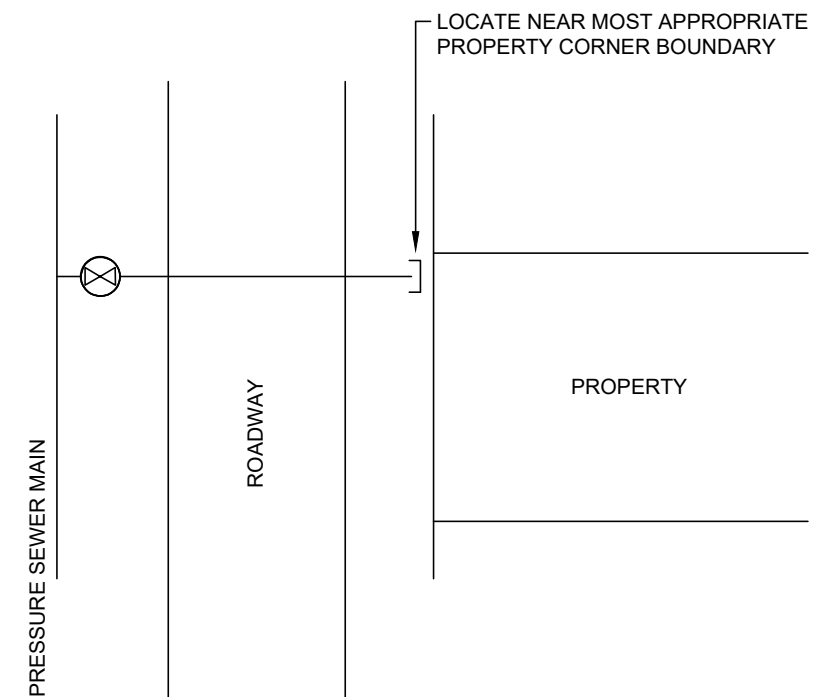


NOTE: TEE OFF BRANCH TO BE SAME SIZE AS PRESSURE SEWER MAIN

FIGURE 1 - SUPER LOT CONNECTION DETAIL



OPTION 1 - PROPERTY SAME SIDE AS PRESSURE SEWER MAIN



OPTION 2 - PROPERTY OPPOSITE SIDE TO PRESSURE SEWER MAIN

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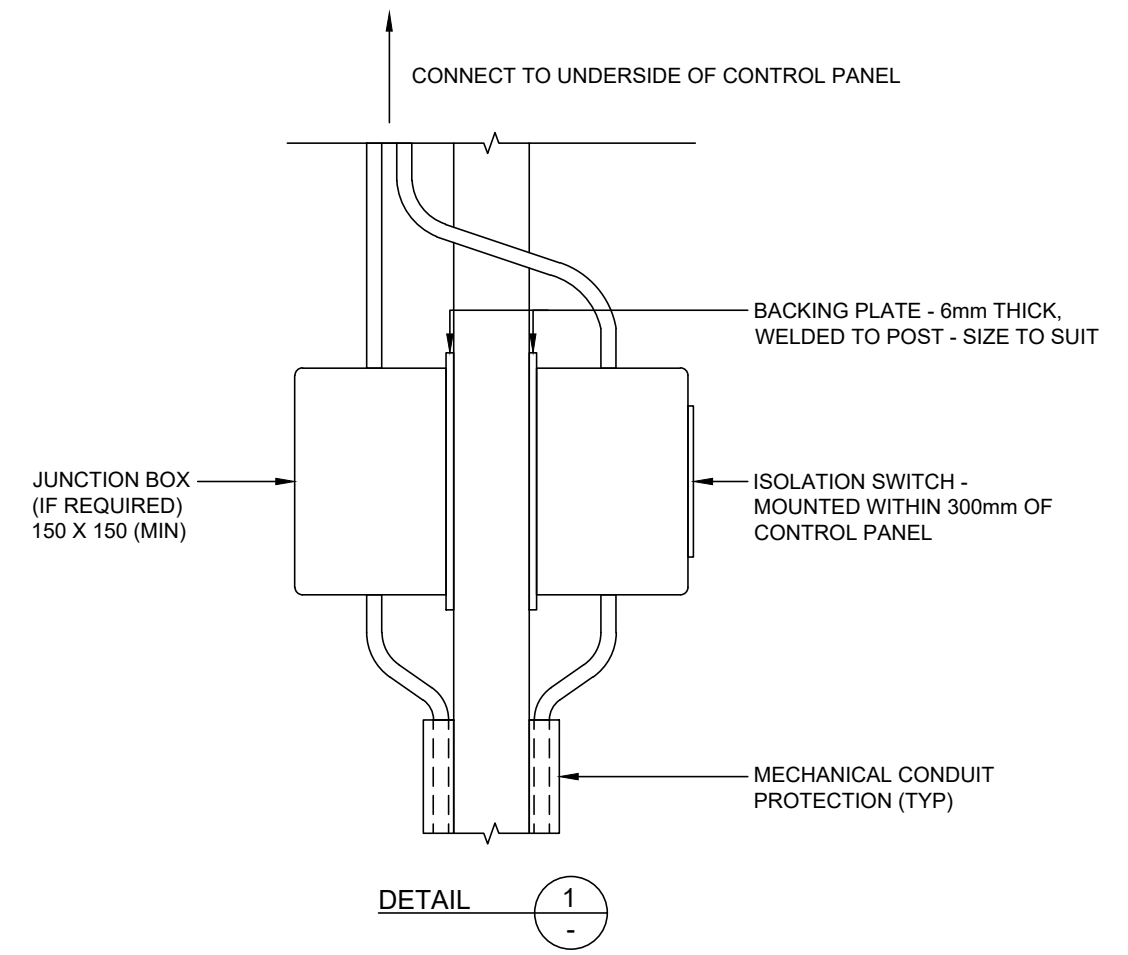
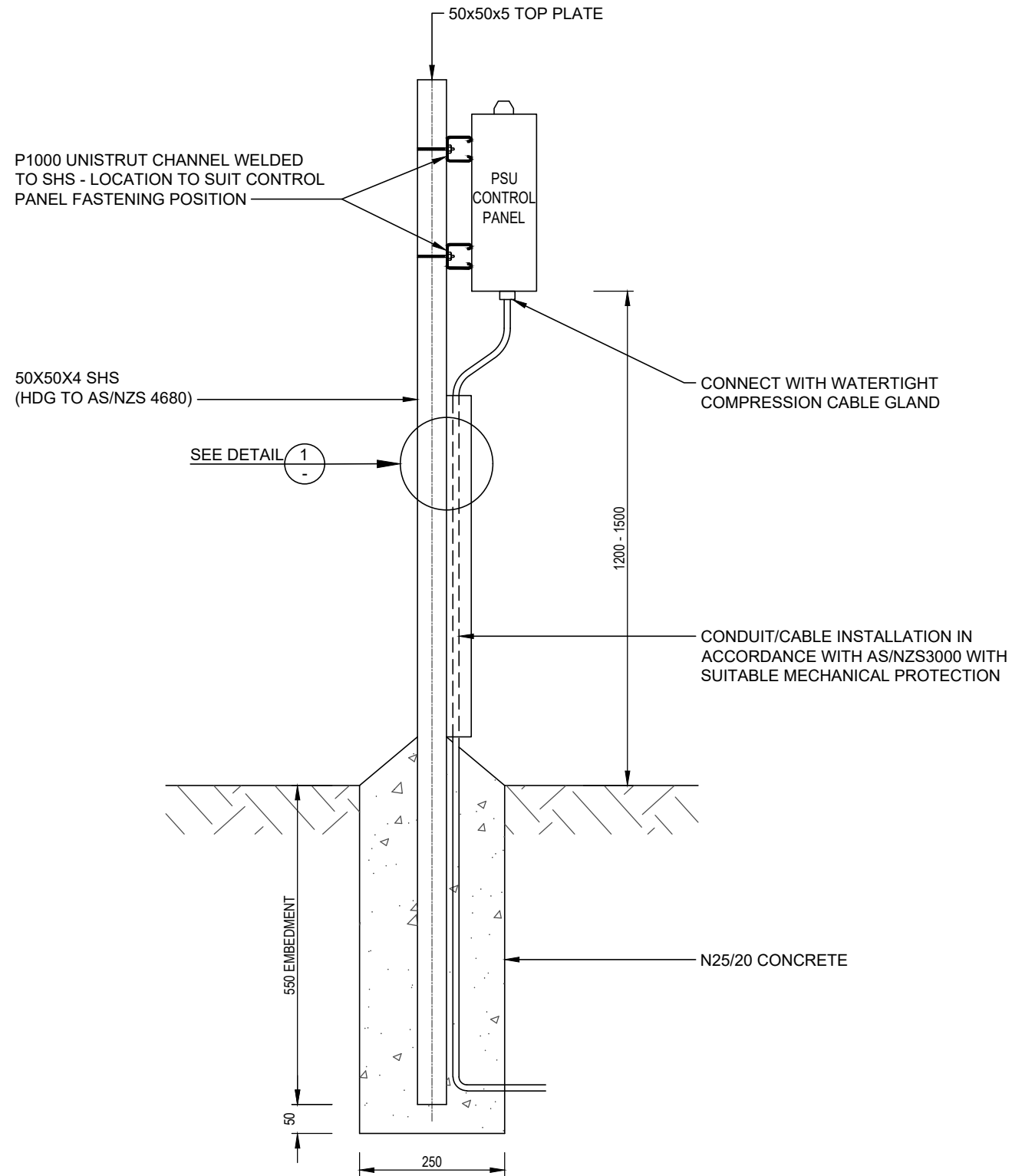
PRESSURE SEWERAGE CODE WSA 07

**PROPERTY SEWERAGE SERVICING
- SUPER LOT
CONNECTION DETAIL**

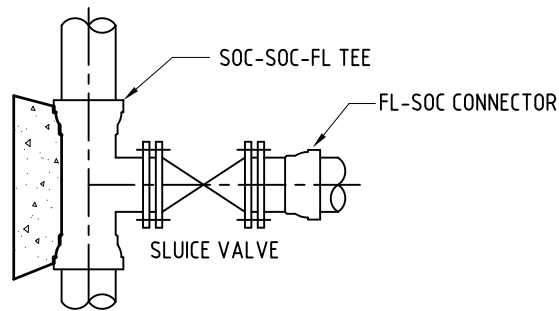
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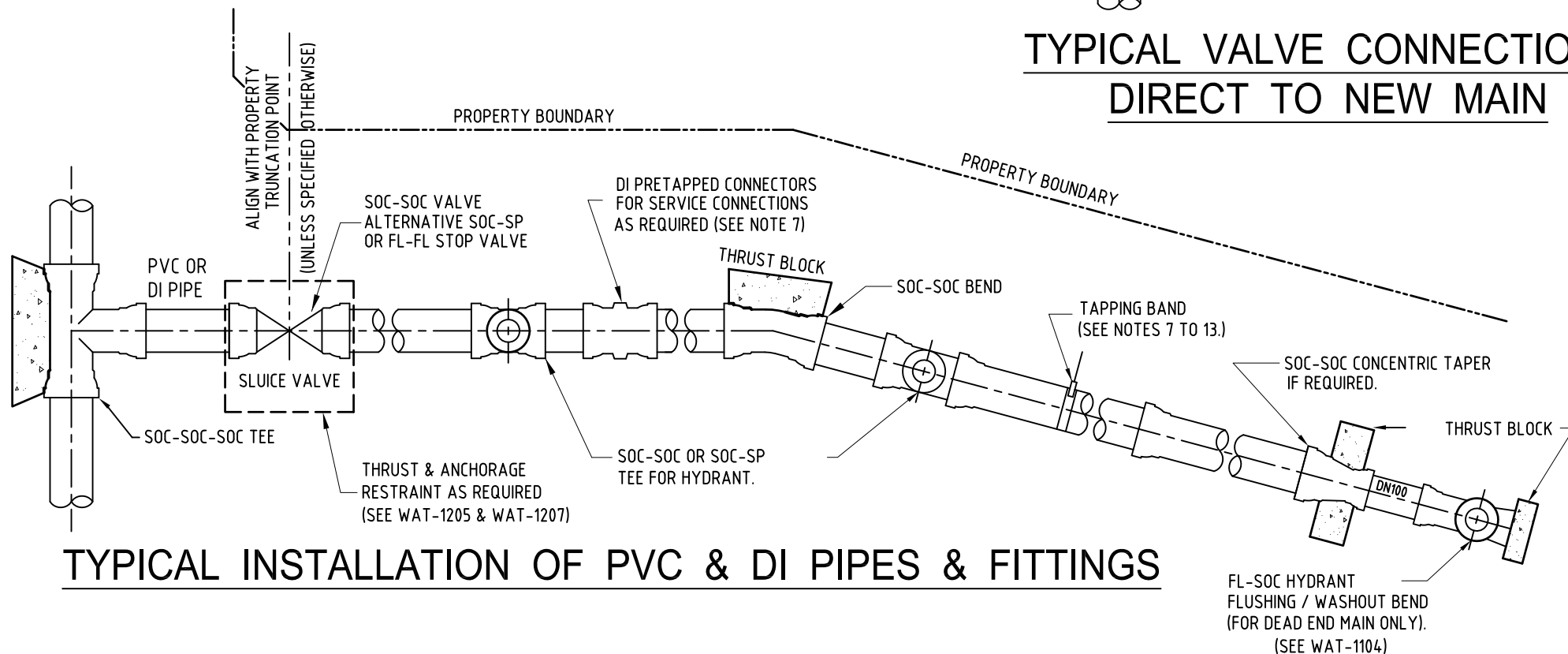
ISSUE: A DATE: 16/04/2021



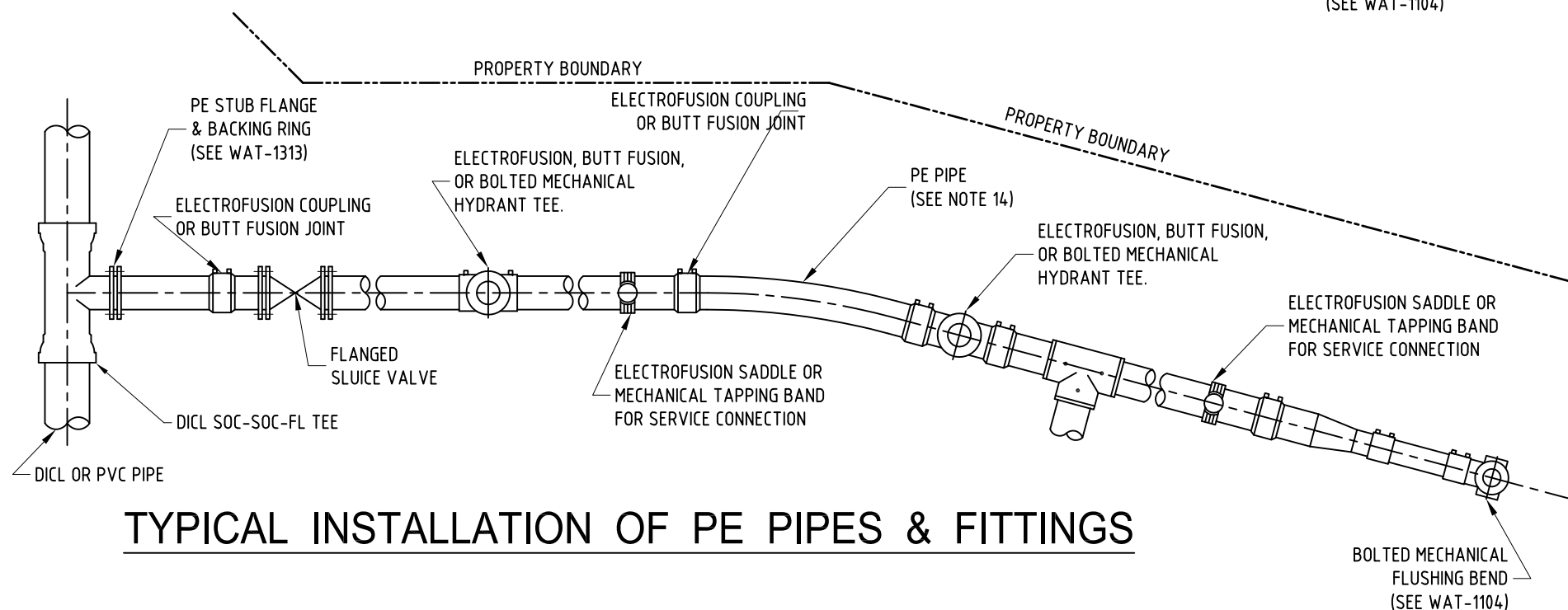
<p>© COPYRIGHT STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED</p>	<p>APPROVED</p> <p>NORBERT SCHAEFER MANAGER, ENGINEERING</p>	<p>PREPARED BY</p> <p>ENGINEERING & TECHNICAL SUPPORT</p>	<p>PRESSURE SEWERAGE CODE WSA 07</p>		<p>NOT TO SCALE</p>	
	<p>CONTROL PANEL SUPPORT POST TYPICAL INSTALLATION</p>		<p>PSS-1156-S</p>		<p>ISSUE: A</p>	<p>DATE: 16/04/2021</p>
	<p>A ORIGINAL ISSUE NS 16/04/21</p>		<p>LETTER DETAILS OF VERSION / AMENDMENT APP'D DATE</p>			



TYPICAL VALVE CONNECTION DIRECT TO NEW MAIN



TYPICAL INSTALLATION OF PVC & DI PIPES & FITTINGS



TYPICAL INSTALLATION OF PE PIPES & FITTINGS

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. INSTALL PIPEWORK PARALLEL TO PROPERTY BOUNDARIES.
3. STAINLESS STEEL AND FBE COATED TAPPING BANDS DO NOT REQUIRE ADDITIONAL CORROSION PROTECTION.
4. WRAP BOLTED CONNECTIONS USING OTHER THAN FBE COATED FITTINGS AND STAINLESS STEEL BOLTS WITH A PETROLATUM TAPE SYSTEM IN ACCORDANCE WITH WAT-1313.

DI & PVC PIPE

5. DUCTILE IRON FITTINGS SHALL BE USED WITH DI & PVC PIPE. FITTINGS MAY BE FBE COATED AND LINED OR CEMENT LINED WITH A BITUMINOUS EXTERNAL COATING.
6. PE SLEEVING REQUIRED ON ALL BITUMINOUS COATED DI PIPE AND FITTINGS APPLIED IN ACCORDANCE WITH AS 3681. TWO THICKNESSES REQUIRED BETWEEN FITTINGS AND THRUST BLOCK. REINSTATE ANY DAMAGED SLEEVING AS PER MANUFACTURER'S SPECIFICATIONS.
7. USE PRE-TAPPED CONNECTORS ON DN 100 & DN 150 NEW MAIN INSTALLATIONS (UNLESS SPECIFIED OTHERWISE BY SYDNEY WATER).
8. USE TAPPING BANDS FOR CONNECTIONS TO EXISTING MAINS AND NEW MAINS >DN 150.
9. ELECTRICALLY ISOLATE COPPER SERVICES FROM DI CL PIPE.

PVC PIPE

10. PVC PIPES SHALL BE MINIMUM PN16 (UNLESS SPECIFIED OTHERWISE BY SYDNEY WATER)
11. TAPPING BANDS ON PVC PIPE TO BE FULL CIRCLE CLAMPING.
12. MAXIMUM SIZE OF DRILLED HOLES FOR SERVICE CONNECTIONS IN PVC PIPE TO BE 30% DN OR 50 (LOWER VALUE TO BE USED) LARGER HOLES CAN BE USED FOR UNDER PRESSURE CUT IN CONNECTIONS.

DI PIPE

13. DIRECT TAPPING OF >DN 200 DI CL MAY BE AUTHORISED BY WATER AGENCIES.

PE PIPE

14. PE PIPES SHALL BE MINIMUM PN16 (UNLESS SPECIFIED OTHERWISE BY SYDNEY WATER).
15. PE PIPE MAY BE COLD BENT TO MINIMUM RADIUS OF 25 x (OD). STAKES OR OTHER SOURCES OF POINT LOADS SHALL NOT BE USED TO ASSIST IN BENDING THE PIPE.
16. MAKE ALLOWANCE DURING CONSTRUCTION FOR EXPANSION AND CONTRACTION OF PE PIPE DUE TO TEMPERATURE CHANGES.
17. BUTT WELDING IN ACCORDANCE WITH WSA-01 (POLYETHYLENE CODE). BUTT WELDING IN TRENCHES IS NOT PERMITTED.
18. ALL MECHANICAL COUPLINGS TO BE SELF-RESTRAINING.

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for PROCESS LEADER, WATER OPERATIONS

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WATER**

WITH
ACKNOWLEDGMENT
TO

WATER SUPPLY CODE WSA-03

Sydney WATER

**TYPICAL MAINS CONSTRUCTION
RETICULATION MAIN ARRANGEMENTS**

WAT-1102-V

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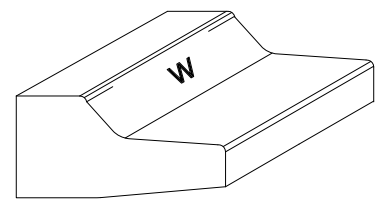
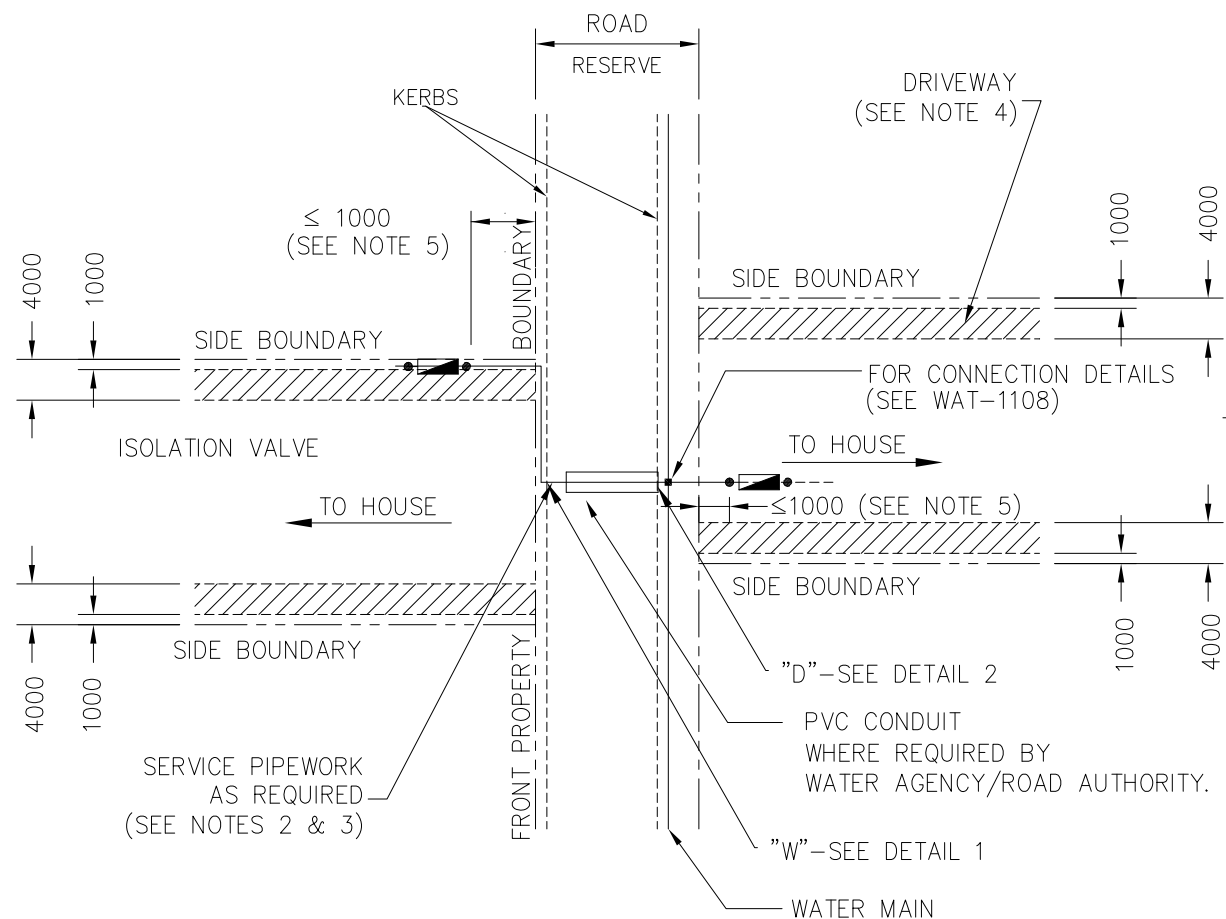
**WATER SERVICES ASSOCIATION
of Australia**

**TYPICAL MAINS CONSTRUCTION
RETICULATION MAIN ARRANGEMENTS**

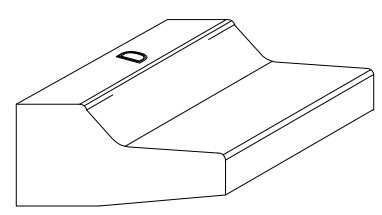
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VERSION 3

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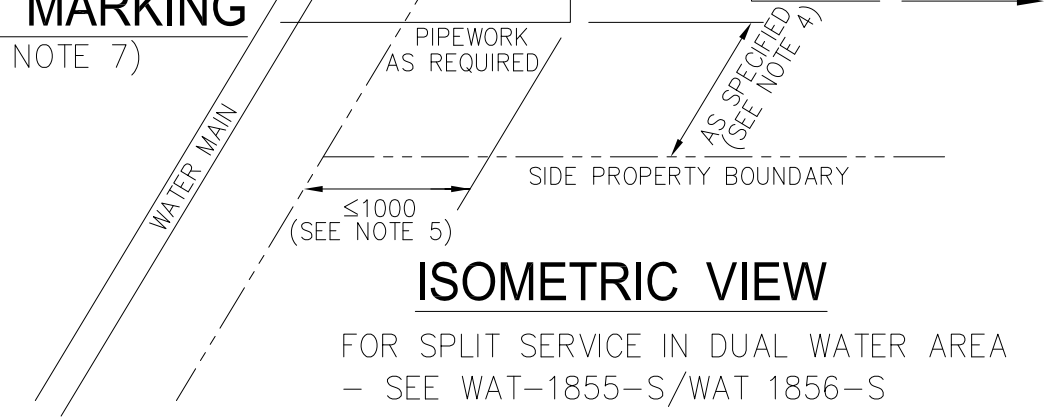


DETAIL 1



DETAIL 2

KERB MARKING
(SEE NOTE 7)



ISOMETRIC VIEW

FOR SPLIT SERVICE IN DUAL WATER AREA
- SEE WAT-1855-S/WAT 1856-S

LEGEND:

- RISERS, ISOLATION VALVE & METER
- DRIVEWAY AREA (NOT TO BE USED FOR METER) (SEE NOTE 4)
- PROPERTY BOUNDARIES

SINGLE SERVICE LOCATION DETAIL

(SEE NOTE 9)

FOR MAIN CONNECTION ARRANGEMENTS AND METER ARRANGEMENT DETAILS SEE WAT-1108 & WAT-1854-S

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. PROPERTY SERVICE PIPEWORK FROM THE MAIN TO METER ASSEMBLY TO BE EITHER
 - COPPER PIPE TYPE A OR B TO AS 1432 (COPPER ALLOY FITTINGS TO AS 3688).
 - POLYETHYLENE PIPE TO WSA 01.
3. WHERE POSSIBLE LAY SERVICE AT RIGHT ANGLES TO WATER MAIN WHERE NOT POSSIBLE, LAY SERVICE PARALLEL TO AND IMMEDIATELY BEHIND KERB AND THEN AT RIGHT ANGLES ACROSS FOOTWAY. LAY MARKING TAPE ON TOP OF PIPEWORK.
4. LOCATE METER RISER RELATIVE TO THE SIDE BOUNDARY AS SHOWN ON DESIGN DRAWINGS. NORMALLY TWO NON-USE STRIPS 3 000 WIDE (SHOWN HATCHED), STARTING 1000 FROM EITHER BOUNDARY, ARE PROVIDED FOR DRIVEWAYS. PREFERRED LOCATION OF SERVICE IS 600 FROM SIDE BOUNDARY.
5. LOCATE METER RISER AND METER WITHIN 1000 OF FRONT BOUNDARY IN ACCORDANCE WITH SYDNEY WATER'S "GUIDELINES FOR METER INSTALLATION".
6. ORIENTATE METER AT RIGHT ANGLES TO FRONT PROPERTY BOUNDARY.
7. PERMANENTLY MARK CONCRETE KERB WITH A "W" IN LINE WITH THE CONDUIT ACROSS THE ROAD -ETCH IN FACE OF KERB AND PAINT YELLOW. PERMANENTLY MARK CONCRETE KERB WITH A "D" (FOR DRINKING WATER) IN LINE WITH MAINTAP FOR EACH SERVICE UNLESS AUTHORISED BY SYDNEY WATER TO OMIT MARKING-ETCH IN TOP OF KERB AND PAINT BLUE.
8. LOCATE PIPEWORK IN THE ROAD RESERVE TO SUIT WATER AGENCY REQUIREMENTS.

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Mullard
for PROCESS LEADER, WATER OPERATIONS

APPROVED
B Nelson 28/03/03
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Sydney WATER

WITH ACKNOWLEDGMENT TO
WATER SERVICES ASSOCIATION of Australia

WATER SUPPLY CODE WSA-03

PROPERTY SERVICES

SINGLE SERVICE MAIN TO METER

Sydney **WATER**

WAT-1106-V

ISSUED 2012 | VERSION 3

PREPARING THE TEST AREA:

CONDUCT ALL NATIVE SOIL IDENTIFICATION TESTS ON A FRESHLY EXPOSED, DAMP, HAND-TRIMMED AREA OF THE TRENCH WALL IN THE PIPE ZONE. TAKE CARE THAT THE SOIL IN THE EXPOSED TEST AREA IS NOT COMPACTED OR LOOSENED DURING TRENCH EXCAVATION. IF THE SOIL IN THE TRENCH FLOOR AND WALL IS VERY DRY AT THE TIME THE TRENCH IS OPENED THEN FLOOD THE TEST AREA AND ALLOW TIME FOR THE WATER TO BE ABSORBED BY THE SOIL BEFORE IT IS TRIMMED AND TESTED.

IDENTIFYING CLAY SOILS:

A LUMP OF CLAY SOIL WILL BE DIFFICULT TO BREAK WHEN DRY. IT WILL BE STICKY AND NEED SOME EFFORT TO MOULD WITH THE FINGERS WHEN WET. CLAY WILL NOT WASH OFF EASILY. INDIVIDUAL CLAY PARTICLES ARE HARD TO SEE.

TESTING CLAY SOILS:

CLAY SOILS ARE BEST TESTED IN THE WALL OF THE TRENCH. THE FIST, THE THUMB OR THE THUMBNAIL ARE USED TO DETERMINE THE CONSISTENCY (STRENGTH) OF THE CLAY (SEE TABLE.)

IDENTIFYING CLEAN SAND SOILS:

THE INDIVIDUAL GRAINS OF SAND WILL BE VISIBLE TO THE EYE. A LUMP OF CLEAN SAND, IF IT CAN BE PICKED UP AT ALL, WILL CRUMBLE WITH VERY LITTLE EFFORT. CLEAN SAND WASHES OFF EASILY.

TESTING CLEAN SAND SOILS:

CLEAN SAND SOILS ARE BEST TESTED IN THE FLOOR OF THE TRENCH BY PUSHING WITH THE WHOLE BODY WEIGHT ON ONE FOOT. THE DEPTH OF THE DEPRESSION LEFT BY THE BOOT IS RELATED TO THE DENSITY OF THE SAND (SEE TABLE). TAKE CARE TO ENSURE THAT THE SAND IN THE TRENCH FLOOR WAS NOT COMPACTED OR LOOSENED DURING THE EXCAVATION OF THE TRENCH OR THE TRIMMING OF THE TEST AREA.


TESTING ROCK:

THE RECOMMENDED FIELD IDENTIFICATION TESTS FOR ROCK RELY ON OBSERVING THE EASE WITH WHICH THE ROCK CAN BE DUG WITH A PICK, AND ESTIMATING THE SPACING OF THE JOINTS IN THE ROCK. (JOINTS ARE COMMONLY CALLED CRACKS OR BREAKS). THE SPACING BETWEEN JOINTS IS IMPORTANT BECAUSE THE ALLOWABLE BEARING PRESSURE ON ROCK IS USUALLY CONTROLLED BY THE JOINTS IN IT, RATHER THAN THE INHERENT STRENGTH OF A FRAGMENT OF ROCK. JOINTS MAY BE TIGHTLY CLOSED (LIKE HAIRLINE CRACKS), BUT CAN ALSO BE OPEN (FILLED WITH AIR) OR FILLED WITH SOFT CLAY OR OTHER SOIL.

SOIL CLASSIFICATION		FIELD IDENTIFICATION TEST	AHBP kPa ▲
CLAY SOILS	VERY SOFT	EASILY PENETRATED 40 mm WITH FIST.	< 50 *
	SOFT	EASILY PENETRATED 40 mm WITH THUMB.	< 50 *
	FIRM	MODERATE EFFORT NEEDED TO PENETRATE 30 mm WITH THUMB.	< 50 *
	STIFF	READILY INDENTED WITH THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.	50
	VERY STIFF	READILY INDENTED WITH THUMBNAIL.	100
	HARD	INDENTED WITH DIFFICULTY BY THUMBNAIL.	200
SANDS	LOOSE CLEAN SAND	TAKES FOOTPRINT MORE THAN 10 mm DEEP.	< 50 *
	MEDIUM-DENSE CLEAN SAND	TAKES FOOTPRINT 3 mm TO 10 mm DEEP.	50
	DENSE CLEAN SAND OR GRAVEL	TAKES FOOTPRINT LESS THAN 3 mm DEEP.	100
ROCK	BROKEN OR DECOMPOSED ROCK	DIGGABLE. HAMMER BLOW "THUDS". JOINTS (BREAKS IN ROCK) SPACED AT LESS THAN 300 mm APART.	100
	SOUND ROCK	NOT DIGGABLE WITH PICK. HAMMER BLOW "RINGS" JOINTS (BREAK IN ROCK) SPACED MORE THAN 300 mm APART.	200
UNCOMPACTED FILL DOMESTIC REFUSE		OBSERVATION AND KNOWLEDGE OF THE SITE HISTORY.	< 50 *

LEGEND

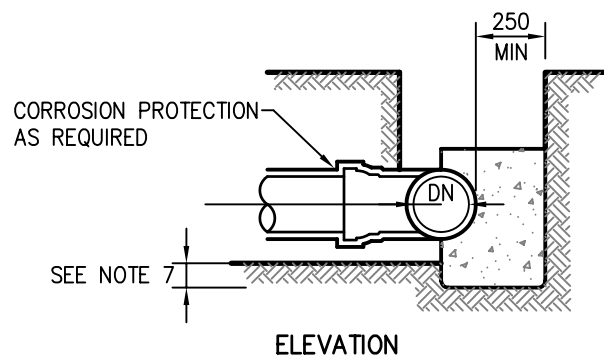
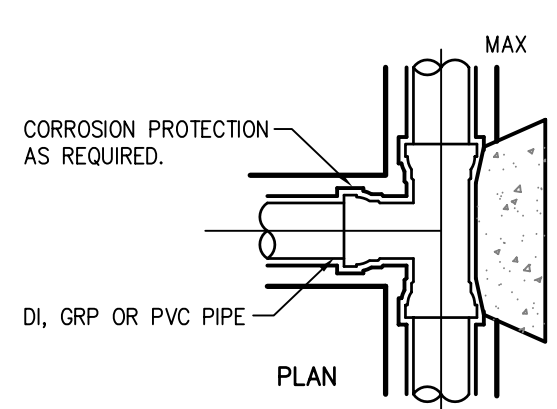
- ▲ AHBP ALLOWABLE HORIZONTAL BEARING PRESSURE FOR:
 - 10 mm MOVEMENT.
 - CENTRE OF THRUST 800 mm BELOW THE NATURAL SURFACE LEVEL.
 - HIGH WATER TABLE.
- * SPECIAL GEOTECHNICAL ASSESSMENT REQUIRED

 WATER SERVICES ASSOCIATION <i>of Australia</i>	WATER SUPPLY CODE OF AUSTRALIA	NOT TO SCALE
	SOIL CLASSIFICATION GUIDELINES AND ALLOWABLE BEARING PRESSURES FOR ANCHORS AND THRUST BLOCKS	WAT-1200
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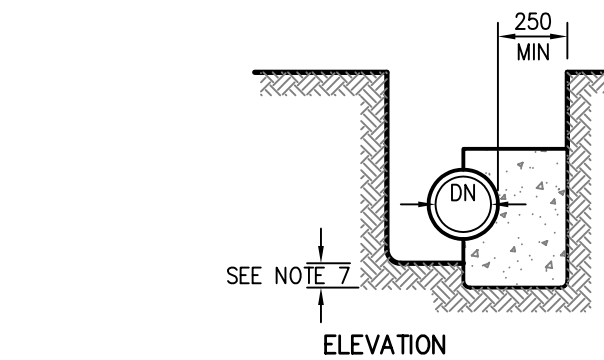
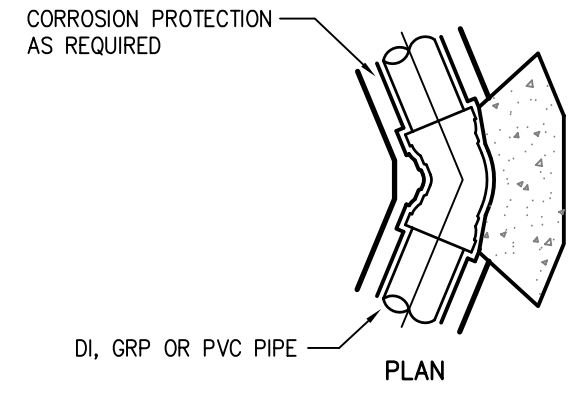
MINIMUM THRUST AREA FOR BLOCKS IN SQUARE METRES (m²)
DESIGN PRESSURE 1000 kPa (NOM. 100 m HEAD)

SOIL CLASSIFICATION AND ALLOWABLE HORIZONTAL BEARING PRESSURE OF GROUND. (SEE NOTE 3)	MINIMUM THRUST AREA FOR BLOCKS IN SQUARE METRES (m ²) DESIGN PRESSURE 1000 kPa (NOM. 100 m HEAD)																
	90° & 60° HORIZONTAL BENDS			45° & 30° HORIZONTAL BENDS			22.5° HORIZONTAL BENDS			11.25° HORIZONTAL BENDS			TEES AND DEAD ENDS				
NOMINAL DIAMETER OF FITTING (DN)	STIFF CLAY	MEDIUM DENSE CLEAN SAND	VERY STIFF CLAY DENSE SAND/GRAVEL DECOMPOSED ROCK	STIFF CLAY	MEDIUM DENSE CLEAN SAND	VERY STIFF CLAY DENSE SAND/GRAVEL DECOMPOSED ROCK	STIFF CLAY	MEDIUM DENSE CLEAN SAND	VERY STIFF CLAY DENSE SAND/GRAVEL DECOMPOSED ROCK	STIFF CLAY	MEDIUM DENSE CLEAN SAND	VERY STIFF CLAY DENSE SAND/GRAVEL DECOMPOSED ROCK	STIFF CLAY	MEDIUM DENSE CLEAN SAND	VERY STIFF CLAY DENSE SAND/GRAVEL DECOMPOSED ROCK	HARD CLAY	SOUND ROCK
	PBH kPa	50	100	200	50	100	200	50	100	200	50	100	200	50	100	200	50
100	0.34	0.17	N	0.18	N	N	0.10	N	N	N	N	N	0.24	0.12	N		
150	0.70	0.35	0.18	0.38	0.19	0.10	0.20	0.10	N	0.10	N	N	0.50	0.25	0.13		
200	1.20	0.60	0.30	0.65	0.33	0.17	0.33	0.17	N	0.17	N	N	0.85	0.43	0.22		
225	1.49	0.75	0.38	0.81	0.41	0.21	0.42	0.21	0.11	0.21	0.11	N	1.06	0.53	0.27		
250	1.82	0.91	0.46	0.99	0.50	0.25	0.51	0.26	0.13	0.26	0.13	N	1.29	0.65	0.33		
300	2.65	1.33	0.67	1.43	0.72	0.36	0.73	0.37	0.19	0.37	0.19	0.10	1.87	0.94	0.47		
375	4.03	2.02	1.01	2.18	1.09	0.55	1.12	0.56	0.28	0.56	0.28	0.14	2.85	1.43	0.72		
450	5.71	2.86	1.43	3.09	1.55	0.78	1.58	0.79	0.40	0.80	0.40	0.20	4.04	2.02	1.01		
500	6.96	3.48	1.74	3.77	1.89	0.95	1.93	0.97	0.49	0.97	0.49	0.25	4.93	2.47	1.24		
600	9.88	4.94	2.47	5.35	2.68	1.34	2.73	1.37	0.69	1.37	0.69	0.35	6.99	3.50	1.75		
750	15.15	7.58	3.79	8.20	4.10	2.05	4.18	2.09	1.05	2.10	1.05	0.53	10.71	5.36	2.68		

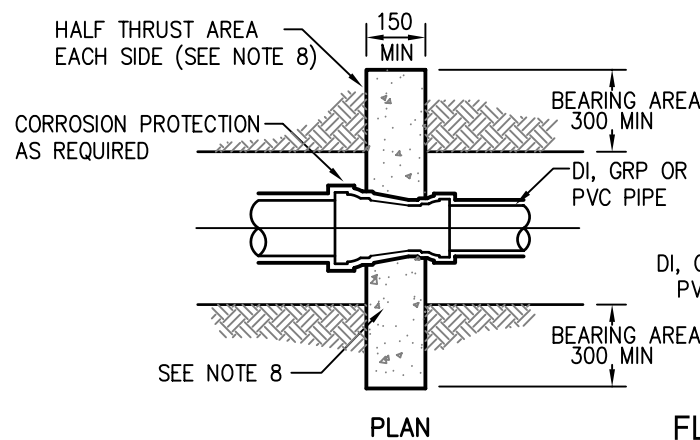
'N' DENOTES NOMINAL THRUST AREA - (SEE NOTES 4&5)
PBH - ALLOWABLE HORIZONTAL BEARING PRESSURE



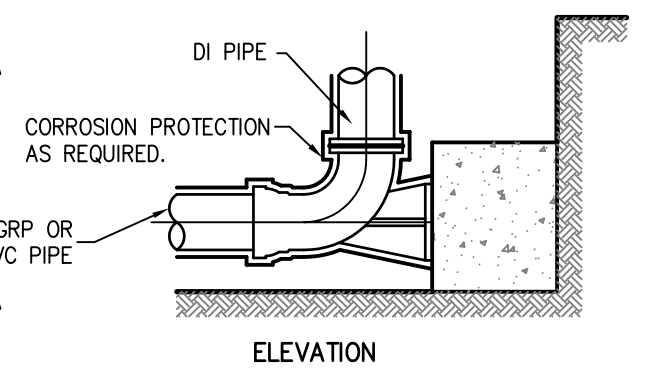
THRUST BLOCK FOR TEES
(FOR HORIZONTAL THRUST)



THRUST BLOCK FOR BENDS
(FOR HORIZONTAL THRUST)



TAPER THRUST BLOCK
(FOR HORIZONTAL THRUST)



FLUSHING/WASHOUT BEND THRUST BLOCK
(FOR HORIZONTAL THRUST)
(MINIMUM REQUIRED THRUST AREA AS PER DEAD END)

NOTES:

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
- CAST THE THRUST AREA OF ALL THRUST BLOCKS AGAINST A CLEAN FACE OF UNDISTURBED NATURAL SOIL. THRUST BLOCKS NOT TO INTERFERE WITH OTHER SERVICES.
- SOIL CLASSIFICATIONS USED ON THIS DRAWING ARE EXPLAINED IN WAT-1200.
- DO NOT USE STANDARD THRUST BLOCKS AS SPECIFIED IN THIS DRAWING IN:
 - VERY SOFT, SOFT OR FIRM CLAY.
 - LOOSE CLEAN SAND.
 - UNCOMPACTED FILL OR REFUSE.
 A GEOTECHNICAL ASSESSMENT AND INDIVIDUAL DESIGN IS REQUIRED FOR THESE SOILS.
- THE NOMINAL THRUST AREA 'N' TO BE ACHIEVED BY POURING CONCRETE THE FULL LENGTH OF THE FITTING AND EXTENDING FROM THE FLOOR OF THE TRENCH TO ABOVE THE FITTING (SEE ALSO NOTE 7).
- DESIGN PRESSURES OTHER THAN 1000 kPa REDUCE OR INCREASE THE MINIMUM THRUST AREA BY THE RATIO OF THE DESIGN PRESSURES EXCEPT WHERE:
 - MIN THRUST AREA IS 0.1 m^2, AND
 - 'N' APPEARS IN THE TABLE AND DESIGN PRESSURE IS ABOVE 1000 kPa CALCULATE THE AREA.
- FINISH THRUST BLOCKS APPROXIMATELY 100 ABOVE THE TOP OF THE FITTING OR BEARING PAD AND EXTEND TO THE FLOOR OF THE TRENCH OR DEEPER IF NECESSARY TO ACHIEVE THE REQUIRED THRUST AREA. MAXIMUM ENCASEMENT TO BE 180°.
- THE MINIMUM THRUST AREA FOR TAPER THRUST BLOCKS TO BE EQUAL TO THE DIFFERENCE BETWEEN THE THRUST AREAS FOR DEAD ENDS OF EQUIVALENT DIAMETER TO THOSE EACH SIDE OF TAPER.
- FOR DOWNWARD VERTICAL THRUST, THE ALLOWABLE BEARING PRESSURES FOR VARIOUS SOILS MAY BE TAKEN AS TWICE THAT FOR HORIZONTAL THRUST SHOWN.
- WHEN POURING CONCRETE AGAINST FITTINGS PLACE A MEMBRANE OF POLYETHYLENE, PVC OR FELT BETWEEN THE FITTING AND CONCRETE TO PREVENT DAMAGE TO THE FITTING. JOINTS TO BE CLEAR OF CONCRETE.
- CONCRETE THRUST BLOCKS AND ANCHORS FOR VALVES TO BE AS DETAILED IN WAT-1207.



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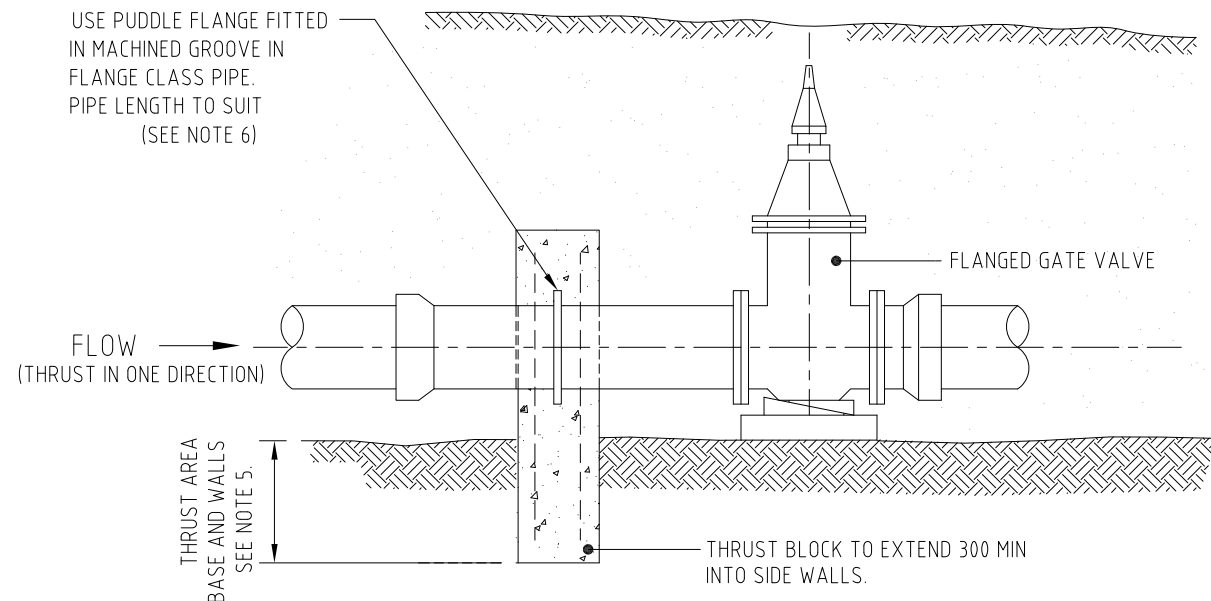
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THRUST BLOCK DETAILS
CONCRETE BLOCKS

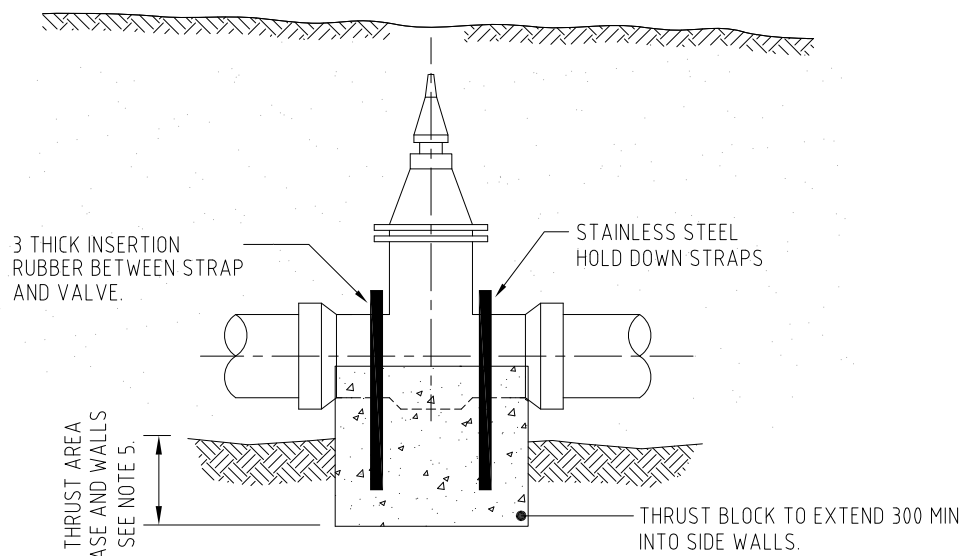
NOT TO SCALE

WAT-1205

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FLANGED VALVES



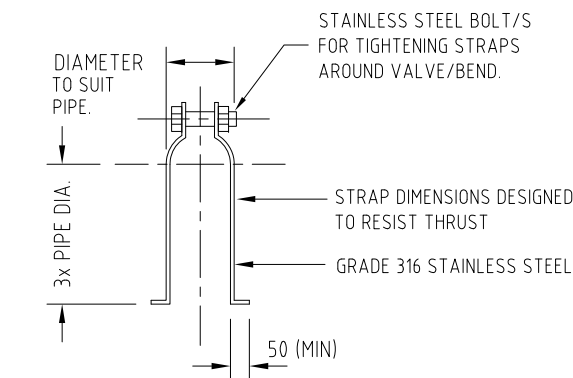
SOCKETED VALVES

NOTES:

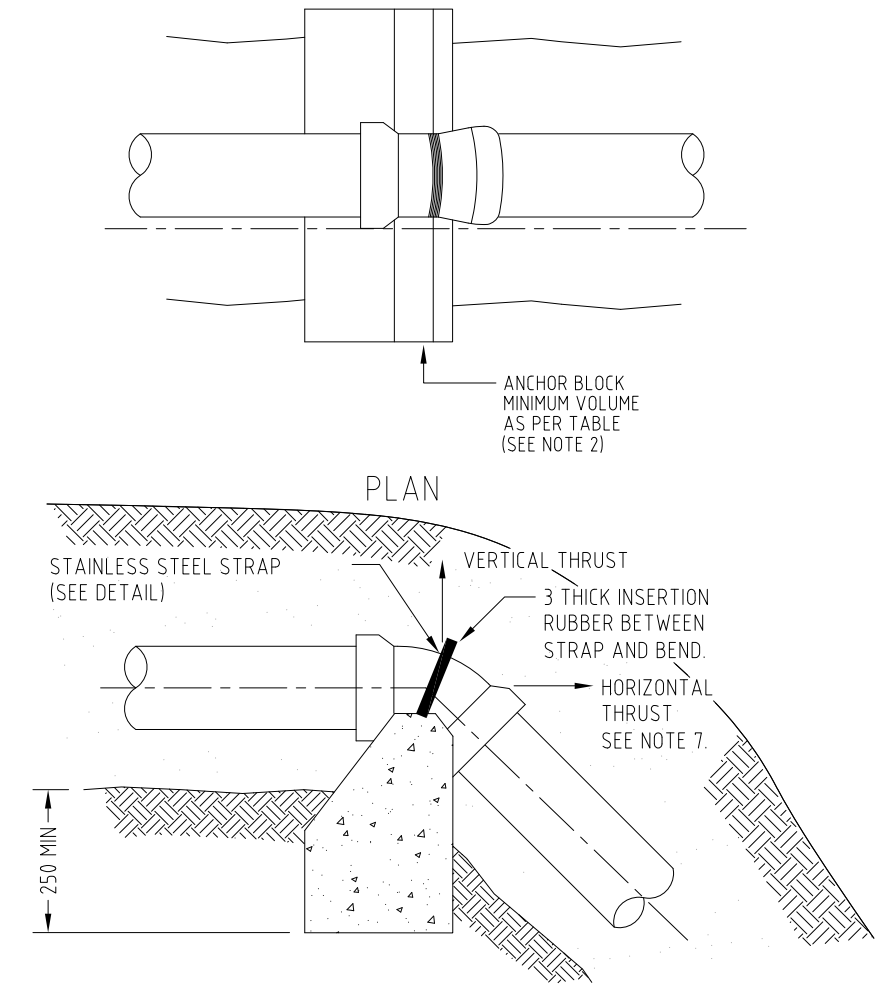
- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN.
- ANCHOR BLOCKS IN THE TABLE ARE DESIGNED FOR A TEST PRESSURE OF 1000 kPa (100 m HEAD). ADJUST CONCRETE VOLUME TO SUIT ACTUAL TEST PRESSURE.
- WHERE DI PIPES AND FITTINGS WITH RESTRAINED JOINTS ARE USED THRUST BLOCKS ARE NOT REQUIRED. SEE WAT-1208.
- THRUST BLOCK REINFORCEMENT AS SPECIFIED IN DESIGN DRAWINGS.
- WHERE SPECIFIED PROVIDE CONCRETE THRUST BLOCKS FOR SOC-SOC VALVES. THRUST AREA TO BE AS FOR DEAD ENDS AS SHOWN IN WAT-1205.
- INSTALL PUDDLE FLANGES ON FLANGE CLASS DI CL PIPE.
- DESIGN OF ANCHOR BLOCKS AT VERTICAL BENDS TO INCLUDE ALLOWANCE FOR THE HORIZONTAL COMPONENT OF THRUST. NOTE THAT BEARING AREAS AS PER WAT-1205 MAY NOT BE APPROPRIATE.

MINIMUM BLOCK VOLUME FOR ANCHORAGE OF VERTICAL COMPONENT OF THRUST				
VERTICAL BENDS FOR TEST PRESSURE OF 1000 kPa (SEE NOTE 2)				
PIPE DN	TYPICAL PIPE OD	CONCRETE VOLUME m ³		
		11.25° BEND	22.5° BEND	45° BEND
100	122	0.1	0.2	0.35
150	177	0.2	0.4	0.75
200	232	0.35	0.7	1.25
225	259	0.45	0.85	1.6
250	286	0.55	1.05	1.95
300	345	0.75	1.5	2.8
375	426	1.2	2.3	4.3
450	507	DETAILED DESIGN REQUIRED (ALTERNATIVE METHODS TO BE CONSIDERED)		
500	560			
600	667			
750	826			

IN CALCULATING THE CONCRETE VOLUME NO CONTRIBUTION FROM THE PIPELINE SELF WEIGHT HAS BEEN INCLUDED



TYPICAL SS STRAP



VERTICAL BENDS

ANCHOR BLOCK CONSTRUCTION NOTES:

- LOCATE ANCHOR BLOCK CENTRALLY AROUND BEND.
- KEY ANCHOR BLOCK INTO BASE OF TRENCH A MINIMUM DEPTH OF 250.
- POUR CONCRETE AGAINST A SOLID EXCAVATION FACE.
- USE GRADE N20 CONCRETE.
- KEEP CONCRETE CLEAR OF ALL BOLTS, NUTS AND PIPE JOINTS.

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**THRUST AND ANCHOR BLOCKS
GATE VALVES AND VERTICAL BENDS**

Sydney **WATER**

WAT-1207-V

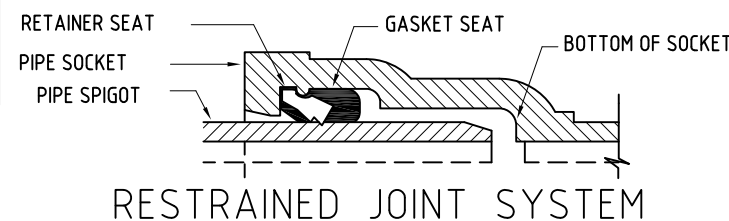
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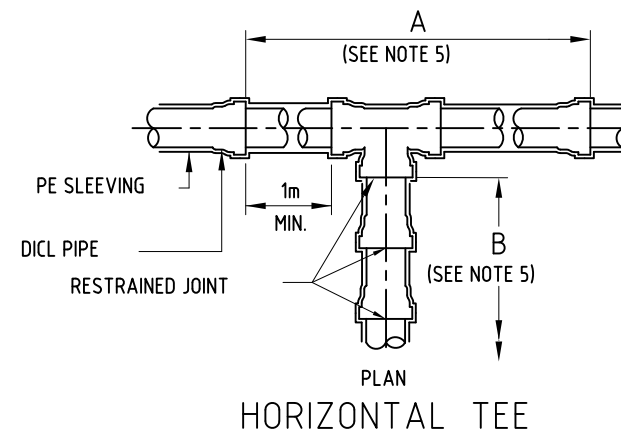
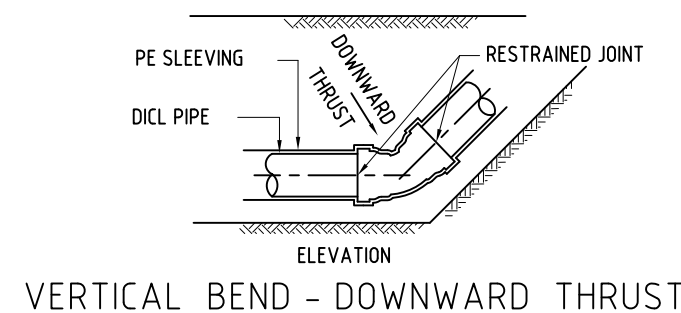
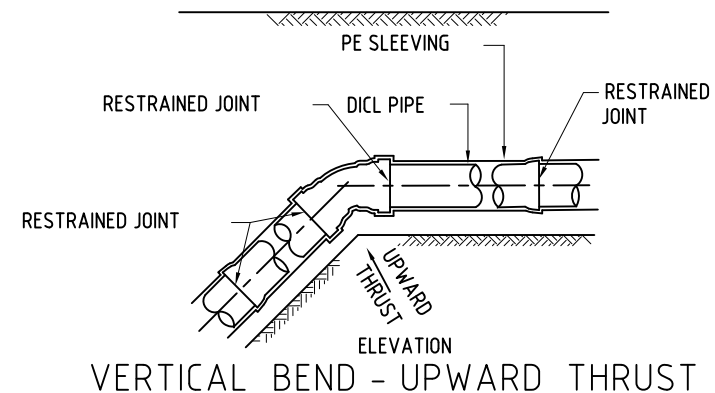
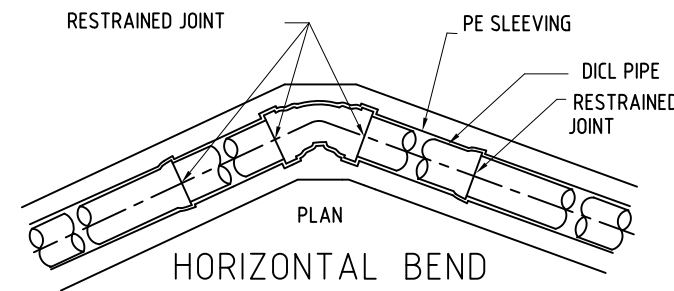
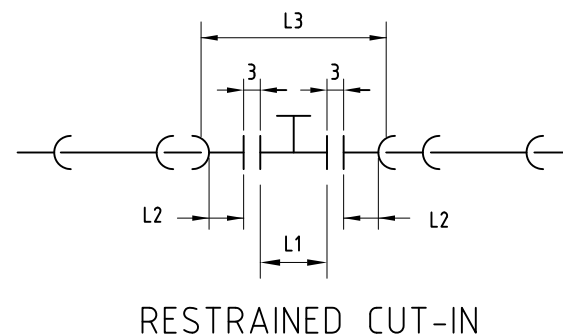
DN	BENDS (SEE NOTE 3)										DEAD ENDS (m)
	HORIZONTAL				VERTICAL						
	11 1/2° (m)	22 1/2° (m)	45° (m)	90° (m)	UPWARD THRUST			DOWNWARD THRUST			
	11 1/2° (m)	22 1/2° (m)	45° (m)	90° (m)	11 1/2° (m)	22 1/2° (m)	45° (m)	11 1/2° (m)	22 1/2° (m)	45° (m)	
100	0.8	1.6	3.4	8.1	2.4	4.9	10.2	0.8	1.6	3.4	24.7
150	1.1	2.2	4.6	11.2	3.4	6.9	14.4	1.1	2.2	4.6	34.7
200	1.4	2.8	5.9	14.2	4.4	8.8	18.4	1.4	2.8	5.9	44.4
250	1.6	3.1	6.5	15.8	4.9	9.8	20.5	1.6	3.1	6.5	49.4
300	1.8	3.7	7.7	18.5	5.8	11.7	24.4	1.8	3.7	7.7	58.9

TEES (SEE NOTE 5)				
MAIN PIPE DN	BRANCH PIPE DN	MIN. DISTANCE BETWEEN JOINTS 'A'		
		2 m	5.5 m	11 m
		RESTRAINED LENGTH 'B' (m)	RESTRAINED LENGTH 'B' (m)	RESTRAINED LENGTH 'B' (m)
100	100	20.6	13.4	2.2
150	100	17.4	7.0	0.2
	150	30.5	23.2	11.6
200	100	14.8	1.1	0.2
	150	28.0	18.4	3.3
250	100	10.6	0.2	0.2
	150	23.1	11.3	0.2
	200	34.5	25.3	10.9
300	100	8.0	0.2	0.2
	150	20.9	6.6	0.2
	200	32.2	21.2	3.8
	250	42.8	33.7	19.5
375	100	54.6	46.9	34.9
	150	REFER TO MANUFACTURER		
	200	REFER TO MANUFACTURER		
	250	REFER TO MANUFACTURER		
300	REFER TO MANUFACTURER			

TAPERS (SEE NOTE 6)			
LARGE PIPE DN	SMALL PIPE DN	MIN. LENGTH OF SMALL PIPE FOR ONE RESTRAINT (m)	MIN. LENGTH OF LARGE PIPE FOR FULL RESTRAINT (m)
150	100	25.8	18.2
200	100	59.1	32.2
200	150	24.0	18.6
250	100	91.0	40.4
250	150	48.2	30.5
250	200	20.6	16.9
300	100	137.6	51.6
300	150	81.3	43.4
300	200	46.7	32.3
300	250	21.8	18.4
375	100	REFER TO MANUFACTURER	
375	150	REFER TO MANUFACTURER	
375	200	REFER TO MANUFACTURER	
375	250	REFER TO MANUFACTURER	
375	300	REFER TO MANUFACTURER	



DN	RESTRAINED CUT-IN		
	INSERT L1	CONNECTOR L2	OVERALL L3
100	356	110	582
150	406	135	682
200	484	135	760
250	534	155	850
300	610	170	956
375	REFER MANUFACTURER		



NOTES

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
- ALL RESTRAINED LENGTHS ARE APPLICABLE FOR BURIED PIPELINES ONLY. THE MINIMUM LENGTH OF PIPELINE REQUIRED TO BE RESTRAINED IS CALCULATED FROM THE PIPE DIAMETER, FITTING TYPE, STANDARD TRENCH CONDITIONS AND A PIPELINE PRESSURE OF 122 m HEAD.
- THE LENGTH OF RESTRAINT REQUIRED IS THE AMOUNT OF PIPELINE THAT MUST BE RESTRAINED EITHER SIDE OF THE FITTING, INCLUDING THE FITTING JOINTS.
- SPECIAL CONSIDERATION IS REQUIRED IF THE DESIGNATED RESTRAINED LENGTH FOR A FITTING ENCLOSES, OR OVERLAPS THE DESIGNATED RESTRAINED LENGTH FOR ANOTHER FITTING. SEEK MANUFACTURER'S OR DESIGNER'S GUIDANCE.
- THE LENGTH OF RESTRAINT REQUIRED FOR TEES APPLIES TO 'B' (BRANCH) ONLY. THE MINIMUM DISTANCE 'A' BETWEEN JOINTS IS THE MINIMUM DISTANCE BETWEEN THE NEAREST UNRESTRAINED JOINT EITHER SIDE OF THE TEE, NOT INCLUDING THE TEE. RESTRAINT IS NOT REQUIRED IN THE MAIN LINE SOCKETS OR MECHANICAL COUPLINGS, UNLESS ENCLOSED (SEE NOTE 4). HYDRANT TEES AND OTHER NON-THRUST BEARING FITTINGS DO NOT REQUIRE RESTRAINT.
- FOR TAPERS, IF THE MINIMUM LENGTH OF THE ADJACENT SMALL PIPE SIZE OCCURS, WITHOUT ENCLOSED ANOTHER FITTING'S RESTRAINT, THEN ONLY ONE RESTRAINED JOINT IS REQUIRED IN THE LARGE SOCKET OF THE TAPER. IF THE MINIMUM LENGTH OF SMALL PIPE DOES NOT OCCUR THEN, FULL RESTRAINT IS REQUIRED, OF JOINTS IN THE LARGE PIPE, WITHIN THE LENGTH INDICATED.
- TREAT FLUSHING BENDS AS A DEAD END.
- SPECIAL DESIGN REQUIRED FOR 90 DEGREE VERTICAL BENDS.
- PLACE MARKING TAPE FOR IDENTIFICATION OF RESTRAINED SECTIONS OF THE PIPELINE ALONG THE TOP OF THE RESTRAINED PIPE LENGTHS AND FASTEN TO THE PIPE AT NOT LESS THAN 3 m CENTRES. MARKING TAPE TO BE PINK COLOURED POLYETHYLENE TAPE APPROXIMATELY 100 WIDE, WITH THE INSCRIPTION:
"WARNING - RESTRAINED PIPELINE - USE RESTRAINED FITTINGS ONLY".
- WHEN MAINTAINING OR CUTTING RESTRAINED SECTIONS OF PIPELINE IT IS ADVISABLE THAT EFFECTIVE LENGTHS OF FITTINGS BE MEASURED ON SITE TO CONFIRM THEIR COMPLIANCE WITH THIS DRAWING.
- RESTRAINED JOINTS MAY BE ASSUMED TO ACT THE SAME AS A FLANGED JOINT.

ASSEMBLY

- JOINTING TO BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- RESTRAINT VIA LOCKING GASKETS IS ONLY TO BE USED WITH DI PIPES AND FITTINGS FEATURING THE AUTHORISED SOCKET PROFILE. DO NOT USE WITH OTHER DI SOCKET PROFILES OR OTHER PIPE MATERIALS.
- IF MAXIMUM JOINT DEFLECTION IS DESIRED, PUSH THE SPIGOT TO THE FIRST WITNESS MARK ONLY AND THEN DEFLECT THE JOINT. THE JOINT WILL NOT DEFLECT AFTER INSERTING THE SPIGOT ALL THE WAY HOME.

DISASSEMBLY

- JOINTS TO BE DISASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- DO NOT REUSE RESTRAINED JOINT GASKETS.

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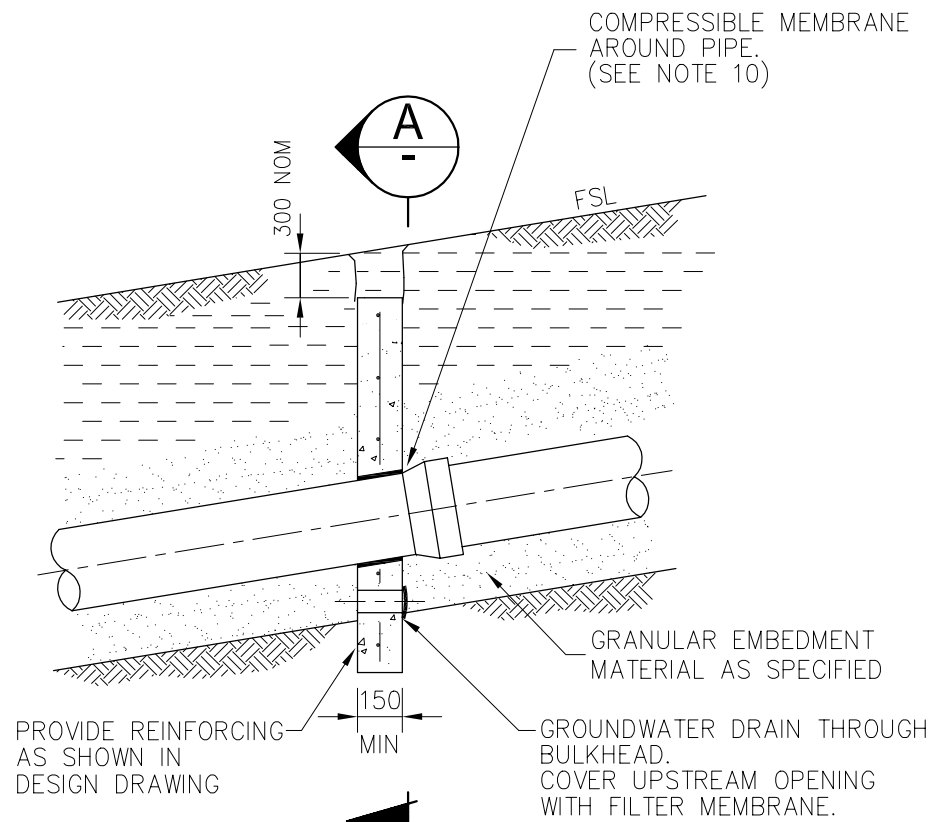
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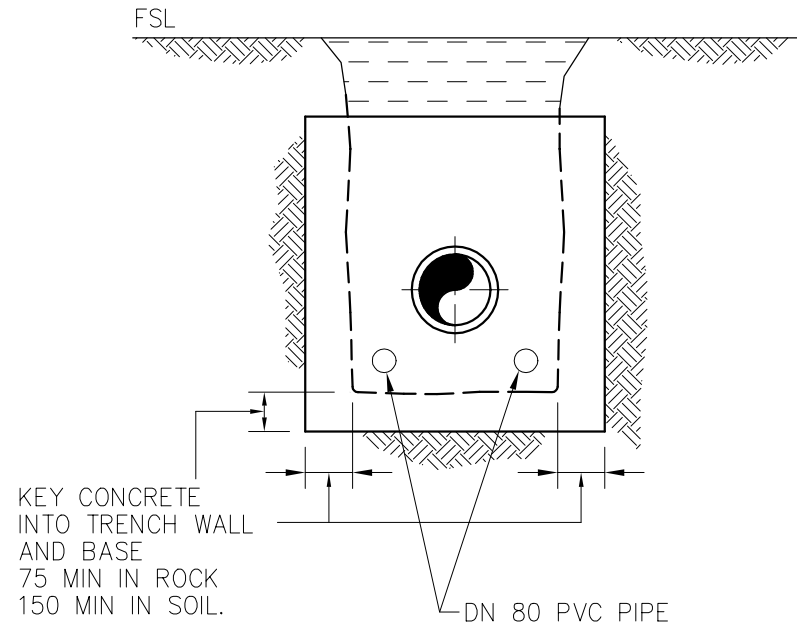
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RESTRAINED JOINT SYSTEM
DN 100 TO DN 375 DI MAINS

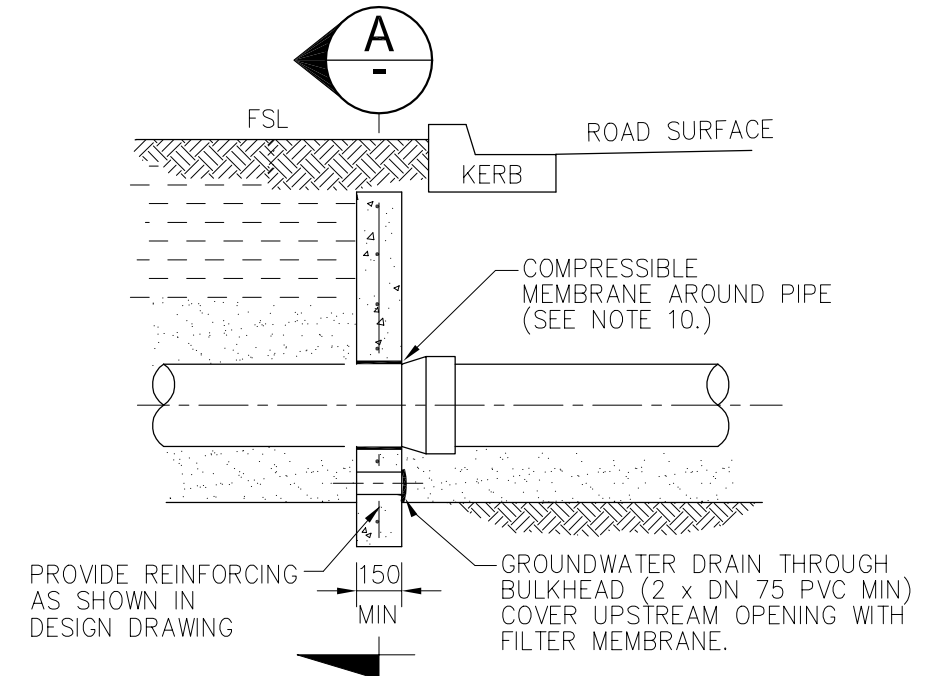
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CONCRETE BULKHEAD DETAIL



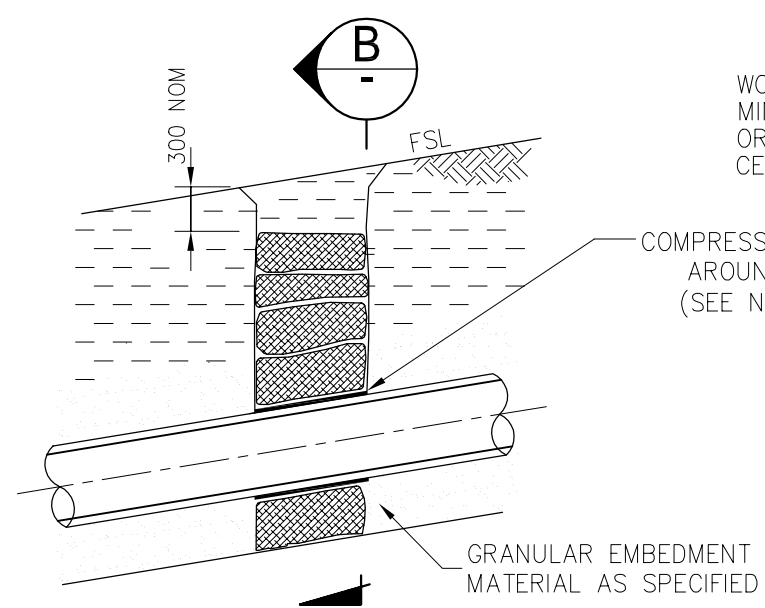
SECTION A



TYPICAL ROAD CROSSING BULKHEAD

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. CONSTRUCT CONCRETE BULKHEADS AND TRENCH STOPS AT LOCATIONS SPECIFIED IN DESIGN DRAWINGS.
3. CONSTRUCT BULKHEAD ADJACENT TO KERB AND GUTTER SHOULDER OF SEALED ROADS.
4. BULKHEAD AT A RETAINING WALL TO BE UNDER THE WALL.
5. KEY CONCRETE BULKHEADS INTO SIDES AND BOTTOM OF TRENCH AGAINST A BEARING SURFACE OF UNDISTURBED SOIL.
6. CONCRETE TO BE CLASS N25.
7. DO NOT DEFORM PIPES DURING PLACEMENT OF CONCRETE.
8. SEAL BAGS TO PREVENT LEAKAGE OF CONTAINED MATERIAL.
9. PROVIDE A CONTINUOUS DRAINAGE PATH
 - THROUGH BULKHEADS AND TRENCHSTOPS
 - AROUND VALVE CHAMBERS.
 - IN TRENCH EXCAVATIONS ACROSS ROADWAYS.
 TRENCH DRAINAGE TO BE IN ACCORDANCE WITH WAT-1210.
10. COMPRESSION MEMBRANE AROUND PIPE TO BE 10 THICK POLYSTYRENE FOR BULKHEADS ADJACENT TO KERBS AND 3 THICK RUBBER FOR BULKHEADS AND TRENCHSTOPS ON SLOPES.
11. FOR SLOPES >30% CONTINUOUSLY ENCASE THE PIPE TO PREVENT MOVEMENT AND TRANSFER OF GROUND WATER. WRAP JOINTS TO PREVENT DAMAGE TO RRJ.



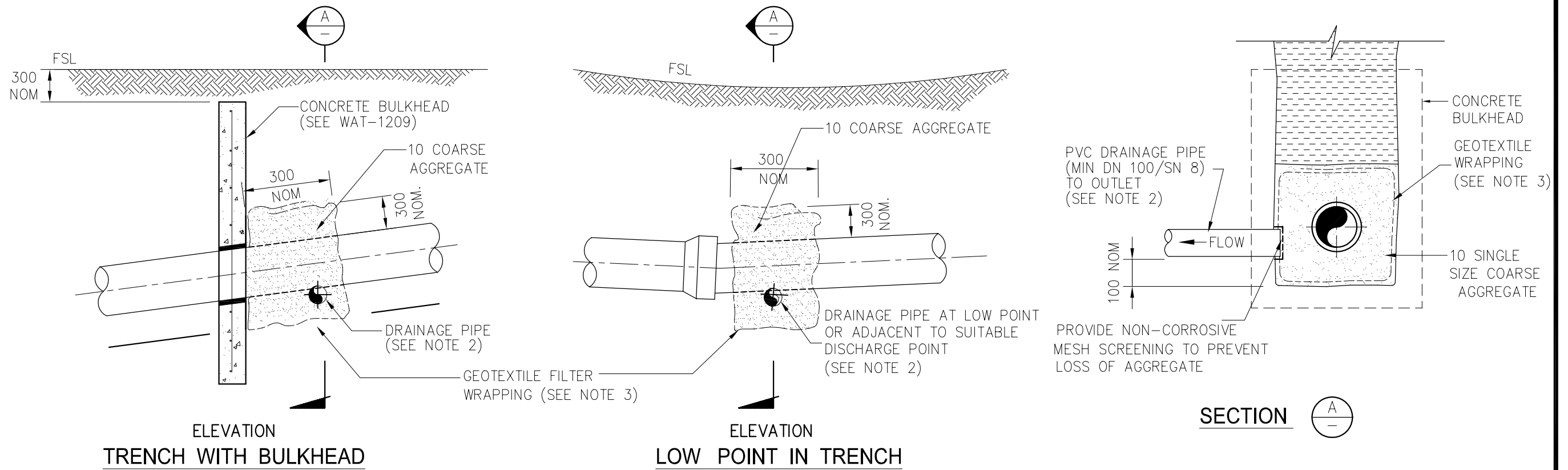
TRENCH STOP DETAIL

SECTION B

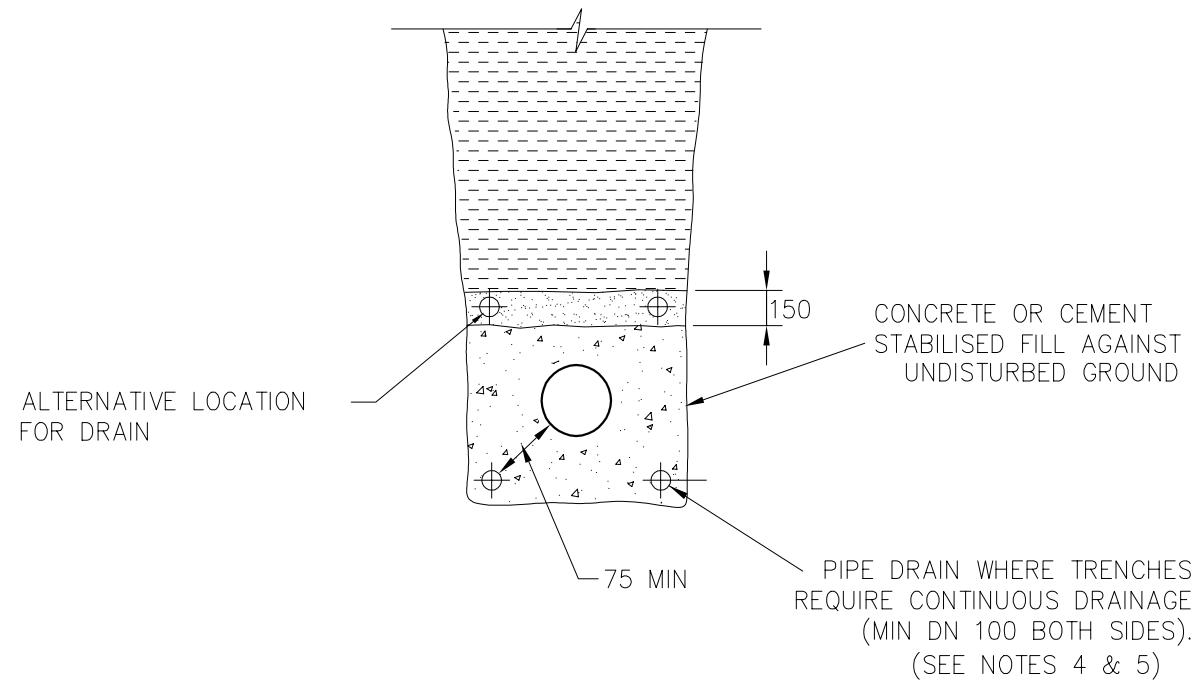
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	TRENCH DRAINAGE BULKHEADS & TRENCHSTOP	WAT-1209
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ADDITIONAL INFORMATION PROVIDED IN WAT-1200 SERIES COMMENTARY

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TYPICAL DISCHARGE SYSTEM FOR PIPE TRENCHES



TRENCH DRAINAGE FOR CONCRETE ENCASEMENT/STABILISATION

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. DRAINAGE PIPES TO DISCHARGE INTO AUTHORISED WATER DISCHARGE AREAS (AS SHOWN IN DESIGN DRAWINGS).
3. LAY GEOTEXTILE FILTER FABRIC IN TRENCH SUCH THAT IT FULLY ENCAPSULATES THE DRAINAGE MATERIAL (COARSE AGGREGATE). PROVIDE MINIMUM OF 250 LAP AT ALL FILTER FABRIC JOINTS.
4. PROVIDE CONTINUOUS DRAINAGE PATH:
 - THROUGH BULKHEADS.
 - IN TRENCH EXCAVATIONS ACROSS ROADWAY.
5. WHERE REINFORCING IS USED LOCATE DRAIN INSIDE THE REINFORCING. DEPTH MAY NEED TO BE INCREASED TO COMPENSATE.



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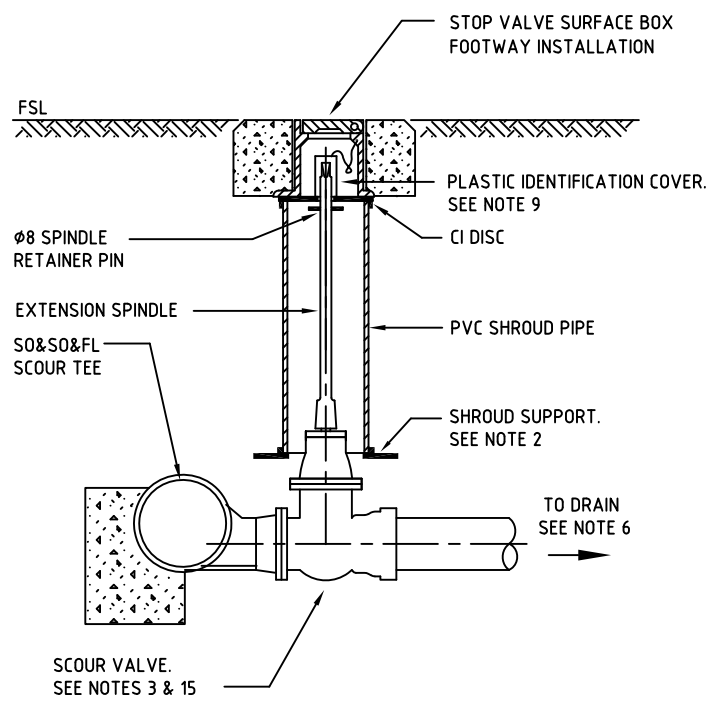
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TRENCH DRAINAGE
TYPICAL SYSTEMS

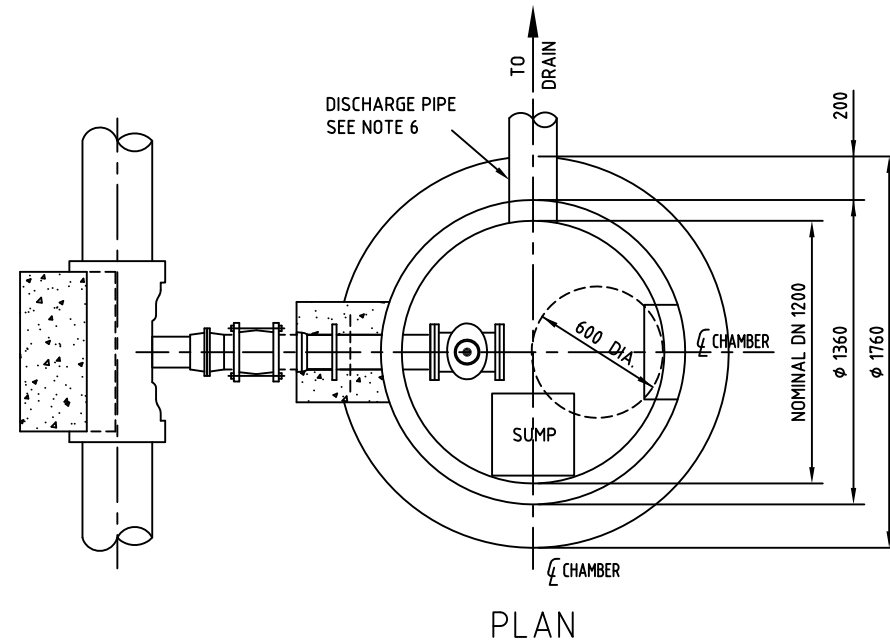
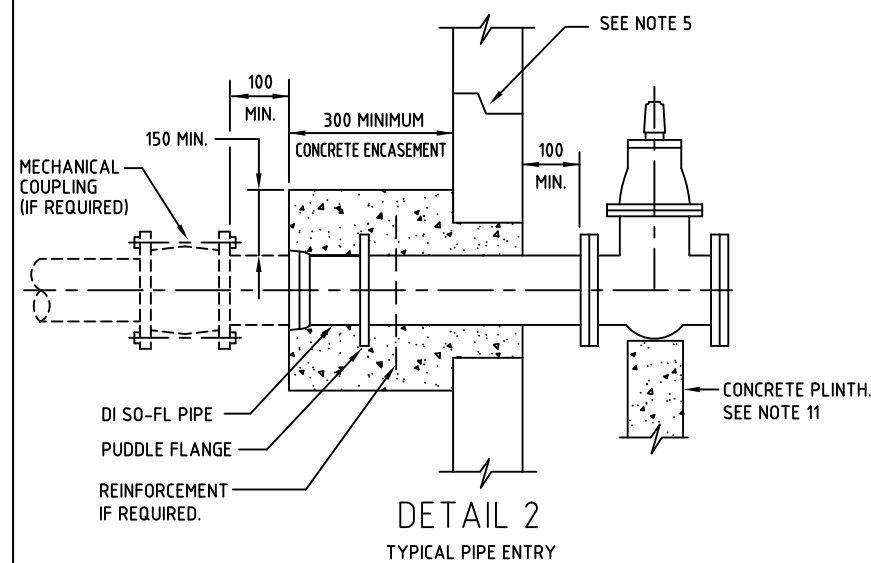
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WAT-1210

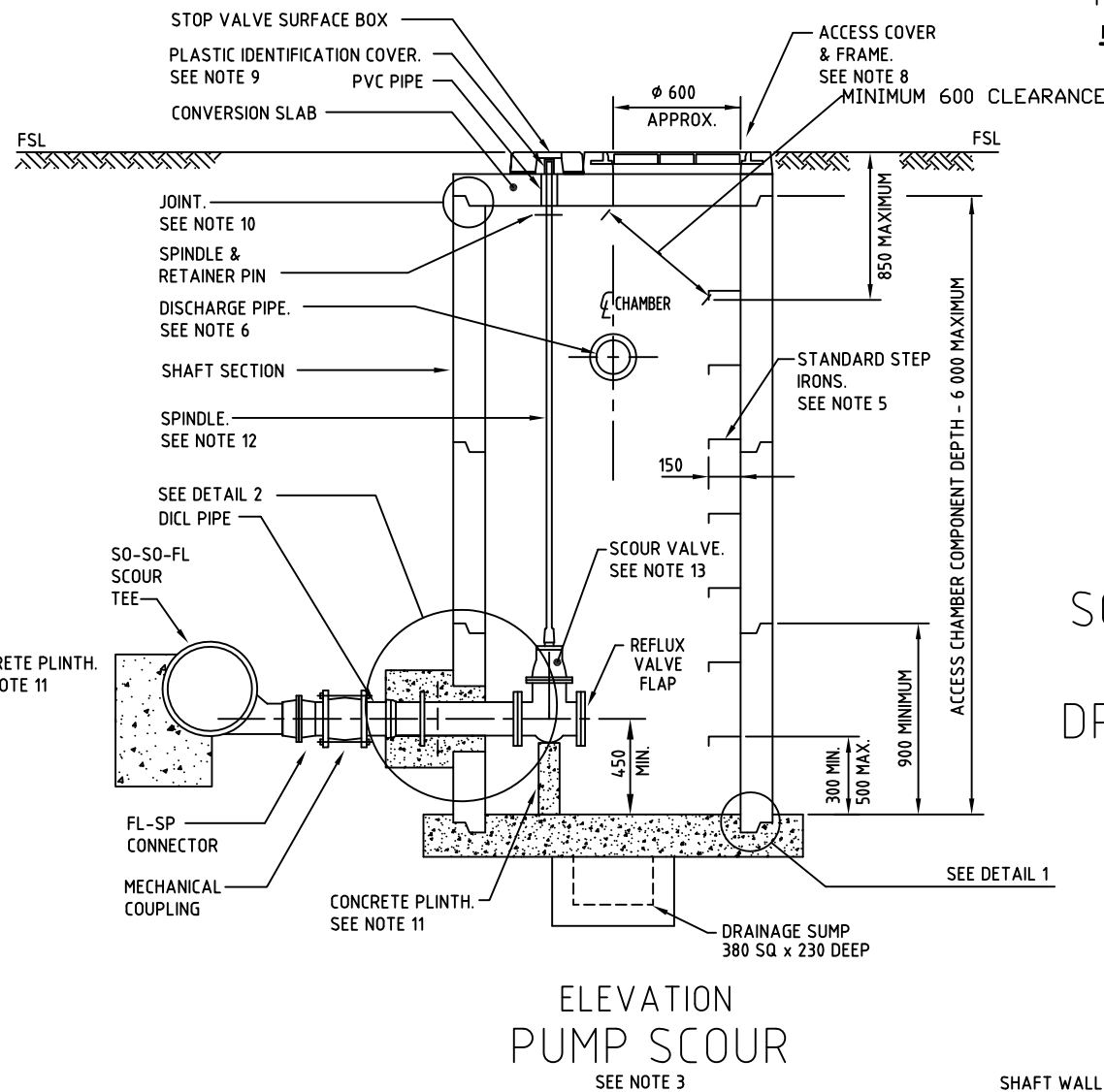
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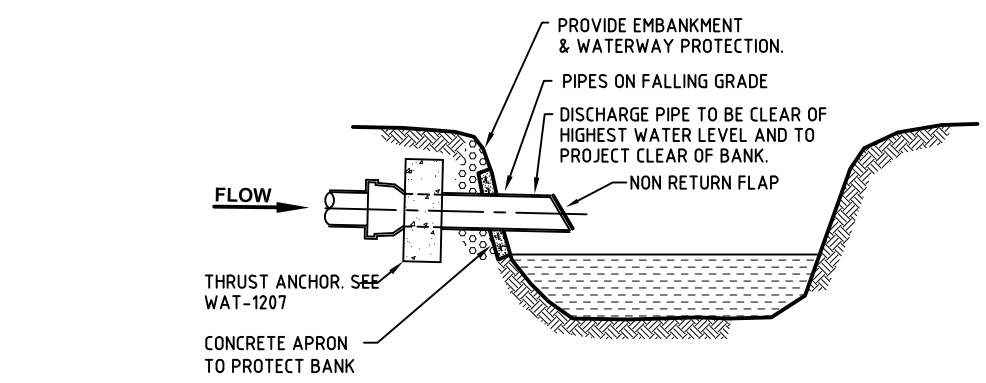
GRAVITY SCOUR
SEE NOTE 3



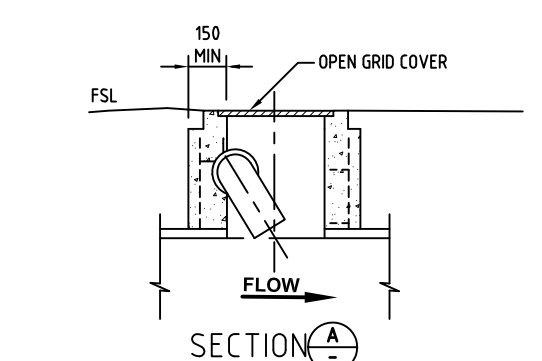
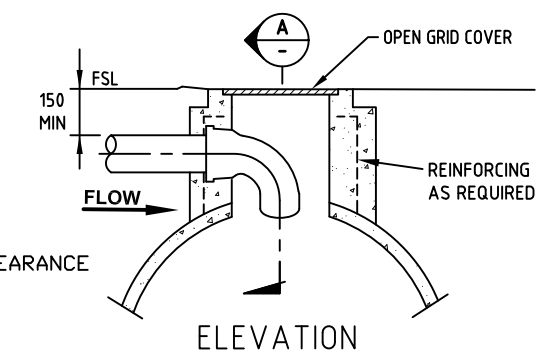
PLAN



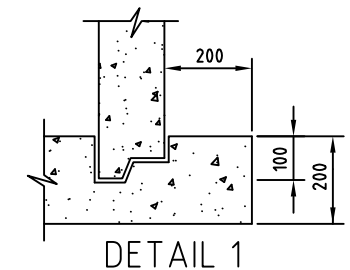
ELEVATION PUMP SCOUR
SEE NOTE 3



SCOUR DISCHARGE TO STORAGE LAGOON



SCOUR DISCHARGE TO APPROVED DRAINAGE SYSTEM



SHAFT WALL UNIT CONNECTION TO CAST IN-SITU BASE SLAB

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWINGS: WAT 1303-V/1304-V "INSTALLATION - SLUICE VALVES FOR DN 100 TO DN 375 MAINS" AND WAT-1301-S "TYPICAL VALVE & HYDRANT INSTALLATION, SHROUD PIPES & FITTINGS ASSEMBLY."
3. TYPE OF SCOUR INSTALLATION, LOCATION AND DISCHARGE ARRANGEMENT TO BE AS SPECIFIED IN THE DESIGN DRAWINGS.
4. TYPES OF SCOUR INSTALLATION.
GRAVITY SCOUR - WHERE SCOUR BRANCH DISCHARGES TO A GRAVITY DRAIN AND A SCOUR CHAMBER IS NOT REQUIRED, THEN A PARTIAL TYPE PIPE SURROUND FOR PROTECTION OF INVERT SCOUR MAY BE USED.
PUMP SCOUR - WHERE A GRAVITY SCOUR IS NOT FEASIBLE, A PUMP SCOUR AS DETAILED ON THIS DRAWING TO BE INSTALLED.
5. INLET PIPE HOLE NOT TO BE WITHIN 75 OF WALL UNIT JOINT. STEP IRON HOLES NOT BE WITHIN 100 OF WALL UNIT JOINT.
6. SELECT DISCHARGE PIPE DIAMETER TO ENSURE MAXIMUM DISCHARGE CAPACITY CONSISTENT WITH SIZE OF SCOUR BRANCH. DIRECTION AND SIZE OF DISCHARGE PIPE TO BE AS SPECIFIED IN THE DESIGN DRAWINGS.
7. CONCRETE TO BE NORMAL CLASS N 20 (UNREINFORCED) OR N 25 (REINFORCED). FOR AGGRESSIVE CONDITIONS USE SPECIAL CLASS SCC 40.
8. METAL ACCESS COVER TO BE Ø600, SEALED TYPE (WATERTIGHT), CLASS "B" FOR FOOTWAYS & CLASS "D" FOR CARRIAGEWAYS.
9. PAINT PLASTIC IDENTIFICATION COVERS AND SURFACE BOX COVERS WITH AN APPROVED ROAD MARKING PAINT.
10. SEAL JOINTS BETWEEN CONVERSION SLAB AND SHAFT SECTION AS PER MANUFACTURER'S INSTRUCTIONS.
11. CAST CONCRETE PLINTH INSITU.
12. PLACE ADJUSTABLE SPINDLE SUPPORTS AT 2m INTERVALS.
13. SCOUR VALVE, IF LARGER THAN DN 200, TO BE METAL WEDGE GATE VALVE.
14. GRADE FLOOR TOWARDS SUMP.
15. A FL-FL SCOUR VALVE AND A FL-SO CONNECTOR MAY BE USED.

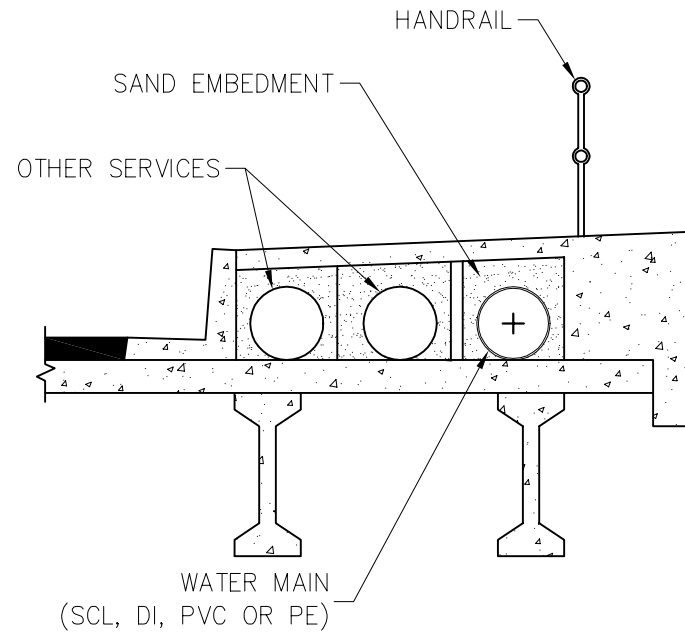
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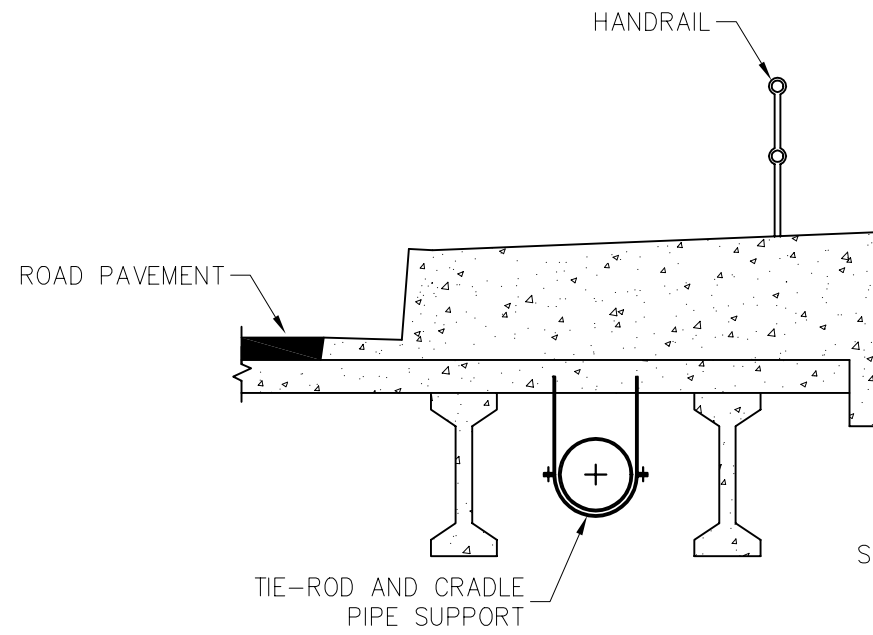
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SCOUR ARRANGEMENTS

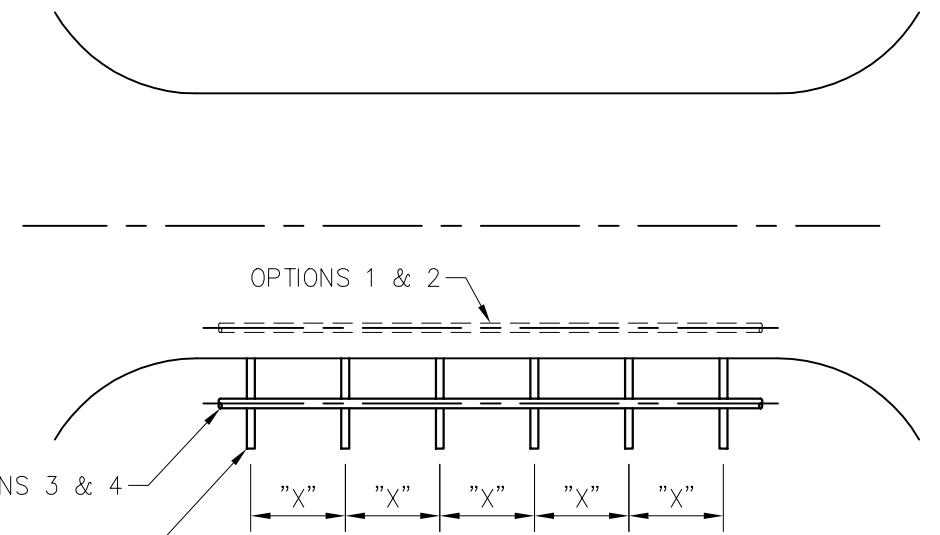
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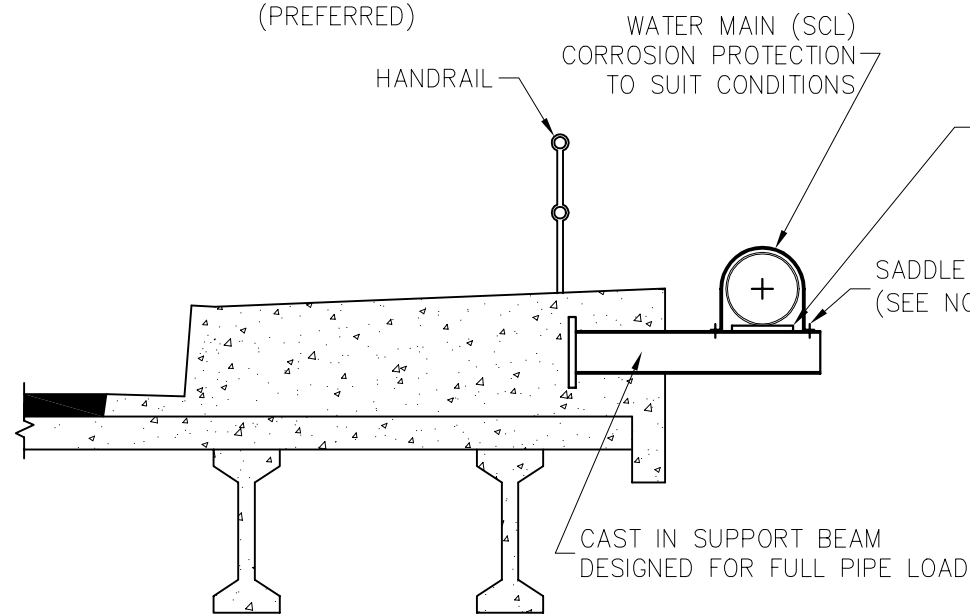
OPTION 1
NEW BRIDGE
(PREFERRED)



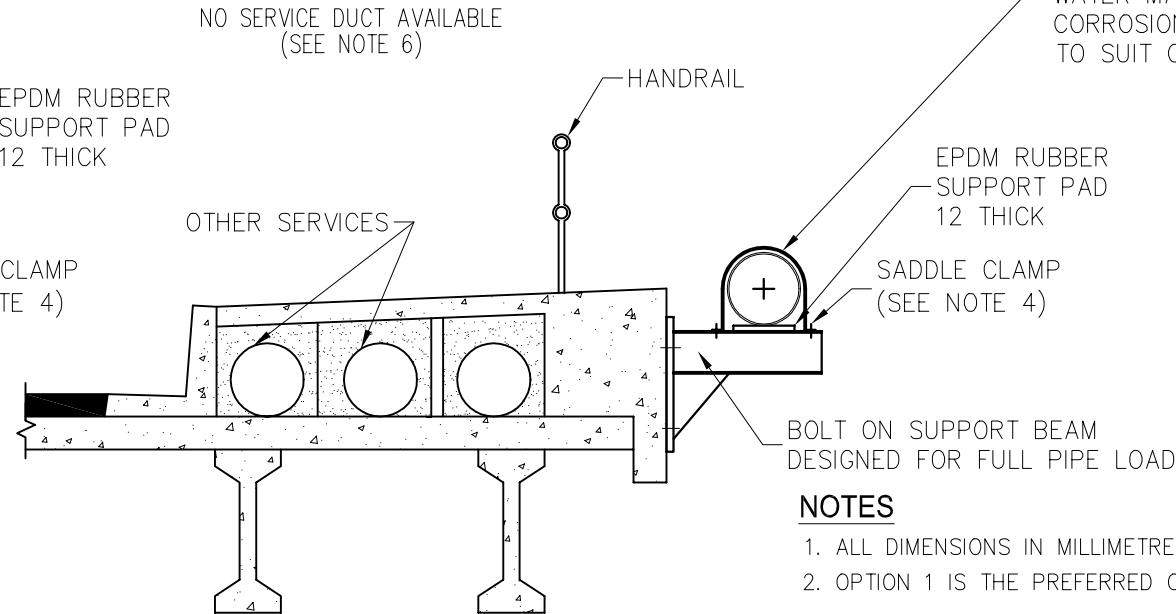
OPTION 2
NEW & EXISTING BRIDGES
NO SERVICE DUCT AVAILABLE
(SEE NOTE 6)



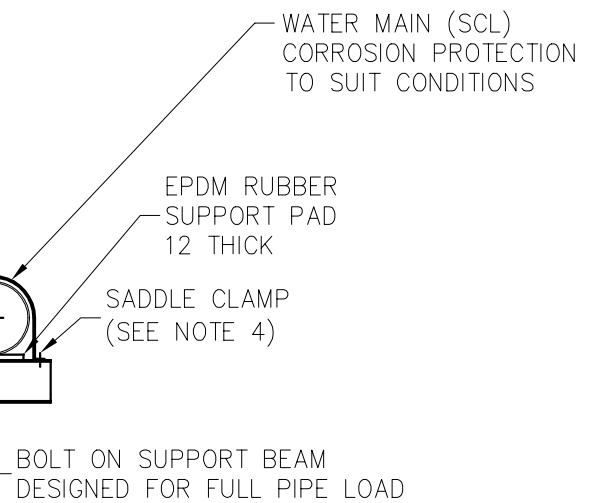
BRIDGE CROSSING PLAN
SEE DESIGN DRAWINGS FOR DIMENSION 'X'



OPTION 3
NEW BRIDGE
NO SERVICE DUCT AVAILABLE
(SEE NOTE 6)



OPTION 4
NEW & EXISTING BRIDGES
NO SERVICE DUCT AVAILABLE
(SEE NOTE 6)



NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. OPTION 1 IS THE PREFERRED OPTION.
3. STEEL COATED SUPPORTS TO AS 3679.1 GRADE 250 AND HOT DIPPED GALVANISED.
4. IN CORROSIVE ENVIRONMENTS USE STAINLESS STEEL MIN GRADE 316 FOR TIE RODS, CRADLE SUPPORTS, CLAMPS, BOLTS, NUTS AND WASHERS.
5. PROVIDE PIPE EXPANSION JOINTS AT EACH END OF BRIDGE.
6. USE DI OR SCL PIPE ONLY FOR OPTIONS 3 & 4.
7. DI, SCL PE OR PVC TO BE USED FOR OPTION 2 MATERIAL TYPE DEPENDS ON ENVIRONMENTAL CONDITIONS.

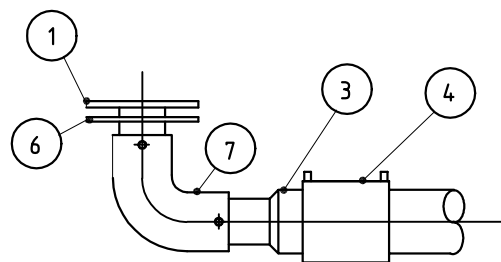
THIS IS NOT A DETAIL DRAWING
CONCEPT ONLY



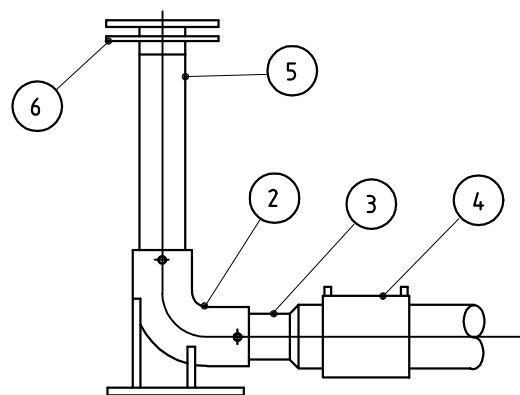
WATER SUPPLY CODE OF AUSTRALIA
AERIAL CROSSINGS
BRIDGE CROSSING CONCEPTS

NOT TO SCALE
WAT-1312
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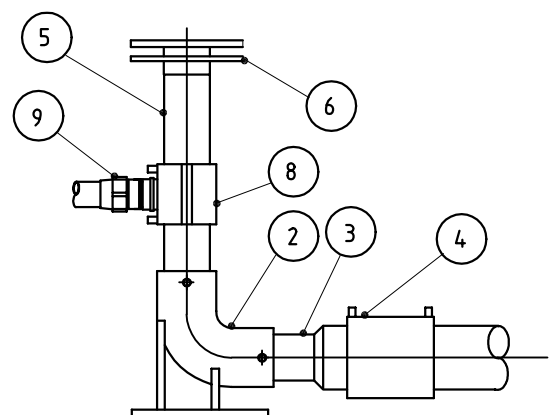
FLUSHING HYDRANTS



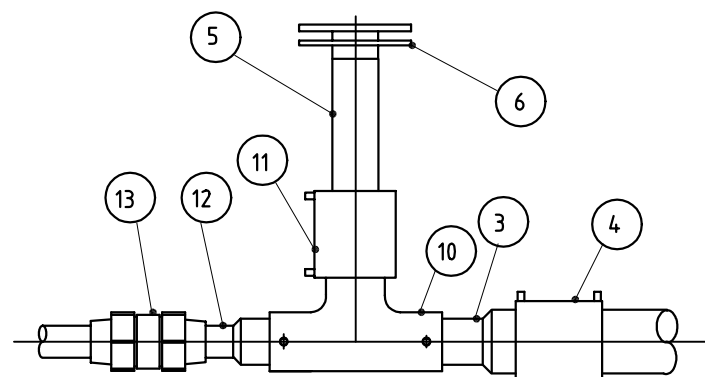
ELECTROFUSED OR BUTT WELDED



ELECTROFUSED OR BUTT WELDED

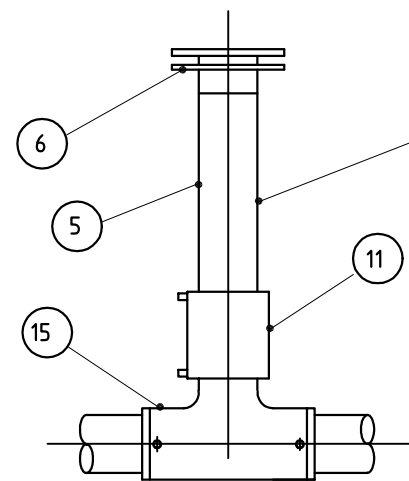


ELECTROFUSED WITH SUB MAIN BRANCH

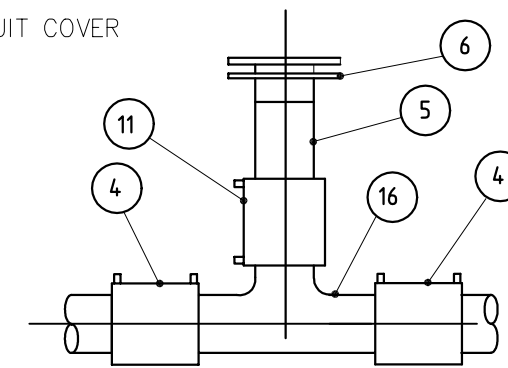


ELECTROFUSED WITH STRAIGHT THROUGH SUBMAIN CONNECTION

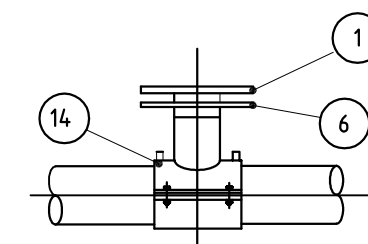
HYDRANT TEES



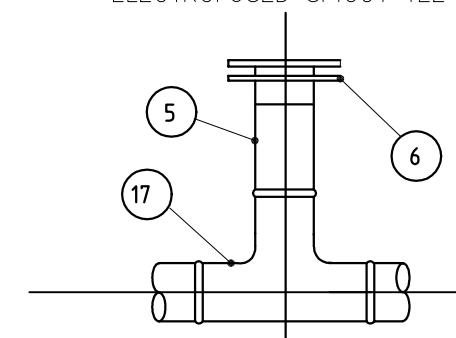
ELECTROFUSION SOCKETED TEE
(SUITS 600 + COVER)



ELECTROFUSED SPIGOT TEE



ELECTROFUSION SADDLE TEE
(SUITS 500 COVER)



BUTT WELDED SPIGOT TEE

LEGEND

- 1 FULL FACE FLANGE ADAPTOR
- 2 90 DUCK FOOT BEND
- 3 125x90 REDUCER, ELONGATED SPIGOT
- 4 125 EF COUPLER
- 5 EXTENDED FULL FACE FLANGE ADAPTOR
- 6 BACKING RING
- 7 90 EF ELBOW 90 deg.
- 8 90x50 BSP EF TRANSITION SADDLE

- 9 63x50 BSP MALE ADAPTOR COMPRESSION FITTING
- 10 90 EF TEE
- 11 90 EF COUPLER
- 12 90x63 REDUCER, ELONGATED SPIGOT
- 13 63 COMPRESSION COUPLING
- 14 125x90 EF SADDLE TEE
- 15 125x90 EF TEE
- 16 125x90 TEE, ELONGATED SPIGOT
- 17 125x90 TEE, BUTT WELDED

NOTES

1. ALL DIMENSIONS IN MILLIMETERS.
2. REFER TO PE CODE SECTION 2 FOR DETAILS OF SIZE, COMPOUND, PRESSURE CLASS AND COLOUR.
3. FOR SURFACE FITTING INSTALLATIONS REFER TO WATER AGENCY STANDARD DRAWINGS.
4. FOR JOINTING DETAILS REFER TO PE CODE WSA-01 SECTION 2.11.3.
5. ALL BACKING PLATED, NUTS, BOLTS AND WASHERS TO BE MINIMUM GRADE 316 STAINLESS STEEL.
6. GASKETS COMPLYING WITH AS 4087 TO BE USED FOR ALL FLANGED CONNECTIONS.



WATER SERVICES ASSOCIATION
of Australia

WATER SUPPLY CODE OF AUSTRALIA

HYDRANT INSTALLATION FITTINGS
PE ASSEMBLIES

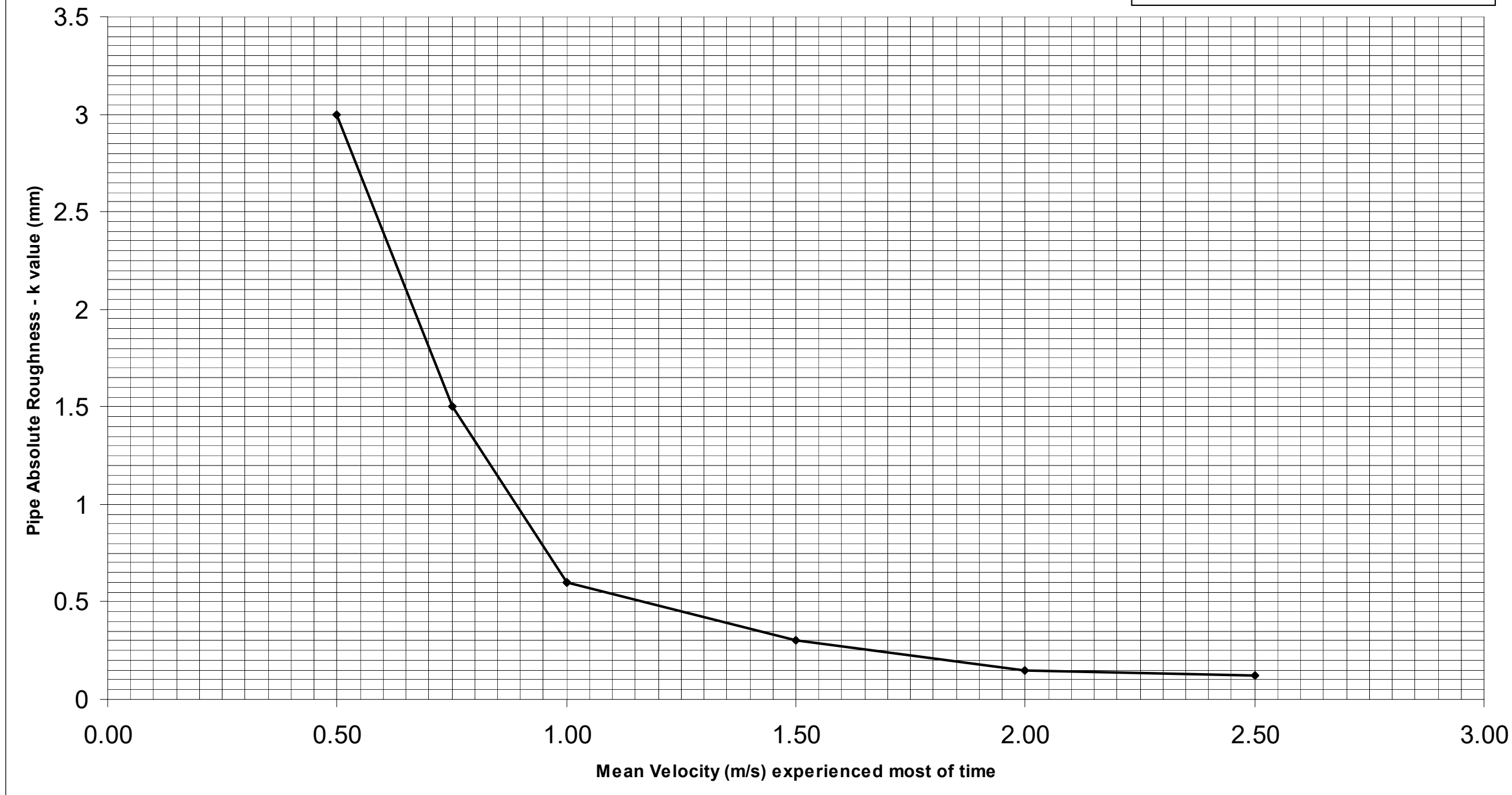
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WAT-1409

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Pipe Absolute Roughness vs Mean Velocity

Source: HR Wallingford and DIH Barr: Tables for hydraulic design of pipes, sewers and channels - 8th edition 2006



PREPARED BY
INFRASTRUCTURE DELIVERY
 ENGINEERING & ENVIRONMENTAL SERVICES

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RECOMMENDED 04.09.12
 S. TONG
 ENGINEERING & PLANNING MANAGER

ACCEPTED 05.09.12
 D. CHERRETT
 MANAGER - FACILITIES MAINTENANCE



SEWAGE PUMPING STATION CODE WSA 04

PIPE ABSOLUTE ROUGHNESS
v
MEAN VELOCITY CHART

Sydney **WATER**

SPS-1608-S

ISSUED_2012 | VERSION 1