



Central Coast Council
Minor Works Sewer Guidelines

Water Planning and Development Unit,
Water and Sewer Division



Minor Works Sewer Guidelines

Author: Water Planning and Development Unit, Water and Sewer Division

Date: 2/03/2021

Approved by: Section Manager Water Services and Design

Date of Approval: 2/03/2021

Assigned review period: 2 years

© Central Coast Council

Wyang Office:

2 Hely St / PO Box 20 Wyong NSW 2259

P 02 4350 5555

E ask@centralcoast.nsw.gov.au

W www.centralcoast.nsw.gov.au

Table of Contents

| | | |
|-----------|--|-----------|
| 1 | Definitions | 1 |
| 2 | Abbreviations..... | 1 |
| 3 | Introduction..... | 2 |
| 3.1 | Purpose / objectives | 2 |
| 3.2 | Scope | 2 |
| 3.3 | Objectives..... | 4 |
| 3.4 | Qualification Requirements | 4 |
| 4 | Complementary Documents..... | 5 |
| 5 | Planning | 5 |
| 5.1 | General..... | 5 |
| 5.2 | Lodge an Application with CCC | 6 |
| 5.3 | Junction Cut In to Lined Sewer Mains..... | 6 |
| 6 | Soffit Requirements and Servicing Below Ground Fixtures | 6 |
| 6.1 | Soffit | 6 |
| 6.2 | Servicing Below Ground Fixtures (such as in Basements) | 7 |
| 7 | Products and Materials..... | 7 |
| 8 | Excavation..... | 8 |
| 8.1 | Dial Before You Dig (DBYD) | 8 |
| 8.2 | Excavation Under Roadways, Driveways and Improved Surfaces | 9 |
| 8.3 | Support of Excavations | 10 |
| 8.4 | Excavation in Root Zones | 10 |
| 8.5 | Excavation Plant and Tools..... | 11 |
| 8.6 | Topsoil | 11 |
| 8.7 | Disposal of Excavated Material..... | 11 |
| 8.8 | Blasting..... | 11 |
| 9 | Trench Filling and Compaction..... | 11 |
| 9.1 | Placement and Compaction of Trench Fill..... | 11 |
| 9.2 | Removal of Trench Supports (Shoring)..... | 12 |
| 10 | Concrete Works..... | 12 |
| 10.1 | Concrete Type | 12 |
| 10.2 | Delivery..... | 12 |
| 10.3 | Transportation of Concrete | 13 |
| 10.4 | Formwork and Reinforcement..... | 13 |
| 10.5 | Compaction | 13 |
| 11 | Maintenance Holes and Shafts..... | 13 |
| 11.1 | Maintenance Hole Bases | 13 |

| | | |
|-----------|---|-----------|
| 11.2 | Maximum Spacing Between Maintenance Structures | 13 |
| 11.3 | Drop Maintenance Structures | 14 |
| 11.4 | Pre-cast Maintenance Hole Construction | 14 |
| 11.5 | Raising / Lowering Existing Maintenance Structures | 14 |
| 12 | Testing of Sewer Pipe and Maintenance Structures | 15 |
| 12.1 | CCTV Inspection | 15 |
| 12.2 | Air Pressure and Vacuum test | 15 |
| 12.3 | Testing of Sewer Maintenance Holes | 15 |
| 12.4 | Testing of Plastic Lined Concrete Sewers and Maintenance Holes | 15 |
| 13 | Sealing Disused Points of Connection | 15 |
| 14 | Surface Restoration | 17 |
| 15 | Inspection of works | 17 |
| 16 | Work as Executed (WAE) Details | 18 |
| 17 | Work Instruction and Drawings | 18 |
| 17.1 | Work Instruction – Investigate Site | 19 |
| 17.1.1 | Scope | 19 |
| 17.1.2 | Background | 20 |
| 17.1.3 | Procedure | 20 |
| 17.2 | Work Instruction – Install Junction | 21 |
| 17.2.1 | Investigate Site | 21 |
| 17.2.2 | Install Junction | 21 |
| 17.3 | Work Instruction – Install Pipework / Riser for Property Connection | 22 |
| 17.3.1 | Install Pipework / Riser | 22 |
| 17.4 | Work Instruction – Construct Property Connection Sewer | 22 |
| 17.4.1 | Investigate Site | 22 |
| 17.4.2 | Construct PCS | 22 |
| 17.5 | Work Instruction – Concrete Encase Sewer | 25 |
| 17.5.1 | Investigate Site | 25 |
| 17.5.2 | Inspect Pipes | 25 |
| 17.5.3 | Replace Defective Pipes | 25 |
| 17.5.4 | Concrete Encase Pipes | 25 |
| 17.6 | Work Instruction – Replace Pipe | 25 |
| 17.6.1 | Investigate Site | 25 |
| 17.6.2 | Replace Defective Pipes | 25 |
| 17.7 | Work Instruction – Construct Maintenance Structure | 25 |
| 17.7.1 | Investigate Site | 25 |
| 17.7.2 | Construct Maintenance Structure | 25 |
| 17.7.3 | Construct Maintenance Structure over Existing Sewer Pipeline | 26 |



| | | |
|-----------|--|-----------|
| 17.7.4 | Modify Maintenance Structure Finished Surface Level..... | 27 |
| 18 | Related Resources | 27 |
| 18.1 | Legislation: | 27 |

1 Definitions

| Term | Definition |
|----------------------------------|--|
| Constructor | In the context of this document, a person listed by Central Coast Council to carry out Minor Works (sewer) activities. |
| Customer Sanitary Drain | A pipeline installed by a licensed plumber within the property boundary and operated by a property owner to convey sewage from buildings to the point of connection with Council reticulation or property connection sewer; constructed to Plumbing Code standards; also called house drain, house service line, house sewer, sanitary connection, property drain, sanitary drain. |
| Inspection Shaft | A shaft constructed in the line of the customer sanitary drain for the purpose of inspection and future access for locating and cleaning the drain. |
| Liner | A plastic composite or pipe inserted or formed inside a sewer. |
| Property Connection Sewer | A short sewer, owned and operated by Council, which connects the main sewer and the customer sanitary drain; it includes a junction on the main sewer, sufficient pipework to ensure that a point of connection is provided within each lot to be serviced. |
| Rodding Point | A structure at the end of a property connection sewer to allow insertion into the property connection sewer of equipment for inspection and maintenance by removing a cover at ground level. The structure can be a rodding shaft or a terminal maintenance shaft. |
| Vertical | The vertical section of a property connection sewer, at the sewer, used where the customer sanitary drain is at a considerably higher level than the sewer. |
| External coordinator | A party who is given permission to coordinate water and sewer activities on behalf of the proponent |

2 Abbreviations

| Abbreviation | Interpretation |
|--------------|---------------------------------|
| AC | Asbestos cement |
| AS | Australian Standard |
| CI | Cast iron |
| CCC | Central Coast Council |
| CCTV | Closed circuit television |
| CSD | Customer sanitary drain |
| DI | Ductile iron |
| DN | Nominal size |
| IS | Inspection shaft |
| kPa | Kilopascal |
| MH | Maintenance hole |
| MS | Maintenance shaft |
| OD | Outside diameter |
| PCS | Property connection sewer |
| PE | Polyethylene |
| PP | Polypropylene |
| PVC | Polyvinylchloride |
| PVC-U | Polyvinylchloride-unplasticised |
| RP | Rodding point |
| RRJ | Rubber ring joint |
| SCJ | Solvent cement joint |
| SS | Stainless steel |
| TMS | Terminal maintenance shaft |
| VC | Vitrified clay |

3 Introduction

3.1 Purpose / objectives

This document sets out technical requirements and work instructions for construction activities allowed under the Minor Works (Sewer) process. It includes both mandatory requirements and informative statements. The informative text (shown in italics) has been provided to allow a better understanding of the mandatory requirements.

Documents related to this technical specification are listed under the 'Complementary Documents' section. If difficulties are encountered at any stage during the conduct of work, contact Central Coast Council (CCC) on 1300 463 954 for more information.

This document must be read in conjunction with Water Services Association of Australia's Sewer Supply code – WSA 02-2002 Version 3 – Sydney Water Edition and the Central Coast Council WSA Development Supplements. Please consult CCC's website for the current version of the WSA Code Supplements.

All materials must be manufactured to the relevant Australian Standard and installed as per the manufactures recommendations.

3.2 Scope

NOTE: There may be occasions where works are initiated but are later found to be beyond the scope for the level of Constructor or have other complexities that are beyond the scope of Minor Works. In these instances, CCC may require the works to be completed by a Constructor with appropriate capability and/or managed under a different process.

This guideline covers personnel employed by CCC; any person or organisation contracted to or acting on behalf of Council; and any person or organisation employed to work on CCC premises or facilities and all activities of the Council.

This Policy covers all works in proximity to sewer mains whether they are undertaken by private developers, other Business Units of CCC or other utilities.

This Policy covers scope of works relating to gravity sewers of size \leq DN 225 and depth \leq 2.5 metres (measured from the invert of the sewer to the ground surface) and limited to:

- a. Inserting junctions/property connection arrangements into existing VC and PVC sewers.
- b. Constructing PCSs of length not greater than 12 metres measured along the axis of the PCS from the centreline of the sewer at the PCS connection point to the centreline of the furthest riser for the IS or RP. Configurations may include a PCS off another PCS, extension of an existing PCS on line and grade or a PCS off an existing CSD inlet at a MH (see NOTES 1 and 2).
- c. Constructing extensions of existing sewers on line and grade of length not greater than 12 metres (measured along the axis of the extension from the end of the existing sewer to the centreline of the TMS), where justification for extension has been accepted by Central Coast Council (see NOTES 1 and 3).
- d. Concrete encasing up to 25 metres of an existing PVC sewer.
- e. Insitu replacement up to 25 metres of existing VC, PVC or AC sewer as a precursor to concrete encasement or sewer relining.
- f. Sealing points of connection to CCCs sewer.
- g. Construction of new maintenance structures.

- h. Modification of existing maintenance structures.

Any works beyond the scope of minor sewer constructors must be performed by an experienced contractor (see Note 4). The scope is extended to works relating to gravity sewers of size \leq DN 225 and depth \leq 6.0 metres (measured from the invert of the sewer to the ground surface) and limited to:

- a. Inserting junctions/property connection arrangements into existing VC, PVC and AC sewers.
- b. Constructing PCSs of length not greater than 25 metres measured along the axis of the PCS from the centreline of the sewer at the PCS connection point to the centreline of the furthest riser for the IS or RP. Configurations may include a PCS off another PCS, extension of an existing PCS on line and grade or a PCS off an existing CSD inlet at a MH (see NOTES 1 and 2).
- c. Constructing extensions of existing sewers on line and grade of length not greater than 25 metres (measured along the axis of the extension from the end of the existing sewer to the centreline of the TMS), where justification for extension has been accepted by CCC (see NOTES 1 and 3).
- d. Concrete encasing an existing PVC sewer. Concrete encasing an existing PVC sewer of size $>$ DN 225 and \leq DN 300 where pipe replacement/flow management is not required is also permitted.
- e. Replacing up to 25 metres of existing VC, PVC, AC, CI or DI sewer as a precursor to concrete encasement or relining.
- f. Sealing points of connection to CCC's sewer.
- g. Disusing PCSs and sewers of size \leq DN 300 (see NOTE 5).
- h. Construction of new maintenance structures
- i. Modification of existing maintenance structures

Note 1: CCC will only accept an application where the PCS or a sewer extension is proposed to be not greater than 12 metres. If the length is proposed to be greater than 12 metres, a Sewer Plan Approval must be obtained from Council's Water Assessment Team.

Note 2: Breaking into existing MHs for new PCS connections is not permitted.

Note 3: Any proposal to extend a 'dead-end' sewer requires a detailed case to be provided to CCC for consideration and approval before construction.

Note 4: Where the scope falls outside that for 'minor sewer' constructors, the appropriate additional requirements of 'WSA 02 Sewerage Code of Australia (Sydney Water Edition)' will apply.

NOTE 5: Any proposal to disuse a sewer will require consultation with CCC and may involve the submission of a detailed case and method prior to approval for construction.

NOTE 6: For purposes of these requirements, VC includes all types of earthenware and clay pipes.

NOTE 7: The scope of Minor Works (Sewer) does NOT include construction of PCSs, extension of sewers and concrete encasement of sewers in mine subsidence areas, however, inserting junctions/property connection arrangements are permitted. For information on the location of mine subsidence areas, visit www.minesub.nsw.gov.au.

NOTE 8: Existing AC and VC sewer mains cannot be concrete encased. Relining of mains or pipe replacement may be required if AC or VC main is in poor condition. Contact an external coordinator or CCC if this is the case.

3.3 Objectives

The Policy objectives are as follows:

- a. To protect Council's sewer main assets from inappropriate building and development techniques.
- b. Provide guide and set limitations to minor constructors as to appropriate building techniques around sewer property connections and maintenance structures
- c. To not unreasonably impede or restrict development.

3.4 Qualification Requirements

In order for an individual to perform duties within the scope of this document and the CCC network, the following applies:

- a. The individual is a licensed plumber/drainage with recent experience in municipal sewer main junction installations.

NOTE: Proof of relevant insurances and experience will be required prior to commencing works.

- b. The individual has met the requirements for and obtained prior approval from CCC via the Section 305 application process to perform sewer main junction installations.

NOTE: Proof of relevant insurances will be required prior to works.

In order for an individual to perform maintenance structure installations within the CCC network, the following applies:

- a. As per the above requirements for junction installations as well as;
- b. Evidence of maintenance structure installations that have occurred within the CCC network, Hunter Water region and / or Sydney Water region.

4 Complementary Documents

The following documents complement the requirements set out above. Any deviation from the specification required should be consulted with Central Coast Council representative prior to commencing works.

- a. WSA 02 Sewerage Code of Australia (Sydney Water Edition) (available from the Water Services Association of Australia)
- b. Sydney Water list of acceptable product specifications
- c. Sydney Water list of approved non-standard products
- d. CCC Building in Proximity to Water and Sewer Pipelines Policy and Procedure
- e. Central Coast Council Supplement to Sewerage Code of Australia (Sydney Water Edition-Version 4) WSA02-2002-2.2
- f. Central Coast Council Civil Works Specification 2018

Note: Central Coast Council owned specifications take precedence over all other specifications and drawings.

5 Planning

5.1 General

Plan the work adequately to address safety, minimise impact on the community and the environment and to ensure all materials, plant and equipment are appropriate for the task. Ensure overflow or uncontrolled release of sewage will not occur.

Any work involving cutting into or working directly on a CCC sewer or diverting sewage flows must be completed within one calendar day.

If the work involves cutting into a sewer (including cutting an investigation hole to determine if a sewer is lined), treat the trench environment as a confined space. Ensure compliance with Safe Work Australia's 'Confined Spaces Code of Practice' (available at <https://www.safeworkaustralia.gov.au>). If the pipe is suspected to be made of AC material, it is advised to follow the guidelines set out in Safe Work Australia's 'How to Safely Remove Asbestos' Code of Practice.

For each project, determine requirements for controlling sewage flow before starting the work. Consider the potential impact of unpredicted wet weather and/or other surges in flow occurring after work has started. Do not attempt to work during heavy rain or when there is reasonable chance of heavy rain occurring during the course of the job. As necessary, contact CCC to determine the susceptibility of the site to inflow/infiltration. Be prepared for flow variations from diurnal patterns and pumped discharges.

Determine junction/pipe size required to service expected flows from proposed development. Larger pipes may be required for properties with multiple dwellings or where pumped flow is expected.

Verify that the size, depth and pipe type of the sewer is within the scope of Minor Works (sewer) and, if the work requires construction of a PCS, that minimum cover requirements can be achieved (refer to Drawing MWS-200).

Note: CCC's records (e.g. Geographic Information System, Property Sewerage Diagrams) require field verification.

Verify that the soffit requirement can be met for the new connection (refer to Section 6.1). Ensure additional fittings, pipe and materials are readily available in case of unforeseen circumstances and/or unexpected damage to the sewer that may interfere with timely completion of the work.

For each job, follow the instructions set out in the 'Work Instruction - Investigate Site' section of this document. If unexpected risks to safety, the environment and/or to compliance with process and/or technical requirements are identified in the site investigation, take timely and appropriate preventive action.

5.2 Lodge an Application with CCC

It is the contractor's responsibility to carry out a sewer junction cut and / or modification of existing sewer asset. The work will be undertaken under the inspection by a CCC representative. To commence the notification process, the contractor must lodge a Section 305 application under the Water Management Act and email the form with any other relevant documentation to ask@centralcoast.nsw.gov.au. The relevant application forms are available on the CCC forms website (<https://www.centralcoast.nsw.gov.au/plan-and-build/plumbing-and-sewage/water-and-sewer-development>).

It may take up to three (3) weeks for a council representative to determine conditions that form part of a Section 306 approval letter to commence works.

For any works beyond the scope of minor sewer constructors, a maintenance security deposit will be held by Council for up to 12 months post project practical completion. Fees must be paid to Council upon issuance of the Section 306 approval letter and prior to commencing works. Fees will be stipulated in the Section 306 approval letter and are determined based on either the contract value of the works or a minimum fee nominated by Council.

5.3 Junction Cut In to Lined Sewer Mains

To reduce groundwater infiltration into Central Coast Council's sewers and increase their lifespan, many old sewers have been lined.

During the Section 305 application process, Council will advise whether the sewer main is lined, however as a general rule:

- a. Sewers constructed of PVC are not lined.
- b. Some sewers constructed of VC and AC are lined. The lining may have also sealed existing junctions.
- c. Sewers that have been lined can be worked on by either CCC staff or a contractor under the inspection of CCC.

6 Soffit Requirements and Servicing Below Ground Fixtures

6.1 Soffit

The soffit requirement is the depth from the controlling surface level on the property (usually the overflow relief gully) to the soffit of the sewer or PCS at the point of connection. The soffit requirement is based on providing assurance that a reticulation sewer, flowing at full capacity, will not surcharge via the CSD.

Ensure that a soffit height of 1200 mm is maintained. If this condition is not achievable, consult the external coordinator concerning other options for connection. If an external coordinator is not involved in the works, liaise directly with the Developer.

Permissible options where the 1200 mm soffit requirement cannot be met include:

- The soffit height can be reduced to 900 mm for connections where there are less than 10 properties upstream of the connection point.
- Where the 1200 mm cannot be achieved or cannot be reduced to 900 mm (as per point above) then a reflux valve must be fitted subject to a minimum soffit height of 600mm being achieved.

In cases where the land to be serviced is vacant and the soffit requirement is unlikely to be achievable (assuming the overflow gully is located at the lowest existing ground level within the available building envelope) advise the Developer in writing of possible measures to ensure the soffit requirement will be met and of any impacts of not meeting the soffit requirement. The written correspondence must be kept as part of the quality records and be submitted to CCC along with the Work As Constructed details.

Include on the Work As Constructed drawing or Property Sewerage/Hydra Diagram a note reading 'Overflow gully to be installed to a level which meets CCC soffit requirement' and provide a copy of the drawing to the property owner or Developer.

Note: It is the developer's responsibility to check the soffit height is achievable for the development. If there is a discrepancy between the level of the sewer main and the development, please contact Council immediately and seek further advice.

6.2 Servicing Below Ground Fixtures (such as in Basements)

In cases where the land to be serviced will involve below ground fixtures such as in basements, consult an external coordinator for servicing solutions.

7 Products and Materials

Use only products and materials that meet the specifications listed in Table 6.1 or that are listed by Sydney Water as 'Acceptable Products'. The 'List of acceptable product specifications' and the 'List of approved non-standard products' are available on the Providers page in the Plumbing, building & developing section of the Sydney Water website.

Table 7.1 Product Specifications

| Product | Specification or Product |
|------------------------------------|---|
| PVC-U pipes and fittings | AS/NZS 1260, Class SN8, Class SN10 pipework / riser for property connection |
| VC pipe and fittings | EN 295.1 |
| Stainless steel oblique junction | Wang Sewer or Rapid Sewer OB junction clamps or approved equivalent |
| Slip coupling (for ribbed PVC) | AS/NZS 1260 |
| Slip coupling (for plain wall PVC) | AS/NZS 1260 |

| | |
|--|--|
| Metal banded flexible coupling for VC and PVC (plain wall only) | AS4327 (Stainless Steel only and fittings must have double band at each joint) |
| Sealant (for lined sewers) | Sikadur 31, Nitomortar EL-HB, Epirez 633, or approved equivalent |
| Access covers and frames for sewerage | AS3996 Class B for non-trafficable areas, Class D for minor and major roads, and other trafficable areas, Stainless steel holding bolts |
| Maintenance Holes (MH) | WSA PS-323 |
| Maintenance Shafts (MS) | WSA PS-321 |

**This table is not a comprehensive listing of product specifications*

8 Excavation

This section specifies general requirements for excavation undertaken for Minor Works activities. Additional requirements for specific activities are specified in the Work Instructions and Drawings.

8.1 Dial Before You Dig (DBYD)

Determine the location and type of services in the area where work is to take place by contacting the 'Dial Before You Dig' service (visit www.1100.com.au or telephone 1100) and by other appropriate means.

Take precautions against the possibility that major and/or dangerous services may be located within private property.

Note: Dial Before You Dig does not usually provide information about property services.

Ensure plans and information from utility service owners are available on site to assist in locating, identifying and protecting services both before and throughout excavation and restoration activities.

Immediately report damage to any services, whether public or private, to the owner of the service.

New PCS's must have clearance from other services not less than (and preferably exceeding) those shown in Table 8.1.

The clearance must be measured between the two closest parts of the sewer and the other underground service e.g. collar to socket.

Table 8.1 Clearance between sewers and other underground services

| Utility (Existing Service) | Minimum Horizontal clearance (mm) for new sewers \leq DN300 | Minimum Vertical Clearance ¹ (mm) |
|--|---|--|
| Sewers \leq DN300 | 300 | 150 |
| Sewers $>$ DN300 | 600 | 300 |
| Gas Mains | 300 ³ | 150 ² /300 |
| Telecommunication conduits and cables | 300 ³ | 150 ² /300 |

| | | |
|---------------------------------|------------------------|---|
| Electricity conduits and cables | 500 | 225 ² /300 |
| Stormwater drains ⁷ | 300 ³ | 150 ² and 4/300 ⁴ |
| Water Mains | 1000 ⁵ /600 | 500 ⁴ |
| Kerbs | 150 ⁶ | 150 (where practicable) |

NOTES:

1. Vertical clearances apply when sewers cross one another, except in the case of water mains when a vertical separation must always be maintained, even when the sewer and main are parallel. *The sewer should always be located below water mains to minimise the possibility of backflow contamination in the event of a water main break.*
2. A minimum vertical clearance of 300 mm applies if the size of the existing service is >DN 300.
3. *Clearances can be further reduced to 150 mm for distances up to 2 metres when passing installations such as poles, pits and small structures, providing the structure is not destabilised in the process.*
4. *Sewers should always cross under water mains and stormwater drains.* If this requirement cannot be met, liaise with the developer/property owner to engage an external coordinator for the development of a servicing solution and management of the works. Where a sewer crosses a water main at or close to 90 degrees, the vertical clearance may be reduced to not less than 200 mm provided that the sewer is concrete encased and a 50 mm compressible material is placed over the encasement. The encasement must not have any joints within 1000 mm either side of the water main and must conform to Drawing MWS-300.
5. When the sewer is at the minimum vertical clearance below the water main (500 mm) maintain a minimum horizontal clearance of 1000 mm. *This minimum horizontal clearance can be progressively reduced to 600 mm as the vertical clearance increases to 750 mm.*
6. Clearance from kerbs must be measured from the nearest point of the kerb.
7. A sewer to be constructed under an existing or proposed stormwater pipe or channel ≥DN 375 must be concrete encased. The concrete encasement must extend at least one metre each side of the stormwater pipe or channel. Clearances between the sewer and other services must be measured from the outer surface of the concrete encasement.

8.2 Excavation Under Roadways, Driveways and Improved Surfaces

Where the construction of the works involve the opening of a road or footpath, it is the Constructor's responsibility to obtain the consent of the relevant roads authority and abide by the conditions of consent as referred to in the Roads Act 1993 granted by the approving authority.

Written permission must be obtained from the relevant property owner(s) before commencing any excavation under or across improved surfaces.

If excavation is required across improved surfaces such as pavements, driveways, kerbs and gutters, or where the surfaces cannot be satisfactorily reinstated, assess constraints and, in consultation with an external coordinator if they are involved with the works, select an appropriate method (for example, boring).

For open excavation across improved surfaces, keep the trench width to the minimum allowed. Saw cut neat straight lines through bitumen, asphalt and concrete at least 150 mm beyond the

outer limits of the required excavation. Remove pavers, blocks and bricks by hand, clean them and set them aside for later replacement.

A road opening permit at the developer's cost must be obtained from the appropriate road authority. Please note it is the developer's responsibility to obtain relevant approvals from the TFNSW. A permit to open a Council road may be obtained by contacting Council's Infrastructure Engineer on (02) 4325 8222 before construction can commence in the road reserve.

8.3 Support of Excavations

Comply with all support requirements set out in the 'Model Code of Practice: Excavation Work', (available at <https://www.safeworkaustralia.gov.au/>). Particular attention is drawn to the following requirements for trench stability:

- a. Support, or bench, any trench of depth greater than 1.5 metres
- b. Where material is stored within the trench's zone of influence, the height of the trench to be used in determining the zone of influence must be the greater of:
 - i. the distance between the trench floor and the top of the stored material Or
 - ii. the height of the highest trench wall
- c. Support all trenches where trench walls are unstable. Consider all trenches 1.5 metres and deeper to be unstable. In the event of uncertainty about any trench, obtain specialist engineering advice.
- d. For a trench of depth 1.5 metres or greater, ensure plant, traffic and materials do not encroach within 1 metre of the trench's zone of influence, except where support systems are designed for these surcharge loads.
- e. Ensure that adjacent structures and services are not subject to disturbance by the trench support system.

8.4 Excavation in Root Zones

Take every precaution to ensure that no undue damage is caused to tree root systems from excavating. Consider excavating by hand or by boring to protect the root zone.

Do not cut tree roots exceeding 50mm diameter. If it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.

Prevent damage to tree bark. Do not attach stays and guys to trees.

Do not remove topsoil from, or add topsoil to, the area within the dripline of the trees.

Provide a tree root barrier if the pipe is under the tree canopy. Install the barrier along the length of the pipe to the full extent of the canopy drip line.

Backfill excavations around tree roots with a mixture consisting of three parts by volume of topsoil and one part of well-rotted compost with a neutral pH value, free from weed growth and harmful materials. Place the backfill layers, each of 300mm maximum depth, compacted to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 200mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

Be aware of the restrictions on work near trees and if required seek direction from Council's Representative. If a tree is required to be removed as a result of the works, contact Council as a tree removal permit may be required.

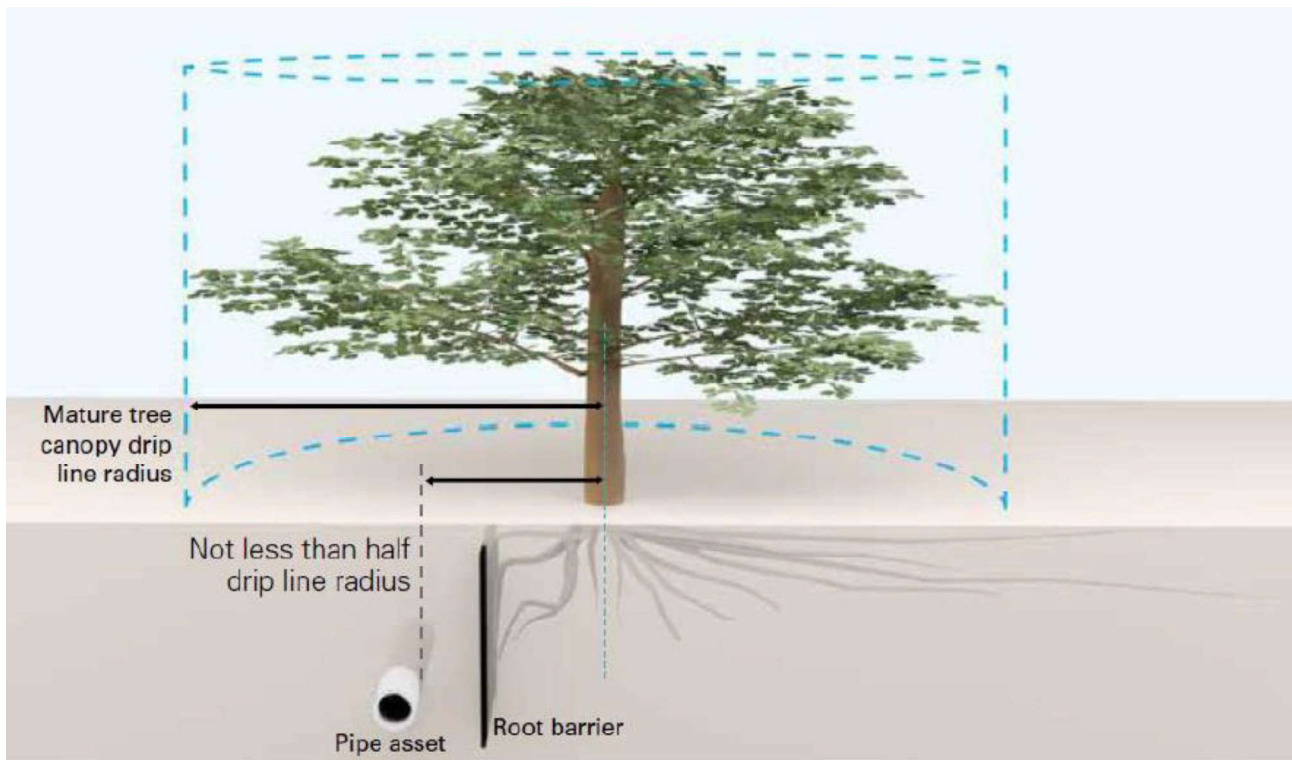


Figure 8.2. Tree Drip Line Radius

8.5 Excavation Plant and Tools

Choose excavation plant and/or tools so that plant operation will minimise safety hazards, will not adversely impact on the environment and community and will not damage existing infrastructure and property.

8.6 Topsoil

Where construction is to occur on grassed areas, remove turf sods and topsoil before excavating and set aside in an appropriate location for later use in restoring the site.

8.7 Disposal of Excavated Material

Dispose of any excess material in accordance with the property owner's requirements and with regard to environmental legislation.

8.8 Blasting

Do not use blasting.

9 Trench Filling and Compaction

9.1 Placement and Compaction of Trench Fill

Before placing trench fill, ensure that pipe bedding fully supports the pipe and that pipe embedment material covers the crown of the pipe by at least 150 mm in non-trafficable areas and

at least 300 mm in trafficable areas. Embedment material should be limited to single size aggregate of 7mm or 10mm size to ensure self compaction. Single-size aggregate should always be specified where strict control of grading is considered essential. Graded aggregates are considered more susceptible to segregation in transport and handling.

Where the filled trench will be subjected to traffic loading, Council's directive is to follow specifications contained within WSA 02 Sewerage Code of Australia, Clause 20 Pipe Embedment and Support and Clause 21 Fill. Refer to WSA drawing SEW-1202 Standard Embedment Flexible and Rigid Pipes for further details.

Specification of temporary and final restoration of the roadway is stipulated within the "Civil Works Specification - Construction Specification" Section 7 which is located in the link below.

<https://www.centralcoast.nsw.gov.au/plan-and-build/development-applications/subdivision-and-development-works>. STD Drawing trench fill / embedment. If the roadway is owned by TfNSW then separate specifications apply.

Ensure that trench fill is free of large clumps and debris and complies with requirements specified in the Drawings.

When placing trench fill, avoid impact loading of the sewer and/or junction. Place and compact trench fill in layers of approximately 300 mm. Do not use flooding compaction.

9.2 Removal of Trench Supports (Shoring)

When removing, raising or withdrawing trench supports, prevent slips and falls and ensure that no damage, disturbance or displacement occurs to the pipe, fittings, geotextile filter fabric, pipe embedment and trench fill already installed. Ensure that all embedment and trench fill material located below such trench support and against native ground is progressively compacted as supports are withdrawn.

If agreed with the property owner, the trench support system may be left in place as permanent support. Where the property owner agrees to trench supports being left in place, cut off the support system at a depth at least 200 mm below the finished surface level required to satisfy structural and development requirements of the site.

Rectify all settlement occurring within 12 months of completion of work.

10 Concrete Works

10.1 Concrete Type

Special class sulphate resistant cement/concrete shall be used where exposed to waste liquids and emitted gases, acidic soils, very high salinity soils and sulphate bearing ground water and soils that attack concrete pipe and maintenance structures. Usually unreinforced concrete is to be minimum class N20, and reinforced concrete N25.

Concrete for maintenance hole bases shall be Public Works Department mix, minimum concrete class S40MPA with 30% fly ash (low heat) with slump tolerance 80-120mm.

10.2 Delivery

Concrete shall be delivered to site for placement within 90 minutes of commencement of mixing at the plant or within the time limitations for the mix and ambient temperature. Adjust the time constraint on use (i.e. placement) of concrete to take account of the prevailing ambient

temperature, typically <60 minutes for ambient temperatures of 27-30°C and <45 minutes for temperatures of 30-35°C.

10.3 Transportation of Concrete

Concrete to be transported to site using appropriate means such as pneumatic / pumping methods. Wheeled or barrowed methods are suitable for distances up to 50m length. If concrete is covered by chute, ensure equipment size, slope and type allows for continuous flow of concrete with segregation of materials. Delivery end of chute should be as close as possible to the final position of the concrete.

10.4 Formwork and Reinforcement

Where required, formwork should comply to requirements of AS 3610. Refer to requirements of the external coordinator where formwork and reinforcement is required.

10.5 Compaction

Immediately compact concrete after placing. Use internal or external vibration in a systematic manner to ensure all concrete is thoroughly compacted. Vibrate to full depth of each layer and extend into the top 100mm of the underlying layer. Do not vibrate to the point where segregation of ingredients occurs.

11 Maintenance Holes and Shafts

Maintenance holes are placed on gravity sewers at changes in direction, grade or pipe size.

11.1 Maintenance Hole Bases

Pipes shall be built into the walls of the maintenance hole to ensure watertightness. Bases and benching shall be formed to suit the alignment of the sewer pipe. Benching shall be rendered and trowelled smooth and shall slope towards the main channel at a slope as per the table below.

Table 11.1 Fall across MH (inlet to outlet invert)

| Deflection Angle | Minimum fall (mm) |
|------------------|-------------------|
| 0° - 30° | 30 |
| >30° - 60° | 50 |
| >60° | 80 |

NOTES:

1. Maximum allowable deflection within a sewer maintenance hole is 120° (but only in conjunction with an external drop where greater than 90° is required). Refer to SEW-1304-V for further details.
2. Maximum allowable crossfall within a manhole is 150mm.
3. Low heat concrete required for construction of manhole bases and subsequent render of channels

11.2 Maximum Spacing Between Maintenance Structures

For reticulation sewers, the maximum distance between any two consecutive MHs shall be 120 metres. The maximum distance between a MH and any other MC shall be 60m. At permanent end of line sewers, the distance from the end of the line MC to the nearest downstream MH shall not exceed 60m. A maintenance structure shall be installed at the end of a line (terminating sewer).

Note Maintenance Shafts (MS) and Terminal Maintenance Shafts (TMS) are no longer accepted by CCC.

11.3 Drop Maintenance Structures

Where the difference in levels of the inlet and outlet are greater than can be accommodated with a fall through the invert of a manhole, an external drop must be constructed. See below Table 11.2 for reference to minimum allowable vertical drops into maintenance holes.

Table 11.2 Vertical Drop

| Pipe Size DN | Minimum Drop (mm) |
|--------------|-------------------|
| 150 | 460 |
| 225 | 710 |
| 300 | 880 |

Minimum allowable drop is 460mm for DN150 sewer mains based on current UPVC fittings.

Note: An MS or MC cannot be used for applications where a vertical drop is required unless in exceptional circumstances approved by CCC.

11.4 Pre-cast Maintenance Hole Construction

Pre-cast concrete maintenance holes shall be set on cast-in-situ concrete base with all sections stacking together with tongue and groove joints. All joints shall be sealed with an elastomeric ring, epoxy mortar or sealing compound recommended by the pre-cast manufacturer to ensure the watertightness of the maintenance holes. The sealing compound shall be applied in accordance with the manufacturer's instructions. Maintenance hole joints to be sealed with approved protective wrap or other approved product to further assist against infiltration and tree root intrusion.

The top concrete eccentric conical section or precast concrete cover slab shall be bedded on the topmost concrete section and effectively sealed from water entry. This connection between cover slab and taper also must have an approved epoxy resin and / or protective wrap as stated above.

Minimum type of cover to be used is Class D cover. Class B covers are no longer accepted by CCC.

Cover shall be of metal material, bolted down and watertight.

Pre-cast concrete construction shall not be used in water-charged ground or where there is a significant risk to surcharge, and shall not be deeper than 6m to the invert.

Installation of a maintenance 'chamber' in lieu of a maintenance 'hole' must be consulted with CCC to confirm whether it is suitable for the application. The installation of these types of structures must also comply with the 'List of acceptable product specifications' and the 'List of approved non-standard products' that are available on the Providers page in the Plumbing, building & developing section of the Sydney Water website.

When building a maintenance structure over an existing sewer pipe, refer to 'Work Instruction – Build Maintenance Structure'.

11.5 Raising / Lowering Existing Maintenance Structures

In the event of raising or lowering the existing finished surface level (FSL), the existing height of a maintenance structure may need to be altered to suit the new FSL. It is the proponents responsibility to adjust the height of the maintenance structure to suit the new finish surface level

and restore the surrounding area to its original condition. If there is a structure being built within the vicinity of the maintenance structure, please refer to CCC's Building in Proximity to Water and Sewer Pipelines policy and procedure located at <https://www.centralcoast.nsw.gov.au/council/forms-and-publications/policies>, to ensure minimum spacing requirements are adhered to.

12 Testing of Sewer Pipe and Maintenance Structures

All testing shall be carried out by firms accredited by NATA. All test results shall be documented and submitted to CCC for acceptance.

12.1 CCTV Inspection

CCTV inspection of a completed pipeline greater than 12m in length, including a property connection sewer, is required by a NATA Accredited provider in accordance with the acceptance criteria stipulated in the Water Services Association of Australia's Sewer Supply code – WSA 02-2002 Version 3 – Sydney Water Edition. Council may require CCTV prior to commencement and post works, for example, where piling works may take place in the vicinity.

12.2 Air Pressure and Vacuum test

Either lower pressure or vacuum testing shall be undertaken for all completed sewers to detect points of leakage and potential groundwater infiltration. Testing shall be carried out from maintenance hole to maintenance hole generally after backfilling is completed. Short branch drains shall be tested together with the main line. Long branches shall be tested separately.

12.3 Testing of Sewer Maintenance Holes

All pre-cast concrete, cast in-situ concrete and polyethylenes sewer maintenance holes and chambers shall be subjected to vacuum testing after completion of backfilling and the fitting of the cover and frame (refer to Table 12.1 below for frequency of testing required). Vacuum testing shall be undertaken in accordance with and to the acceptance criteria stipulated in the Water Services Association of Australia's Sewer Supply code – WSA 02-2002 Version 3 – Sydney Water Edition and CCC Supplement to the WSAA Code.

12.4 Testing of Plastic Lined Concrete Sewers and Maintenance Holes

Visual inspection must be carried out of all surfaces of the lining and weld seams for defects. All field extrusion welds shall be 100% vacuum tested using a suitably designed vacuum box under a partial vacuum minus 35kPa. No leakage or drop in vacuum pressure shall be allowed.

13 Sealing Disused Points of Connection

Where constructing a new junction/property connection arrangement or a PCS results in an existing connection no longer being required, seal the redundant connection at the point of connection to Council's system using approved materials in the accordance with Section 7 of this guideline.

Sealing a sewer service at the inspection shaft is not allowed.

Provide a 150mm PVC adapter and approved sealed screwed PVC cap on the private sanitary drainage line, upstream of Council's point of connection. This configuration allows potential future sewer connection possible with minimal impact to Council's sewer infrastructure.

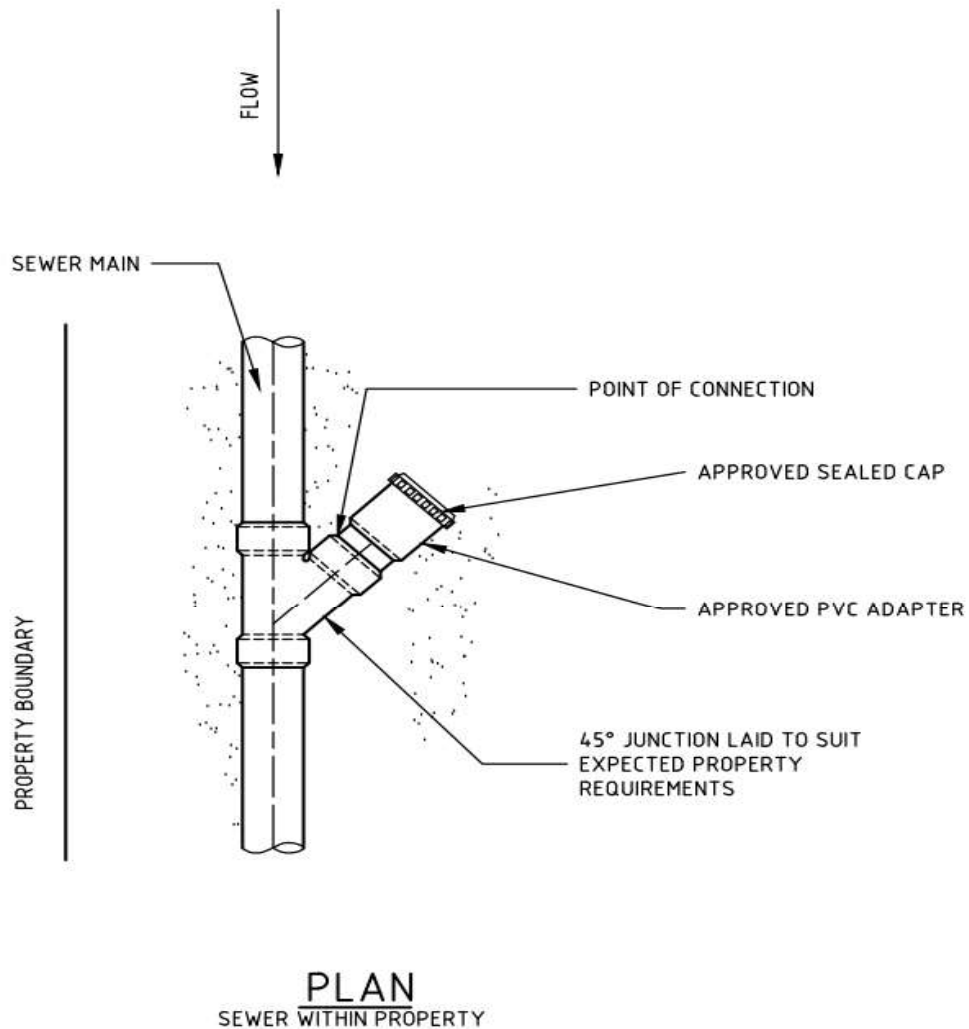


Figure 13.1. Disused connection for sewer within private property

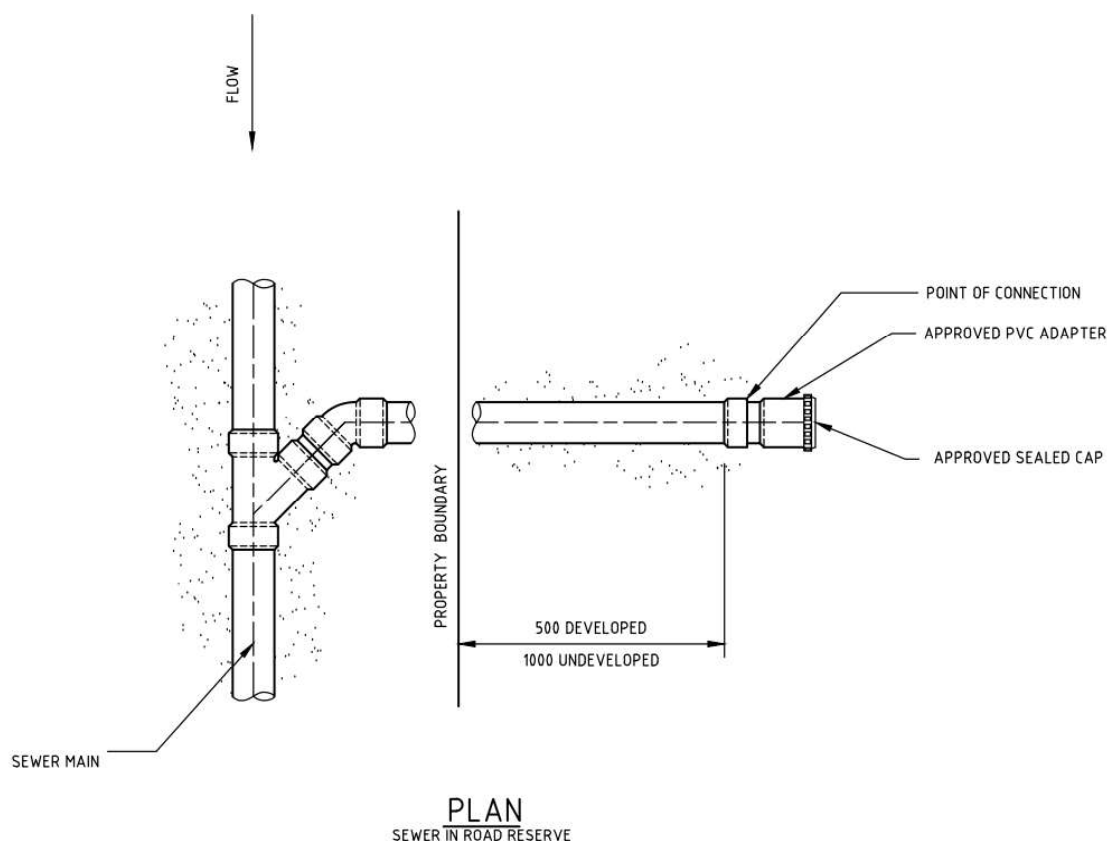


Figure 13.2. Disused connection for sewer within road reserve

14 Surface Restoration

Unless otherwise authorised in writing by the owner of the disturbed property, replace or repair as near as practicable to the pre-construction condition all surfaces and/or improvements (for example shrubs, gardens, retaining walls, fences, pavements) which are disturbed or damaged during construction.

As soon as possible after completing trench backfill, relay turf sods and topsoil previously removed and set aside.

Immediately after trench backfilling and compaction, make safe and temporarily restore trafficable areas to a condition suitable for withstanding traffic loads. Maintain the temporary restoration until final restoration is completed. Where pavements and driveways require restoration or replacement, complete such work in consultation with the property owner and within one month of trench backfilling.

Restore bushland areas as near as practicable to their pre-construction state. Place previously stockpiled topsoil over the affected area and protect the site against erosion.

15 Inspection of works

Central Coast Council are required to carry out a site inspection to verify the works have been completed in accordance with the guidelines specified in this document. The developer is to arrange an inspection of the work by contacting waterandsewerworks@centralcoast.nsw.gov.au.

Provide details of the project location, a description of the works and confirmation of payment of inspection fees as stipulated in the Section 306 letter of approval.

Mandatory inspection of sewer assets include;

- Cutting in of a new property connection to sewer main
- Sealing of disused property connection
- Manhole base construction
- Manhole construction joints
- Vacuum testing (mains and manholes), deflection (ovality) testing
- CCTV inspections
- Infiltration testing (mains and manholes) where applicable
- Manhole cut in to existing sewer
- Any other inspections deemed necessary by Central Coast Council representative

Note: Minimum 48 hours notice is required for a Council inspector to attend the site.

Note: At its discretion, Council may conduct additional independent inspections of the work, including CCTV inspections.

16 Work as Executed (WAE) Details

During progress of the work, legibly record all as-constructed details (including ties to enable location of work) in a manner which accurately shows the completed work.

For works associated with junction cut in connections or sealing of existing disused connections only, a sewer line sheet will be sufficient which is completed by a CCC representative. An example sewer line sheet is included as an Appendix to this document.

For works requiring a detailed design, Work as Executed (WAE) drawings shall be prepared using the Council approved design drawings as a base. In addition to providing WAE level information, location and junction information shall be provided. Refer to Central Coast Council's Water and Sewer Work as Executed CAD Drawing Standard and Requirements document for further details. WAE plans to be submitted to waterandsewerworks@centralcoast.nsw.gov.au at least one month post construction for review. A resubmission fee, minimum of \$100, is payable in the event of Council requiring resubmission of the WAE plans.

Note: Any disused points of connection or disused sewers must be clearly marked on the WAE plan.

17 Work Instruction and Drawings

Note: Any work involving cutting into or working directly on a CCC sewer or diverting sewage flows must be completed within one calendar day.

Note: Care must be taken to ensure that all works are constructed to prohibit the ingress of groundwater and stormwater for the life of the pipework.

The following Work Instructions and Drawings form part of the requirements and must be read in conjunction with the requirements:

Table 17.1 List of Relevant Drawings

| Work Instruction Title | Drawing No. | Drawing Title |
|--|-------------|---|
| Investigate Site | SEW-1150-S | Sewer Symbols |
| | SEW-1200 | Soil Classification Guidelines |
| | SEW-1202 | Standard Embedment Flexible and Rigid Pipes |
| Install Junction and pipework / riser for Property Connection | MWS-101 | Install SS Junction – Unlined Sewer |
| | MWS-103 | Install Cut -in Junction – Unlined Sewer |
| | MWS-104 | Install Pipework / Riser for single property connection |
| Construct Property Connection Sewer | MWS-200 | Construction PCS |
| | MWS-201 | Construct Rodding Point |
| | MWS-202 | Existing Vertical for PCS |
| Concrete Encase Sewer | MWS-300 | Concrete encase sewer |
| Replace pipe | MWS-400 | Replace Pipe |
| Maintenance hole / shaft construction | SEW-1300 | Maintenance Hole Sewers ≤ DN300 Precast Types P1 & P2 |
| | SEW-1301 | Maintenance Holes Sewers ≤ DN300 Cast in-situ Types C1 & C2 |
| | SEW-1302 | Maintenance Holes Pipe Connection Details |
| | SEW-1303 | Maintenance Holes Sewers ≤ DN300 Changes in Level Details |
| | SEW-1304 | Maintenance Holes Sewers ≤ DN300 Typical Channel Arrangements |
| | SEW-1305 | Maintenance Holes Typical Channel Details |
| | SEW-1306 | Maintenance Holes Alternative Drop Connections for DN150 Sewers |
| | SEW-1307 | Maintenance Holes Step Irons, Ladders and Footsteps in Channels |
| | SEW-1308 | Maintenance Holes Typical MH Cover |

17.1 Work Instruction – Investigate Site

17.1.1 Scope

This Work Instruction sets out technical requirements for site investigation as a first step in undertaking any and all work. The purpose of the investigation is to:

- a. Identify site safety and environmental issues.
- b. As necessary, verify:
 - i. location, depth, size and function of underground services, obstructions and that properties can be served by proposed sewer works
 - ii. that the soffit requirement relating to the lowest fitting on the property is achievable (refer to Section 5.1)
- c. Identify sewer pipe material

- d. Determine whether the sewer is lined
- e. Identify impediments to the work (for example the sewer receives pumped flows or is encased).

17.1.2 Background

To reduce infiltration into CCC's sewers and to increase the life of sewers, many older VC and AC sewers have been lined.

Special methods may be necessary for undertaking Minor Works activities on sewers constructed from obsolete materials such as cast iron, or materials that do not conform to current design standards.

CCC's database (GIS) may not accurately record pipe material and/or lining details. Consequently, as a first step in undertaking work, a site investigation is required to determine the sewer pipe material, if the sewer is lined and/or if unexpected features exist.

Constructors should be aware that, as a general rule:

- a. Sewers constructed of polyvinylchloride (PVC) are not lined.
- b. Some sewers constructed of vitrified clay (VC) or asbestos (AC) are lined. The lining may also have sealed existing unused junctions.
- c. A relatively small number of sewers are constructed from alternative materials such as cast iron (CI), ductile iron (DI) or concrete, and they may have been concrete encased at the intended location of a junction.
- d. Sewer linings that may be encountered include:
 - i. Folded and formed PVC
 - ii. Spiral-wound PVC
 - iii. Cured-in-place resin impregnated felt
 - iv. Folded and formed PE
 - v. Plain PE
 - vi. Formed fibreglass

17.1.3 Procedure

17.1.3.1 Verify Records

Obtain services records (for example through Dial Before You Dig, sewer service diagram, GIS) and verify the accuracy of records in the field. Verify the work site is not located in a mine subsidence area.

17.1.3.2 Site Safety and Environmental Issues

Assess site safety and environmental issues, develop appropriate documentation and execute requirements in accordance with relevant Provider Instructions.

If work involves cutting into the sewer, or in the event that the sewer is damaged, treat the excavation as a confined space.

17.1.3.3 Control Sewage Flow

Ensure that appropriate measures can be implemented to control sewage flow, including any flows from sewage pumping stations and private pumping. Councils Technical Services Team may be required to be engaged to implement appropriate measures where Councils Sewer Pumping Stations may impact.

17.1.3.4 Ensure Materials are Available

Ensure ready availability of additional fittings, pipe and materials that may be required in the event of unforeseen circumstances and/or unexpected damage to the sewer that may interfere with timely completion of the work.

17.1.3.5 Excavate to Reveal Sewer

Taking extreme care to avoid damage to the sewer, excavate and expose a section of sewer at the proposed work location e.g. point of connection. If a Constructor who only has 'minor constructor' listing finds that the depth of the sewer exceeds 2.5 metres, immediately cease work and contact CCC. Ensure safety and other issues are addressed should the site need to be made available to others for inspection or further work.

17.1.3.6 Verify Soffit Requirement

For a junction installation and/or construction of a PCS, verify that the overflow level of the lowest actual and/or expected future drainage fitting (for example, overflow gully) on the property being connected is at least 1200 mm above the soffit of CCC's sewer at the point of connection. Where the requirement is not achievable and/or the land to be serviced is vacant, contact CCC.

17.1.3.7 Identify Sewer Material

Clean and inspect the sewer to determine the pipe material. If the sewer pipe material is ductile iron, cast iron, PE, PP, asbestos cement or concrete, or if the sewer is concrete encased at the intended location of work, contact CCC. If the pipe material is PVC, proceed with work as appropriate and in accordance with relevant Work Instructions and Drawings. If the pipe material is VC or AC, for junction installations and pipe replacement continue as specified below to determine whether the sewer is lined.

17.1.3.8 Determine if Sewer is Lined

If an existing junction is to be utilised to connect a PCS, carefully remove the cap and check that the inlet has not been sealed by a lining in the sewer. If it has been sealed, contact CCC. The condition of the junction and the difficulty of effectively cutting and sealing the liner through the arm of the junction may mean that junction/pipe replacement is required. Alternatively, the installer of the liner might be contracted to cut-out the inlet using job specific tools from within the sewer.

For new junction installations, check whether the sewer is lined by visual inspection of the sewer from a nearby maintenance hole. If still unsure whether the sewer is lined, contact Council.

17.2 Work Instruction – Install Junction

17.2.1 Investigate Site

Execute Work Instruction - Investigate Site.

17.2.2 Install Junction

Select junction size to suit flows from the proposed development. The size for a typical residential property is to be 150 x 150 x 150 or 225 x 225 x 150.

Note: A 100mm offtake from the sewer main is no longer accepted by CCC under any circumstances. A 150mm offtake is the minimum size acceptance by CCC.

Install a junction in accordance with the relevant method/drawing referenced in the table below. Selection of an allowable method depends on the existing sewer or existing PCS size and material and if the sewer is lined (both determined by site investigation).

Table 17.2 Selection of junction installation methods

| | Pipe Material | Drawing |
|----------------------|-------------------------|-------------------|
| Unlined Sewer | PVC – plain wall | MWS-101 |
| | PVC – ribbed / profiled | MWS-103 |
| | VC or AC | MWS-101 & MWS-103 |

Note: Pipe for gravity sewer mains shall generally be flexible pipes with rubber ring joints. Pipes in mine subsidence areas shall not be greater than 3m in length, shall incorporate flexible joints and have a smooth external surface. Pipes to be used in mine subsidence areas shall be certified by the pipe supplier to be suitable for the predicted ground strains as advised by the Mine Subsidence Board.

17.3 Work Instruction – Install Pipework / Riser for Property Connection

17.3.1 Install Pipework / Riser

Install pipework / riser in accordance with Drawing MWS-104.

17.4 Work Instruction – Construct Property Connection Sewer

17.4.1 Investigate Site

Execute Work Instruction Investigate site.

17.4.2 Construct PCS

17.4.2.1 Existing Sewer of PCS

If the PCS will be constructed off an existing sewer or PCS, or if it will be an extension of an existing sewer or PCS on line and grade, construct a PCS in accordance with Drawing MWS-200. Some possible PCS configurations are shown in Figure 1.

17.4.2.2 Existing Vertical

If the junction to which the PCS is to be connected is located on an existing PCS Vertical (see Drawing MWS-202) and is not in a trafficable area, obtain CCC approval to proceed with constructing a PCS. Subject to approval, construct the PCS in accordance with Drawing MWS-200. This work is not permitted where the PCS Vertical is in a trafficable area.

Note: In assessing an application to construct a PCS from an existing Vertical, CCC will consider aspects such as:

- The risk of interfering with an adjacent service (for example, if the sewer is not in the property to be served, or if two connections to the Vertical already exist)
- The condition of the Vertical and its connection to the reticulation sewer
- Whether the Vertical is connected to the reticulation sewer by means of a square junction (that is, the reticulation sewer may be at risk of damage if rodded via the Vertical)

17.4.2.3 New Vertical

A new Vertical is not permitted.

If the existing sewer and existing/new junction are in rock or an obstruction is found, provided the new sewer is not located in a trafficable area and subject to CCC approval, the option exists under the minor works process for 'S1' and 'S2' listed constructors only to:

- a. First construct a MS in accordance with WSA 02 Sewerage Code of Australia (Sydney Water edition) and Technical Specification for Leak Tight Sewer Systems (Sydney Water) and then
- b. Construct a PCS from the MS riser in accordance with Drawing MWS-200.

17.4.2.4 Obstruction

If an underground obstruction exists in the proposed route of the PCS:

- a. Document details of function, depth and dimensions of obstruction.
- b. Undertake a risk assessment and record possible safety risks/hazards including possible damage to obstruction or property.
- c. Document proposed work method based on the concept of a typical PCS configuration for a single property (see next page) and Drawing MWS-104.
- d. Before adopting this option, submit obstruction details and proposed work method for the external coordinator or CCC approval.
- e. Construct PCS in accordance with approved work method and relevant drawings.

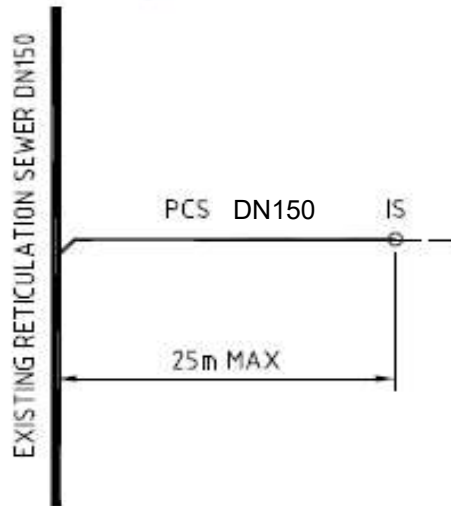
17.4.2.5 Construct a Maintenance Chamber

Where a PCS will service more than one property, construct a Terminal Maintenance Chamber at the most upstream end.

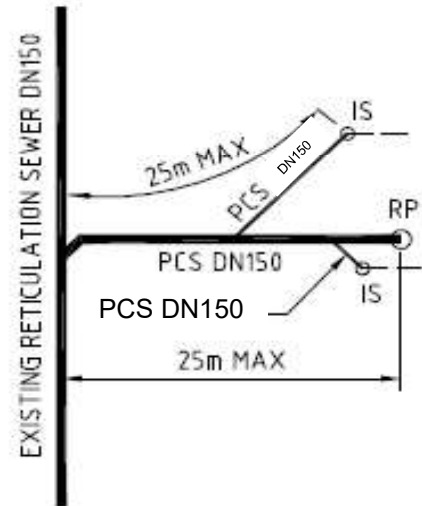
Note: Terminal Maintenance Shafts (TMS) are no longer accepted by Council.

Figure 1 Typical PCS configurations

The length of a PCS is measured along the axis of the PCS from the centreline of the existing sewer at the PCS connection point to the centerline of the furthest riser for the IS or RP. Some permitted PCS configurations are listed as follows (length limits shown are for "S1" and "S2" listed Constructors. Length limit for Constructors who only have "MS" listing is 12 m MAX):

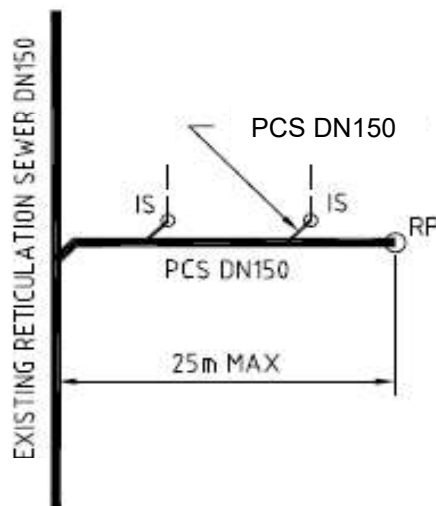


SINGLE PROPERTY

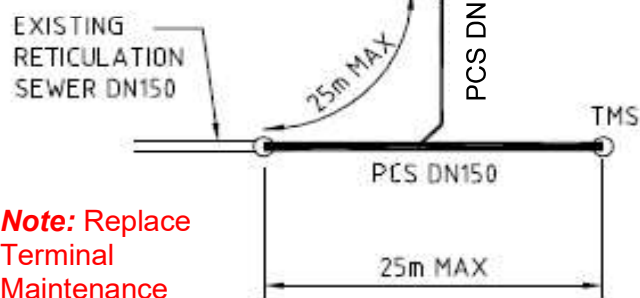


DOUBLE (Y-BRANCH) MULTIPLE PROPERTIES

DN150



MULTIPLE PROPERTIES



MULTIPLE PROPERTIES

Note: Replace Terminal Maintenance Shafts (TMS) with Terminal Maintenance Chamber (TMC).

For all configurations, a PCS shall provide a connection point within each property.

Each PCS shall have maintenance access from the surface at its upstream end. This access will be through the future inspection shaft to be completed by the plumbing licensee on each property. Depending on the configuration, a RP or TMS may also be required to be installed by the Constructor.

The RP for the on line and grade extension of a sewer shall be of TMS type.

RPs must be located within the properties being served by the new works. An exception may be where the TMS of an on-line and grade sewer extension is in public land.

17.5 Work Instruction – Concrete Encase Sewer

17.5.1 Investigate Site

Execute Work Instruction Investigate site.

17.5.2 Inspect Pipes

Before concrete encasing the sewer, consult with the external coordinator to arrange for them to inspect the existing pipes. Determine if any live, unused and/or disused junctions are within the length of sewer to be encased. Get direction from the external coordinator about actions to be taken for junctions.

17.5.3 Replace Defective Pipes

Apply to Council to reline mortar-jointed VC or AC pipes or apply to Council for application to replace the materials with an acceptable alternative. As directed by the external coordinator or as otherwise determined, replace defective pipes in accordance with 17.6. Work Instruction Replace Pipe. Remove, seal or otherwise treat junctions in accordance with Drawing MWS-300.

17.5.4 Concrete Encase Pipes

Relining of pipes is always preferred over concrete encasement where feasible, and where there isn't minimum cover or clearance challenges. For more information refer to the CCC's Building over or adjacent to Water and Sewer Assets Policy and Procedure. Where concrete encasement is required, concrete encase pipes in accordance with Drawing MWS-300.

17.6 Work Instruction – Replace Pipe

17.6.1 Investigate Site

As necessary, execute Work Instruction Investigate site.

17.6.2 Replace Defective Pipes

As directed by the external coordinator or CCC, or as otherwise determined, replace defective pipes in accordance with Drawing MWS-400.

17.7 Work Instruction – Construct Maintenance Structure




17.7.1 Investigate Site

As necessary, execute Work Instruction Investigate site.

17.7.2 Construct Maintenance Structure

Construct maintenance structure as per SEW-1300 series drawings.

17.7.3 Construct Maintenance Structure over Existing Sewer Pipeline

| Step | Details | Figure |
|------|---|--|
| 1 | Expose existing sewer. Divert flows between maintenance structures using a pump with another pump on standby. Cut open half of sewer pipe to limits of manhole base construction. |  |
| 2 | Tape back on and secure temporarily the cut piece of pipe to existing sewer pipe. |  |
| 3 | Pour manhole base surrounding pipe using concrete specified in this document and as per SEW1300 series drawings. Benching to be raised above halfway point of pipe to make allowance for new incoming sewer to drop into existing sewer line. |  |

- 4 Render maintenance structure base and make good. Build up maintenance structure using pre-cast components as per manufacturer guidelines.



Note: The proponent shall submit a methodology to Council for live cut in to existing sewer main where sewer diversion is required prior to commencing works.

17.7.4 Modify Maintenance Structure Finished Surface Level

Identify type of maintenance structure to be raised (pre-cast manhole, cast in-situ manhole, maintenance shaft, etc). New height to suit new finished surface level. Carefully remove the existing cover and frame and adjust height to suit according to manufacturers specifications. If the maintenance structure is a cast in-situ manhole, contact the external coordinator to prepare design to adjust the manhole to suit conditions set out in WSA 02 Sewerage Code of Australia (Sydney Water Edition).

18 Related Resources

18.1 Legislation:

[Corporations Act 2001 \(Cwlth\)](#)

[Local Government Act 1993 \(NSW\)](#)

[Water Management Act 2000 \(NSW\)](#)



LINE SHEET

Sewer Junction Cut-in Information

DETAILS OF WORK TO BE CARRIED OUT

Lot No: _____ House No: _____ DP No: _____
Street Name: _____
Locality: _____
Nearest Cross Street: _____ Line No: _____

Upstream Manhole No: _____



Downstream Manhole No: _____

Distance between Manholes: _____
Junction Distance from Downstream Manhole: _____
Junction Depth: _____
Junction Projection Distance (if applicable): _____
Distance to top of Riser (if applicable) _____
New Manholes shown (if applicable): YES/NO

Work completed by:

Civil Field Officer Dispatch Start End
Name: _____ No: _____ Date: _____ Time: _____ Time: _____

| MISCELLANEOUS | SYMBOL |
|---|------------|
| SURVEY MARKS | |
| BENCH MARK | ▲ |
| LEVEL MARK | △ |
| PERMANENT MARK (PM) | □ PM 12345 |
| STATE SURVEY MARK (SSM) | □ SSM 6789 |
| ROCK MARK OR DRILL HOLE AND WING (DH&W) | ▼ ○ ◀ |
| GALVANISED IRON NAIL IN TREE | ☁ GN |
| BOUNDARY LINE | — |
| FENCE | — — — — — |
| WALL | ▩ |
| RETAINING WALL ON LINE (SECTION) | |
| BUILDING | |
| HOUSE ON LOT (IF HOUSE NUMBER IS SHOWN SYMBOL IS OMITTED) | H |
| VACANT LOT | V |
| FINISHED SURFACE LEVEL | FSL |
| DIRECTION OF FLOW | |

| STRUCTURE | SYMBOL |
|--|--------------------------------|
| MAINTENANCE HOLE (ACCESS CHAMBER) | — ■ — |
| MAINTENANCE HOLE WITH OVERFLOW AND GAS CHECK | — ■ — |
| DUAL MAINTENANCE HOLES FOR OVERFLOW | — ■ — |
| MAINTENANCE HOLE WITH VENTSHAFT | VENTSHAFT — ○ — |
| MAINTENANCE SHAFT | MS — ○ — |
| VACUUM CHAMBER | VC — ○ — |
| TERMINAL MAINTENANCE SHAFT | TMS — ○ — |
| RODDING POINT | RP — ● — |
| VENTSHAFT (INDUCT OR EDUCT) | 1/51 — ○ — 1/52 — ○ — |
| PROPOSED SEWER TO BE CONSTRUCTED ON ASSOCIATED PLANS | — — — — — |
| EXISTING SEWER AND MAINTENANCE HOLE | — ■ — |
| CONCRETE ENCASEMENT (SECTION) | |
| POSITION OF JUNCTION AND POSITION OF PROPERTY CONNECTION SEWER (PCS) | |

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 THE BLOCK 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 |
| SAND & GRAVEL | HARD | INDENTED WITH DIFFICULTY BY THUMBNAIL. | 200 |
| | 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 | DIGGABLE. HAMMER BLOW "THUDS". JOINTS (BREAK IN ROCK) SPACED AT 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
of Australia

SEWERAGE CODE OF AUSTRALIA

SOIL CLASSIFICATION GUIDELINES
AND ALLOWABLE BEARING PRESSURES
FOR BULKHEADS

NOT TO SCALE

SEW-1200

© WSAA, 2002 V2.1

MWS-101

Investigate Site

1. Execute Work Instruction "Investigate Site".

Excavation

2. Excavate under and along sewer to enable placing two halves of junction in position. When in rock strata, ensure excavation is sufficient to enable later connection of property connection arrangement or PCS without having to excavate rock within 500 of junction.
3. If sewer is damaged, replace damaged pipes in accordance with Work Instruction "Replace Pipe", at same time installing cut-in junction in accordance with Drawing MWS-103.

Install Junction

4. At proposed location of connection to PVC sewer or at investigation hole previously cut into VC sewer (refer Work Instruction "Investigate Site"), mark an outline of the elliptical inlet hole to be cut into sewer that matches branch of stainless steel junction. Use a template of branch – do not use the SS junction itself as template.
Do not use permanent markers (e.g. non-water-based markers and paints or spray paints etc) on SS junctions as it may cause corrosion.
5. For PVC sewer, cut elliptical hole in sewer to match elliptical trace of junction branch. Prevent pieces cut from pipe from entering sewer or else retrieve. Use suitable tools to cut the pipe. Do not use hammers and chisels.

For a VC sewer, reshape initial investigation hole to match elliptical trace by cutting, grinding or ribbling edges of hole. Prevent pieces cut from pipe from entering sewer or else retrieve. Ensure edges of hole are smooth and clean. Use suitable tools to cut and grind the pipe. Do not use hammers and chisels.

6. Thoroughly clean full circumferential surface of sewer over length greater than SS junction.

7. Clean and then apply lubricant to corrugated elastomer underlay of junction to ensure it will effectively seal when clamped onto surface of sewer.

8. Place two parts of junction around sewer so branch is aligned with direction of flow and is directly over elliptical opening previously cut in sewer. Look through branch and ensure inlet aligns with and matches size of elliptical hole cut into sewer. As necessary, re-work the cut hole and/or re-align junction before tightening bolts to secure junction in place. Ensure grade of junction branch is 2% for pipework to riser for IS or min 2% for PCS.

Re-tighten bolts

9. As required for specific job, install pipework/friser for property connection as per Drawing MWS-104 or install PCS as per Drawing MWS-200 from junction.

10. Carefully remove temporary pipe supports while placing single size 7 or 10 granular bedding or placing and compacting stabilised sand (25:1 sand/cement) under and around junction to ensure sound support of sewer.

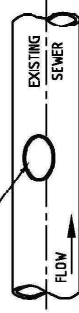
11. Place trench fill material in 300 layers and compact progressively.

12. Restore surface.

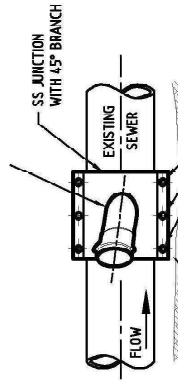
THIS METHOD PERMITTED FOR:

- PLAIN WALL PVC SEWERS
- UNLINED VC SEWERS

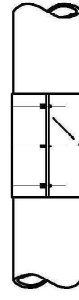
ELLIPTICAL HOLE CUT TO MATCH SS JUNCTION INLET SIZE. LOCATE TO ACHIEVE SPECIFIED FALL TO INVERT FOR EITHER PROPERTY CONNECTION ARRANGEMENT OR PCS CONNECTION.



INLET BRANCH PLACED OVER ELLIPTICAL HOLE CUT INTO EXISTING SEWER.



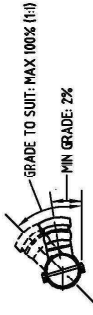
BOLTS RE-TIGHTENED BOLTS TEN MINUTES AFTER INITIAL TIGHTENING.



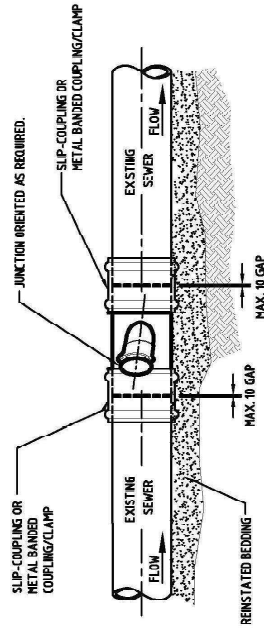
45° JUNCTION LOCATED TO SUIT EXPECTED PROPERTY CONNECTION ARRANGEMENT OR PCS

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN

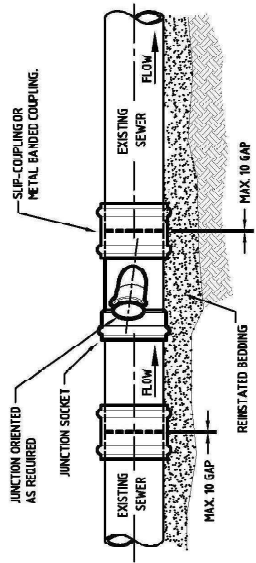
JUNCTION FOR PIPEWORK / RISER TO IS



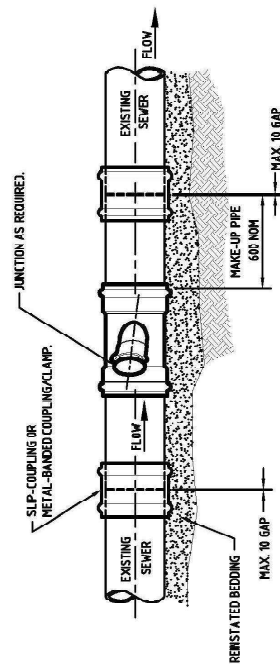
JUNCTION FOR PCS



SPIGOT/SPIGOT JUNCTION



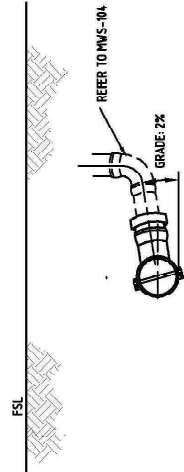
SOCKET/SPIGOT JUNCTION



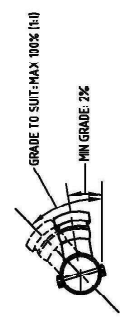
SOCKET/SOCKET JUNCTION

THIS METHOD PERMITTED FOR:

- PLAIN WALL PVC SEWERS
- RIBBED PVC SEWERS
- UNLINED VC SEWERS



JUNCTION FOR PIPEWORK / RISER TO IS



JUNCTION FOR PCS

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN

Investigate Site

1. Execute Work Instruction "Investigate Site".

Excavation

2. Excavate under and along sewer to enable insertion of junction, short pipe section (if required) and slip couplings. When in rock strata, ensure excavation is sufficient to enable later connection of property connection arrangement or PCS without having to excavate rock within 500 of junction.
3. If sewer is damaged, replace damaged pipes in accordance with Work Instruction "Replace Pipe".

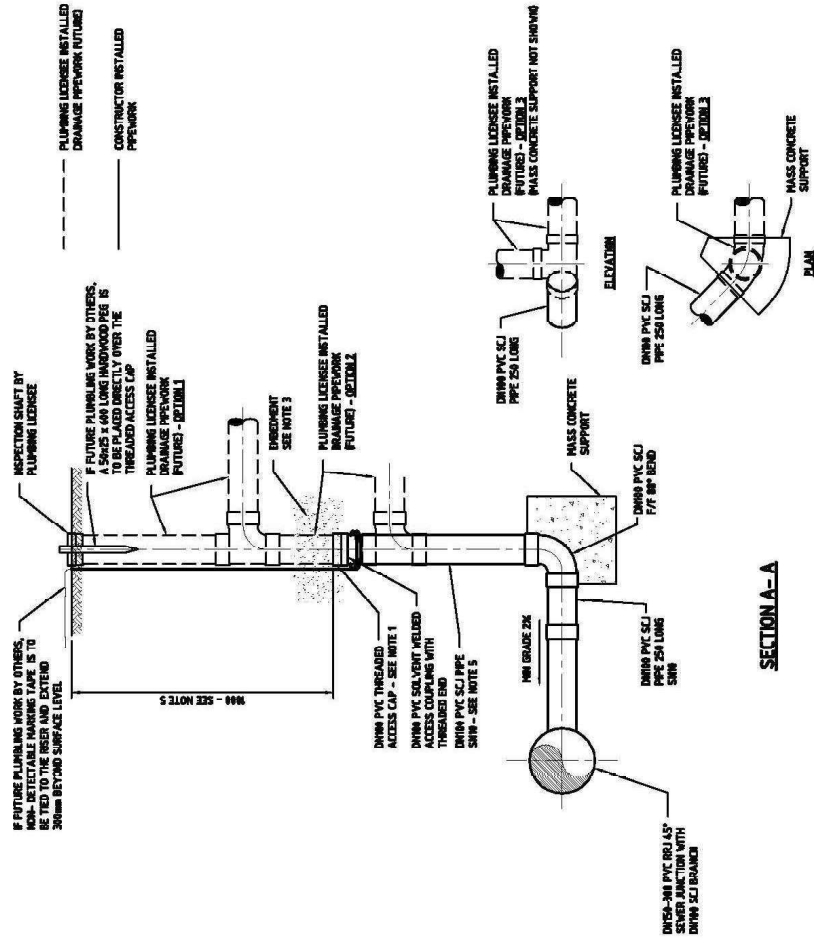
Check Dimension Tolerances

4. Ensure junction is same material and strength/stiffness class as existing sewer. To avoid creating a step in invert of sewer, ensure internal diameter of main bore of both junction and short pipe match internal diameter of sewer into which they are to be inserted within following tolerances:
 - ± 8 for DN 150
 - ± 10 for DN 225.
5. Where a pipe coupling is to be used, ensure difference in ODs of junction/short pipe and sewer are within coupling manufacturer's limits.

Cut Pipe and Install Junction

6. Provide temporary supports under sewer at either side of proposed junction location.
7. Determine length of sewer to be removed to achieve neat fit of junction (and short-pipe inserts if spigot/socket or socket/socket junctions to be used). Mark where cuts are to be made: cut and remove section of sewer. Ensure cut ends are square and smooth. Clean external surfaces of any short-pipe inserts and external surfaces (ends) of sewer.
8. Ensure internal and external dimensions of sewer, short-pipe inserts and junction satisfy dimensional tolerances specified above.
- Position junction (and short-pipes as required) in sewer and ensure gaps are ≤ 10 . Align inverts to match as closely as practicable.
9. Ensure grade of junction branch is 2% for pipework to riser for IS or min 2% for PCS.
10. Provide witness marks on inserted pipe to indicate final positions of couplings. Thoroughly clean full circumferential surface of sewer at joint vicinity. Slide each coupling so it is centred over its joint and secure couplings.
11. As required for specific job, install pipework/riser for property connection as per Drawing MWS-104 or install PCS as per Drawing MWS-200 from junction.
12. Carefully remove temporary pipe supports while placing single size 7 or 10 granular bedding or placing and compacting stabilised sand (25:1 sand/cement) under and around junction to ensure sound support of sewer.
13. Place trench fill material in 300 layers and compact progressively.
14. Restore surface.


| Sydney WATER | | MINOR WORKS (SEWER) | | NOT TO SCALE | |
|---|--|--|--|--|--|
| RECOMMENDED R. RIZZI for MANAGER WASTEWATER SYSTEMS APPROVED 07.07.05 B. NELSON for MANAGER STRATEGIC ASSET MANAGEMENT | | INSTALL JUNCTION INSTALL CUT-IN JUNCTION UNLINED SEWER | | MWS - 103 ISSUED: 2015 VERSION: 2 | |
| | | | | | |
| © COPYRIGHT STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED | | DETAILS OF VERSION / AMENDMENT LETTER 2 GENERAL REVISION 1 ORIGINAL ISSUE | | HP. 12.08.15 BN. 01.07.15 APPD. DATE | |
| | | | | | |



NOTES:-

1. THE CONSTRUCTOR SHALL INSTALL UP TO AND INCLUDING THE THREADED ACCESS CAP IN ALL CASES.
2. ALTERNATIVE FITTINGS MAY BE UTILISED IN THE PCS IN PLACE OF THOSE SHOWN IF APPROVED BY STONEY WATER.
3. PROPERTY CONNECTION SERIES AND INSPECTION SHAFTS SHALL BE SURROUNDED BY PIPE EMBEDMENT MATERIAL WITH MINIMUM COVER OF 150mm TO ALL COMPONENTS. EMBEDMENT MATERIAL SHALL BE SINGLE SIZE 7 OR 10 GRANULAR AND SHALL EXTEND 150mm ABOVE THREADED ACCESS CAP.
4. DN100 PROPERTY CONNECTION SIZE SHOWN. PIPEWORK AND FITTING ARRANGEMENT MAY BE ADOPTED FOR LARGER CONNECTIONS TO SUIT DEVELOPMENT.
5. THE MINIMUM LENGTH OF RISER PIPE SHALL BE 250mm. DEPTH TO THREADED ACCESS CAP MAY BE LESS THAN 1000mm FOR SHALLOW INSTALLATIONS TO PROVIDE THE MINIMUM LENGTH OF RISER PIPE.
6. CONNECTION OPTIONS SHOWN ARE FOR FUTURE PLUMBING WORK BY OTHERS.

**ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SHOWN**

| | | | | | | | | | |
|--|--|--------|--|---|--|---|--|---|--|
|  | | | | | | MINOR WORKS (SEWER) | | NOT TO SCALE | |
| © COPYRIGHT STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED | | | | 1 | | ORIGINAL ISSUE - REDRAW OF FIGURE LT-2 FROM THE TECHNICAL SPECIFICATION FOR LEAK TIGHT SEWER SYSTEMS (SYDNEY WATER) VERSION 8 | | DN100 PVC-U PROPERTY CONNECTION ARRANGEMENT INSTALL PIPEWORK / RISER FOR SINGLE PROPERTY CONNECTION | |
| | | | | | | DETAILS OF VERSION / AMENDMENT | | H.P. 12.08.15 | |
| | | LETTER | | | | APPD | | DATE | |
| | | | | | | | | ISSUED: 2015 | |
| | | | | | | | | VERSION: 1 | |

1. As necessary, execute Work Instruction "Investigate Site".

- ### Construct PCS – Standard Method

- Note:** Minimum 150mm offset required for junction. 100mm offset is not accepted by CCO

| Nominal Size (DN) | Minimum Trench Width* |
|-------------------|-----------------------|
| 150 | 450 |
| 200 | 550 |
| 225 | 600 |

TABLE B - MINIMUM PIPE COVER

| Location | Minimum Cover to Top of Sewer |
|---|-------------------------------|
| Private and public property / Non-vehicular loading | 600 ^{mm} |
| Private residential property / Vehicular loading | 750 |
| Footway, industrial property & local roads | 900 |
| Arterial roads, State roads, unsealed roads | 1200 |

450 permitted in existing developments

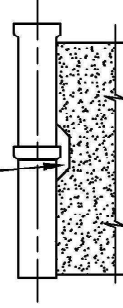
NOT TO SCALE

MWS - 200

| | |
|--------------|------------|
| ISSUED: 2015 | VERSION: 2 |
|--------------|------------|

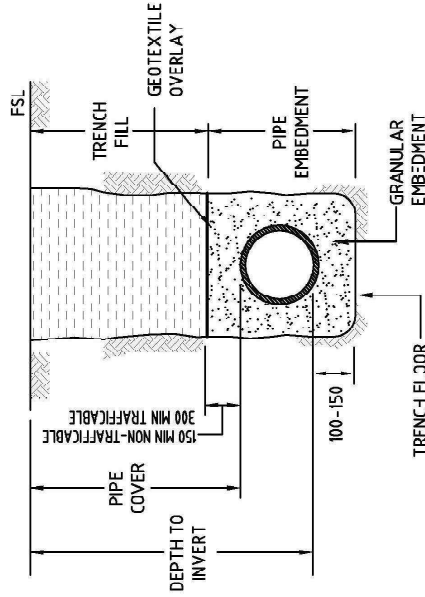


50 NOMINAL DEPTH POCKET
PROVIDED IN BEDDING AT JOINT
PRIOR TO LAYING PIPES.
VOIDS FILLED DURING
COMPLETION OF EMBEDEDMENT.




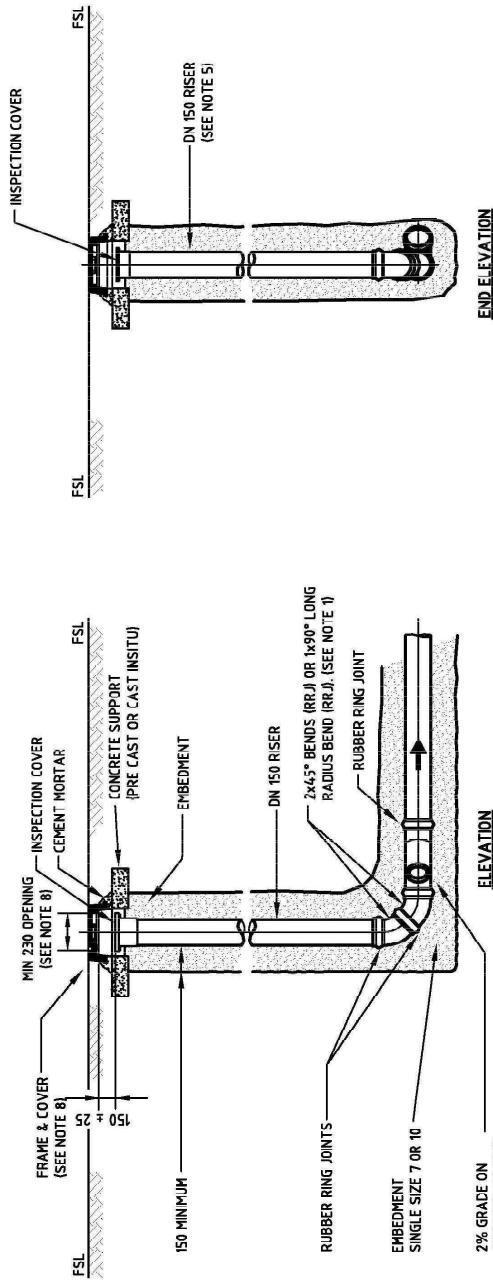
PIPE JOINT

BEDDING POCKETS

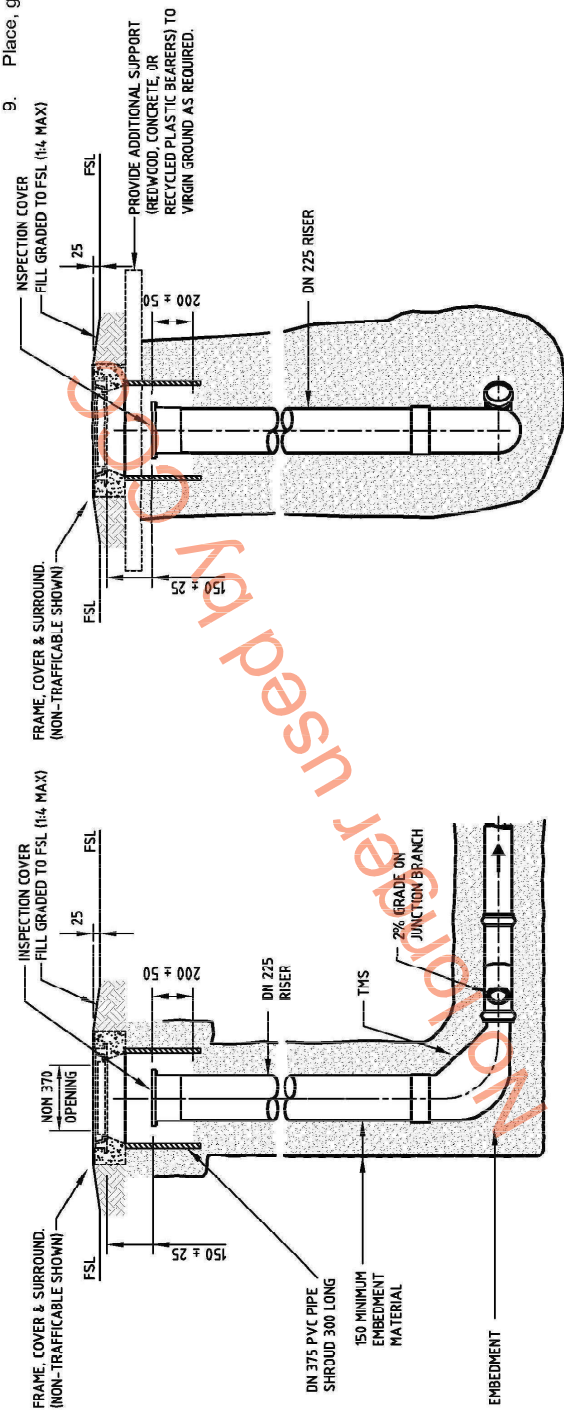


PIPE JOINT

| | | | | |
|---|--|--|--------|-------------------------------|
|  | RECOMMENDED R. RIZZI FOR MANAGER WASTEWATER SYSTEMS | | | |
| | APPROVED B. NELSON FOR MANAGER STORMWATER ASSET MANAGEMENT | 07.07.05 GENERAL REVISION ORIGINAL ISSUE DETAILS OF VERSION / AMENDMENT LETTER | 2 1 | H.P. B.N. APPTD DATE |
| | | | | 12.08.15 07.07.05 |



RODDING SHAFT



TERMINAL MAINTENANCE SHAFT


General

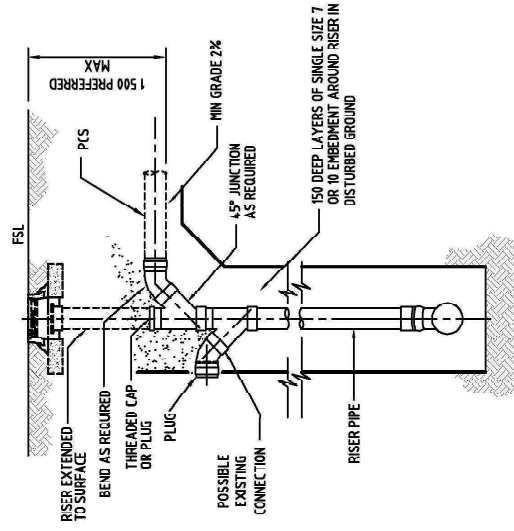
Use either a site-assembled rodding shaft or prefabricated terminal maintenance shaft (TMS) to provide maintenance access to a PCS. If an existing sewer is being extended, a prefabricated TMS shall be installed.

Procedure

- For rodding shaft option, connect 2 x 45 degree bends (or 1 x 90 degree) to terminal junction. Bends and riser to be same size as PCS.
OR
For TMS option, connect base piece of TMS to terminal junction.
- Place single size 7 or 10 granular bedding under bend or base piece.
- Orient rising bend or base piece to ensure riser will be vertical.
- Place bedding over and around bend or base piece.
- Connect riser pipe ensuring it is vertical.
- Place bedding around riser. Ensure bedding material will support cover and surround without settlement.
- Trim riser as required to achieve specified clearances from inspection cover.
- Fit inspection cover to riser; fit frame, cover and surround. If DN 225 riser, use arrangement shown for TMS.
- Place, grade and compact fill material around the cover and surround.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SHOWN

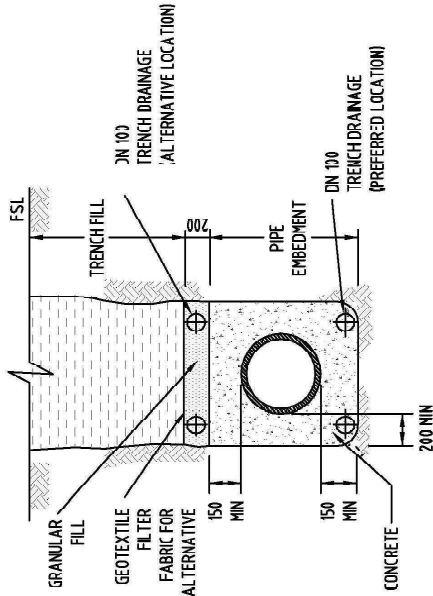
| | | | | | | | | |
|---|---|--------|---|--------------------------------|------|--|------------------|------------|
|  | RECOMMENDED R. RIZZI for MANAGER WASTEWATER SYSTEMS | | | | | MINOR WORKS (SEWER) | NOT TO SCALE | |
| | APPROVED B. NELSON for MANAGER STRATEGIC ASSET MANAGEMENT | | | | | | | |
| | 07.07.05 | | 2 | GENERAL REVISION | H.P. | | | 12.08.15 |
| | | | 1 | ORIGINAL ISSUE | B.N. | | | 07.07.05 |
| STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED | | LETTER | | DETAILS OF VERSION / AMENDMENT | | PROPERTY CONNECTION SEWER CONSTRUCT RODDING POINT | MWS - 201 | |
| © COPYRIGHT | | | | | | | ISSUED: 2015 | VERSION: 2 |



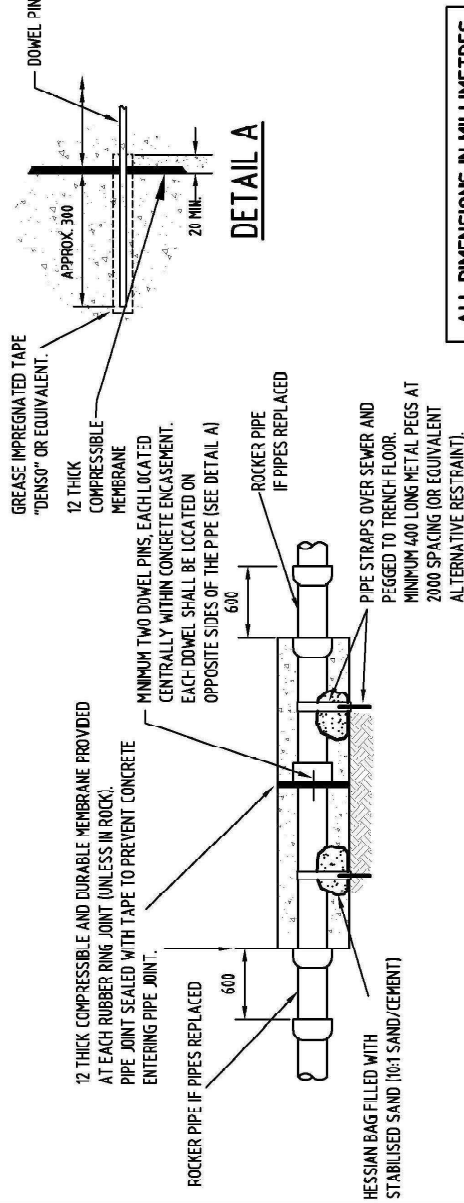
TYPICAL EXISTING VERTICAL

3. If necessary, excavate to locate cap of vertical, junction(s) and any existing CSD.
4. Where riser terminates below ground, extend riser to surface and install surface fittings as for Rocking Point in accordance with Drawing MWS-201.
5. As appropriate, remove junction cap/plug or existing CSD connection.
6. Construct PCS in accordance with Drawings MWS-200 and MWS-201.

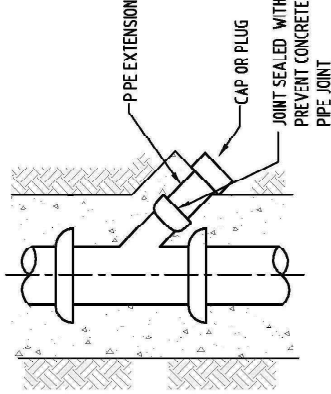
| | | | | | | | |
|---|--|--------------------------------|-------|----------|--|--------------|------------|
| <div>Sydney WATER</div> <div>© COPYRIGHT STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED</div> | RECOMMENDED R. RIZZI for MANAGER WASTEWATER SYSTEMS | | | | MINOR WORKS (SEWER) | NOT TO SCALE | |
| | APPROVED B. NELSON for MANAGER STRATEGIC ASSET MANAGEMENT | 07.07.05 | | | | | |
| | 2 | GENERAL REVISION | H.P. | 12.08.15 | | | |
| | 1 | ORIGINAL ISSUE | B.N. | 07.07.05 | | | |
| | LETTER | DETAILS OF VERSION / AMENDMENT | APP'D | DATE | | | |
| | | | | | PROPERTY CONNECTION SEWER EXISTING VERTICAL FOR PCS | MWS - 202 | |
| | | | | | | ISSUED: 2015 | VERSION: 2 |



UN-REINFORCED CONCRETE ENCASEMENT



SPIGOT/SOCKET JOINT OR SLEEVED COUPLING



JUNCTION IN ENCASED SECTION

Investigate Site

1. Execute Work Instruction "Investigate Site".

Excavation

2. Excavate and expose full length of sewer to be encased.
3. Determine if any live and/or disused junctions are within length to be encased. Do not encase existing junctions without prior Sydney Water approval.
4. Check bearing capacity of trench floor in accordance with Drawing SEW-1200. If allowable bearing is deemed to be <50 kPa, consult WSC or Sydney Water for instruction.
5. If sewer is damaged, either as a result of excavation or other causes, consult WSC or Sydney Water for instruction.
6. Complete excavation under sewer, supporting each excavated pipe on precast concrete support blocks or hessian bags filled with stabilised sand (25:1 sand/cement) placed at 3 m spacing or one under each pipe, whichever is lesser distance.
7. Replace mortar-jointed VC, CI & CI pipes, defective pipes and other pipes as directed by WSC or Sydney Water and in accordance with Work Instruction "Replace Pipe".
8. Unless otherwise authorised, remove junctions and reinstate sewer in accordance with Work Instruction "Replace Pipe".
9. Arrange for WSC or Sydney Water inspection of sewer before concrete encasement.

Pipework Preparation

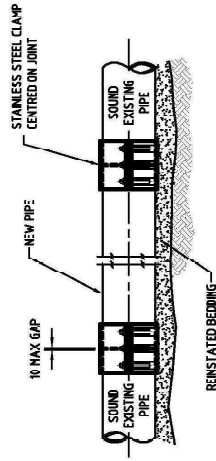
10. Ensure sewer and trench are free of debris and loose spoil.
11. Where Sydney Water has authorised a junction to remain or to be located in encased sewer, connect a length of pipe to junction. Extend pipe so that its socket (or, alternatively, a coupling at spigot end of a pipe) is located at proposed edge of encasement. Cap extended socket/coupling and wrap in polyethylene prior to placing concrete.
12. Install rocker pipes (if pipes replaced).
13. Place compressible membrane and steel dowels at all encased flexible joints (not required for SCJs).
14. Install support/restraint system to prevent pipe movement/floatation during concrete placement.
15. Install drainage pipe, ensuring both upstream and downstream ends of pipe protrude past concrete encasement into granular embedment. Wrap ends of drainage pipe in geotextile fabric. Where encasement ends within 1000 of a MH, extend encasement to MH. Extend drainage pipe beyond MH to adjoining pipework embedment.

Encasement

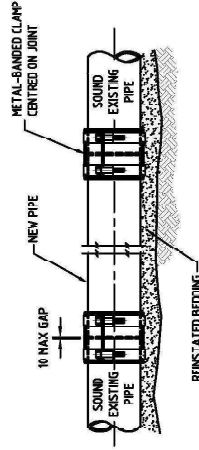
16. Use normal class concrete to AS 1379, and min strength Grade 20. Whilst progressively withdrawing pipe supports, place concrete along one side of sewer and vibrate concrete so it flows under sewer to height of haunch on other side.
17. Do not let free fall of concrete exceed 1.6 m and do not permit concrete to impact directly on exposed sewer.
18. Continue to place concrete around sewer from both sides to achieve specified cover. Stop concrete 10 short of face of pipe socket each end. Vibrate concrete.
19. Make work site safe during initial curing period and allow min 24 hours curing before placing and compacting trench fill.
20. Remove any temporary forms without disturbing concrete.
21. Place trench fill material in 300 layers and compact progressively.
22. Restore surface.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SHOWN

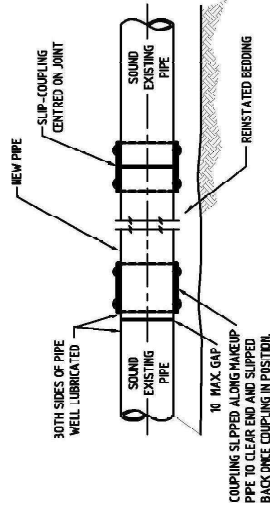
| Sydney WATER | | RECOMMENDED | | MINOR WORKS (SEWER) | | NOT TO SCALE | |
|--|--|--|--|-----------------------|--|--------------|--|
| © COPYRIGHT STATE OF NEW SOUTH WALES THROUGH SYDNEY WATER CORPORATION. ALL RIGHTS RESERVED. | | R. RIZZI for MANAGER WASTEWATER SYSTEMS APPROVED 07.07.05 | | CONCRETE ENCASE SEWER | | MWS - 300 | |
| | | B. NELSON for MANAGER STANDARD ASSET MANAGEMENT | | | | ISSUED: 2015 | |
| | | 2 GENERAL REVISION | | | | VERSION: 2 | |
| | | 1 ORIGINAL ISSUE | | | | | |
| | | LETTER | | | | | |
| | | DETAILS OF VERSION / AMENDMENT | | | | | |
| | | HP. 12.08.15 | | | | | |
| | | BN. 07.07.05 | | | | | |
| | | APPD. DATE | | | | | |



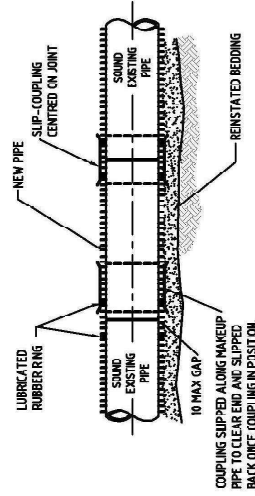
STAINLESS STEEL REPAIR CLAMP METHOD



METAL-BANDED FLEXIBLE COUPLING METHOD



SLIP-COUPLING METHOD PLAIN WALL PIPE



SLIP-COUPLING METHOD PROFILED WALL

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SHOWN

Investigate Site

1. As necessary, execute Work Instruction "Investigate Site".

Excavate and Support Existing Sewer

2. Excavate and expose full length of sewer to be replaced. Achieve min 100 clearance between underside of sewer and trench floor. Support each excavated pipe. A: each end of section to be removed, place supports under exposed section of existing sewer not being removed i.e. immediately adjacent to intended cut locations.
3. Ensure proposed cuts are at least 400 from a remaining socket. Cut and remove pipes to be replaced. Clean remaining pipe ends and ensure cut faces are square.
4. Prepare trench floor e.g. remove or trim rock outcrops and treat soft or loose areas. Check bearing capacity of trench floor in accordance with Drawing SEW-1200. If allowable bearing is deemed to be <50 kPa, consult WSC or Sydney Water for instruction regarding special requirements.
5. Compact fill and disturbed areas. Remove debris and water before placing bedding.

For Unlined Sewers

6. Ensure replacement pipes are same material and strength/stiffness class as existing sewer. Exceptions are where VC, CI & DI pipe can be replaced by PVC pipe as part of concrete encasement work. Ensure that internal diameters of existing sewer and replacement pipes match within the following tolerances:
 - ± 8 for DN ≤ 50
 - ± 10 for DN ≥ 225 .
7. Where a coupling is to be used, ensure difference in ODs of replacement pipe and sewer are within coupling manufacturer's limits.

For Lined Sewers

6. Completely fill any gap between the sewer and its liner using an approved epoxy mastic. Measure and record any difference in internal diameters of lined pipe and replacement pipe
7. Where a difference exists in internal diameters, file or grind end of appropriate pipes (at least 3 o'clock to 9 o'clock) to approximately 30 degrees to achieve smooth transition. Use suitable tools to cut and/or grind the pipe/liner. Do not use hammers and chisels.

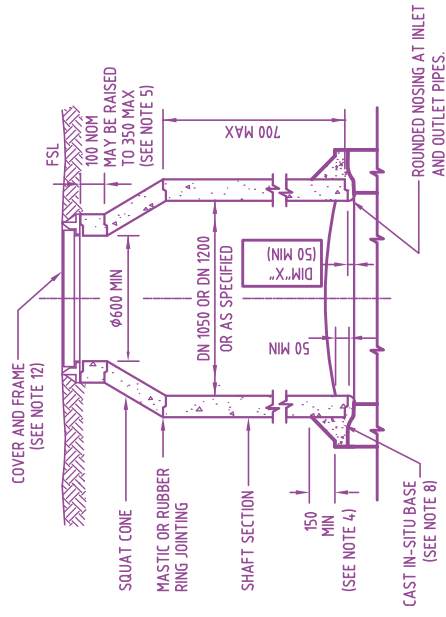
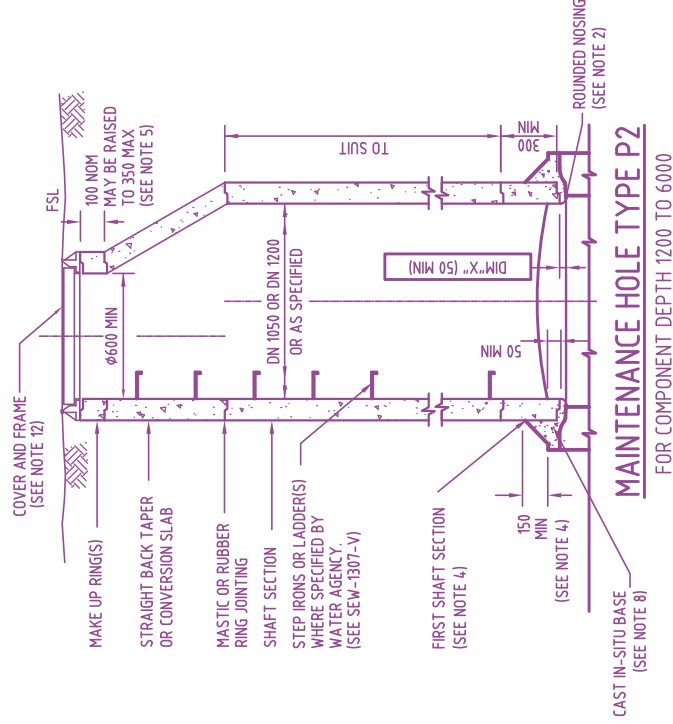
Note: Consult Sydney Water for instruction if replacement pipes do not meet material, stiffness, strength and/or dimensional requirements e.g. lip of sewer may need to be ground (tapered) or a maintenance structure be constructed at upstream face of encasement, or pipes may need to be replaced from NH to MH.

8. Set replacement pipes to line and grade, ensuring gaps between existing sewer and replacement pipes are ≤ 10 .
9. Thoroughly clean surfaces of pipes before installing clamps or couplings. Connect pipes by means of flexible couplings centred over each joint.
10. Unless pipes to be concrete encased (refer Drawing MWS-300), complete pipe embedment.
11. Place trench fill material in 300 layers and compact progressively.
12. Restore surface.
13. For lined sewers, advise Sydney Water in writing of:
 - type of lining found
 - location, length, material and stiffness of replacement pipes inserted into sewer
 - difference in internal diameters of lined sewer and replacement pipes.

| | | | | |
|---|---|----------------------------|--|-----------------------|
| | | MINOR WORKS (SEWER) | | NOT TO SCALE |
| REPLACE PIPE | | MWS - 400 | | ISSUED: 2015 |
| REPLACE PIPE | | MWS - 400 | | VERSION: 2 |
| RECOMMENDED R. RIZZI FOR MANAGER WASTEWATER SYSTEMS | A-PROVED B. NELSON FOR MANAGER STRATEGIC ASSET MANAGEMENT | 2 1 LETTER | GENERAL REVISION ORIGINAL ISSUE DETAILS OF VERSION / AMENDMENT | H.P. B.N. APP'D |
| 12.08.15 07.07.05 | DATE | | | |

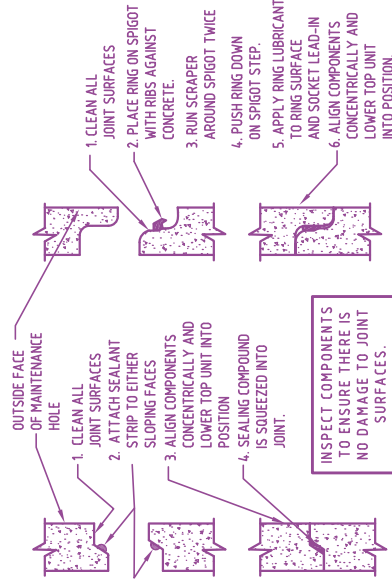
NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. PROVIDE ROUNDED NOSING ON INLET AND OUTLET PIPE TO PREVENT DAMAGE TO JETTING EQUIPMENT AND CCTV GUIDES AND CABLES.
3. CONSTRUCTION MAY BE A COMBINATION OF PRECAST AND IN-SITU TO SUIT APPLICATION (WATER AGENCY AUTHORISATION REQUIRED).
4. LOCATION OF FIRST SHAFT SECTION:
 - a) FIRST SHAFT SECTION TO BE BETWEEN 300-600 LONG TO ALLOW FORMING OF CHANNEL AND BENCH.
 - b) WHERE STEP IRONS ARE USED, CORRECTLY ORIENTATE BOTTOM STEP.
 - c) PIPE COMPONENT 200 FROM BOTTOM WITH CEMENT SLURRY. EMBED SHAFT SECTION 50 INTO WET CONCRETE. BUILD UP OUTSIDE FILLET TO 50.
5. MAKE-UP RINGS:
 - a) USE MINIMUM OF ONE MAKE-UP RING (PREFERABLY 100 OR 150 PER MH DURING CONSTRUCTION TO ALLOW FOR FUTURE SURFACE ADJUSTMENT WITHOUT AFFECTING THE SHAFT SECTIONS.
 - b) SEE SEW-1308-V FOR TAPERED MAKE UP RING ON SLOPING GROUND.
6. BACKFILL METHOD MH.
 - a) THE METHOD OF BACKFILL AND COMPACTION AROUND MH TO BE GENERALLY AS FOR PIPE EMBEDMENT.
 - b) TAKE CARE TO RAISE SELECT FILT EQUALLY ALL AROUND THE MH TO AVOID UNBALANCED LATERAL LOADING.



MAINTENANCE HOLE TYPE P1

FOR COMPONENT DEPTH ≤ 1200



MASTIC JOINT DETAILS

RUBBER RING JOINT DETAILS

CALCULATING TOTAL PRECAST COMPONENT DEPTH

(REFER NOTE 4)

TOTAL DEPTH
OF
PRECAST
COMPONENT

$$\text{DEPTH TO INVERT OF HIGHEST NON-DROP INLET PIPE} \\ \text{MINUS} \\ (\text{ID OF INLET PIPE} + \text{PIPE WALL THICKNESS} + \text{DIM "X"})$$

PREPARED BY
**ASSET
MANAGEMENT**

RECOMMENDED

.....
for WASTEWATER SYSTEMS MANAGER
COVER

© COPYRIGHT

..... 20/8/20
for MANAGER, STRATEGIC ASSET MANAGEMENT

ADDITIONAL INFORMATION PROVIDED IN SEW-1300 SERIES COMMENTARY

SEWERAGE CODE WSA 02

Sydney WATER

MAINTENANCE HOLE

PRECAST TYPES P1 & P2

| | |
|-------------|-----------|
| ISSUED 2006 | VERSION 1 |
|-------------|-----------|

SEW-1300-V

100 NOM CAN BE RAISED TO 350 MAX

COVER FRAME FIXED TO MH TOP FACE

FSL

600 MIN

1000 MAX

RISER RING (SEE NOTE 8)

1. ALL DIMENSIONS IN MILLIMETRES.
2. ALL CONCRETE TO BE SPECIAL CLASS (REFER WSA PS – 358).
3. ENSURE STRUCTURAL DESIGN OF MH CONFORMS TO AS 3735, EXPOSURE CLASSIFICATION D. FOR DEPTHS <6000, WALL THICKNESS TO BE ≥ 150 FOR MH DIAMETER ≤ 1200 AND ≥ 225 FOR MH DIAMETER >1200 .
4. MH TYPE C1 MAY BE FULL OR PARTIAL CONICAL CONSTRUCTION. LOCATE TYPE C1 AND TYPE C2 AS SHOWN IN DESIGN DRAWINGS.
5. PROVIDE ROUNDED NOSING ON INLET AND OUTLET PIPE AND ROUNDED EDGES ON UNDERSIDE OF ACCESS HOLE TO SHAFT.
6. FIX TOP SECTIONS OF MH, COVER SURROUND AND COVER TO PREVENT SEPARATION WHERE SEWER IS SUBJECT TO SURCHARGING.
7. FOR MH TYPE C2 INSTALL STEP IRONS OR LADDERS IN ACCORDANCE WITH SEW-1307-V.

MAINTENANCE HOLE TYPE C1

Technical drawing showing a cross-section of a wall and floor junction. The wall is on the left, and the floor is on the right. A horizontal line labeled 'FSL' (Finish Surface Line) is shown. A vertical line labeled 'COVER FRAME FIXED TO MH TOP FACE (SEE SEW-1308-V)' is shown. A horizontal line labeled '100 NOM CAN BE RAISED TO 350 MAX' is shown. A vertical line labeled 'CONVERSION SLAB' is shown. A horizontal line labeled 'RISER BOLTED OR FIXED TO FLAT TOP SECTION (SEE SURCHARGE (CONDITIONS DETAIL))' is shown. A vertical line labeled 'DN 1050 OR DN 1200 OR AS SPECIFIED' is shown. A horizontal line labeled '6600 MIN' is shown. A vertical line labeled 'MASTIC JOINTING' is shown. A horizontal line labeled 'SEE NOTE 3' is shown.

MAINTENANCE HOLE TYPE C2

FOR MH >1200 TO ≤6000 DEPTH
(TOP SECTION MAY BE AS SHOWN OR STRAIGHT)

RECOMMENDED



.....
for WASTEWATER SYSTEMS MANAGER

APPROVED

Sydney
WATER

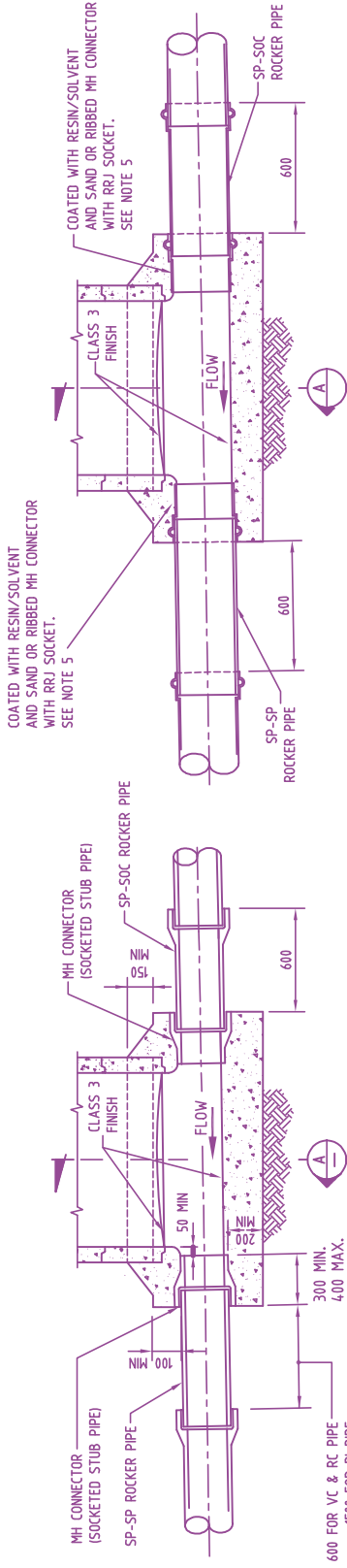
..... 20/6/06
for MANAGER, STRATEGIC ASSET MANAGEMENT

**MAINTENANCE HOLES
SEWERS ≤ DN 300
CAST IN-SITU TYPES C1 & C2**

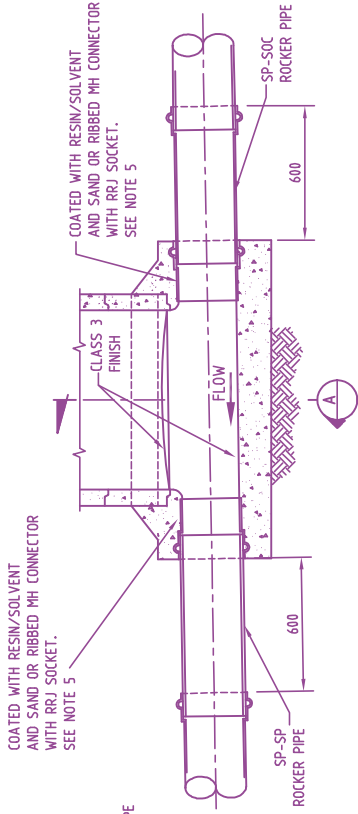
SEW-1301-V

| | |
|-------------|-----------|
| ISSUED 2006 | VERSION 1 |
|-------------|-----------|

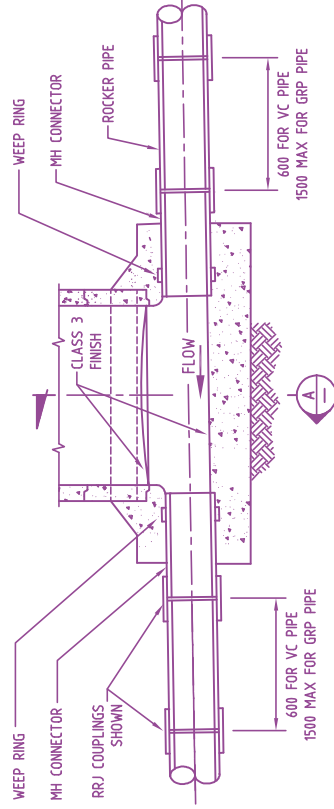
ADDITIONAL INFORMATION PROVIDED IN SEW-1300 SERIES COMMENTARY



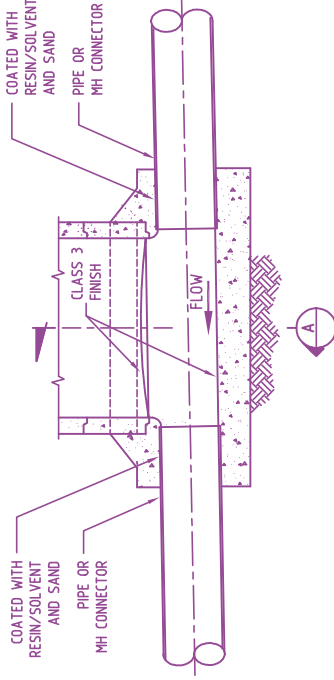
**TYPICAL MAINTENANCE HOLE BASE FOR
VC, RC & DI SOCKETED PIPE**



**TYPICAL MAINTENANCE HOLE BASE FOR
RUBBER RING JOINTED PVC & ABS PIPE**

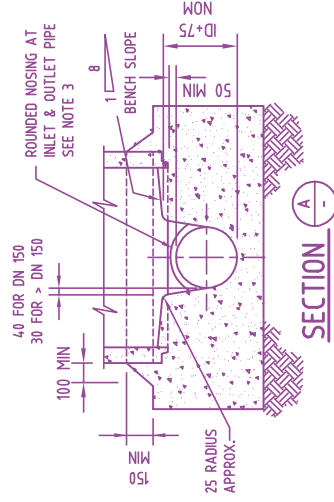


**TYPICAL MAINTENANCE HOLE BASE FOR
VC & GRP SLEEVE COUPLED PIPE**



**TYPICAL MAINTENANCE HOLE BASE FOR
SOLVENT CEMENT JOINTED PVC PIPE**

SEE NOTE 6



NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. PIPE CONNECTION DETAILS APPLY TO PRECAST AND CAST IN-SITU MH (SEE SEW-1300 & SEW-1301) PRECAST CONSTRUCTION SHOWN IN THIS DRAWING.
3. FORM ROUNDED NOSING ON INLET & OUTLET PIPES TO PREVENT DAMAGE TO JETTING EQUIPMENT, CCTV GUIDES AND CABLES.
4. PE CONNECTION METHODS SHOWN ON SEW-1313.
5. PVC, ABS & GRP MH CONNECTORS \geq DN 300 TO HAVE WEEP RINGS AND BE COATED WITH RESIN/SOLVENT AND SAND OR ABRADED TO ENSURE BONDING.
6. IF SOIL BEARING PRESSURE IS LESS THAN 100 kPa, INSTALL ROCKER PIPES IMMEDIATELY UPSTREAM AND DOWNSTREAM OF MH.
7. PRECAST CONCRETE BASES (INCLUDING CONNECTION DETAILS) TO BE IN ACCORDANCE WITH SYDNEY WATER'S APPROVED PRODUCTS.

PREPARED BY
**ASSET
MANAGEMENT**
ASSET PLANNING

RECOMMENDED

for PROCESS LEADER, WASTEWATER OPERATIONS
APPROVED

© COPYRIGHT

**Sydney
WATER**

WITH
ACKNOWLEDGMENT
TO
WATER SERVICES ASSOCIATION
of Australia

SEWERAGE CODE WSA-02

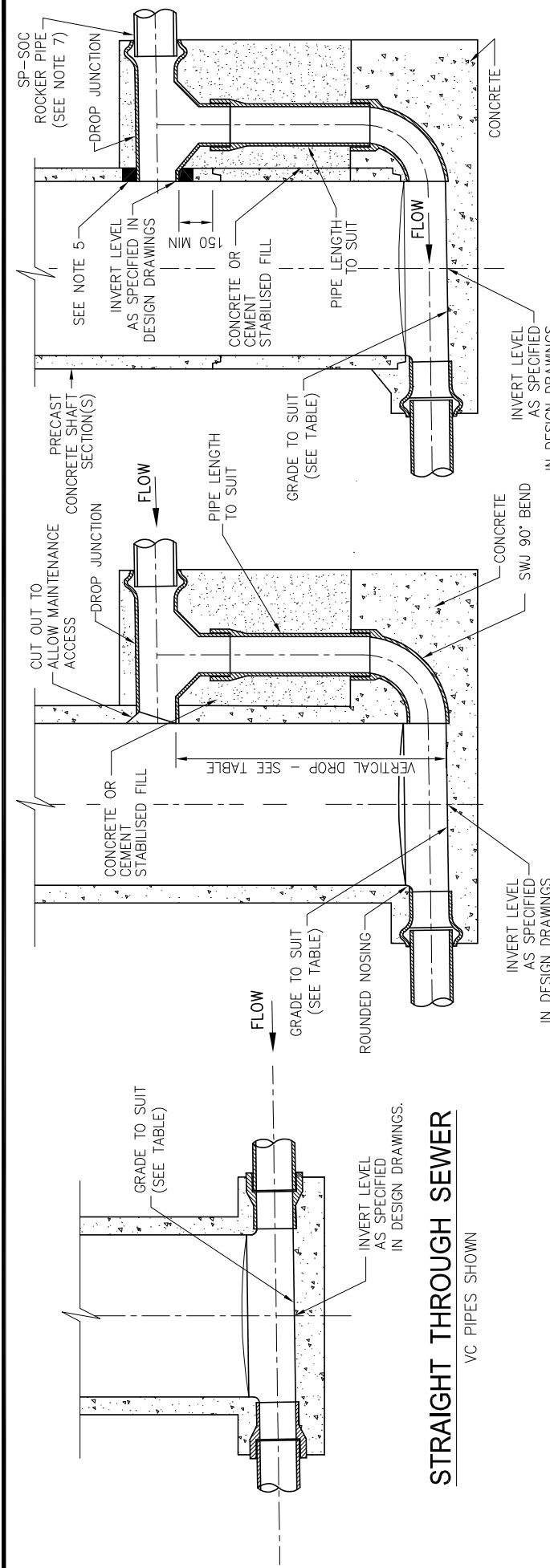
**MAINTENANCE HOLES
PIPE CONNECTION DETAILS**

Sydney WATER

SEW-1302-V

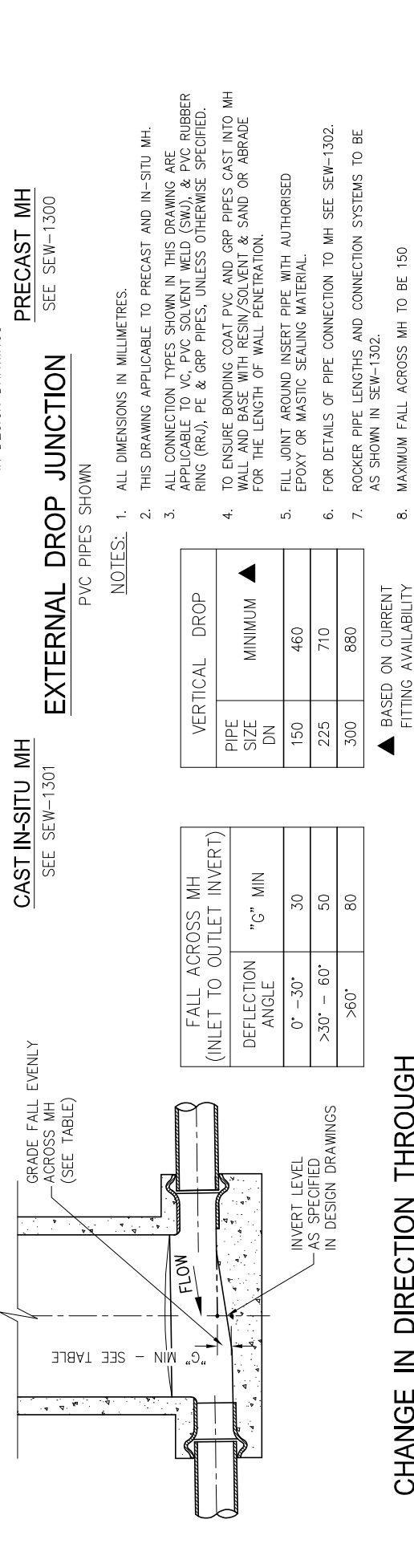
ADDITIONAL INFORMATION PROVIDED IN SEW-1300 SERIES COMMENTARY

ISSUED 2003 VERSION 1



STRAIGHT THROUGH SEWER

VC PIPES SHOWN



EXTERNAL DROP JUNCTION

PVC PIPES SHOWN

- NOTES:
1. ALL DIMENSIONS IN MILLIMETRES.
 2. THIS DRAWING APPLICABLE TO PRECAST AND IN-SITU MH.
 3. ALL CONNECTION TYPES SHOWN IN THIS DRAWING ARE APPLICABLE TO VC, PVC SOLVENT WELD (SWJ), & PVC RUBBER RING (RRJ), PE & GRP PIPES, UNLESS OTHERWISE SPECIFIED.
 4. TO ENSURE BONDING COAT PVC AND GRP PIPES CAST INTO MH WALL AND BASE WITH RESIN/SOLVENT & SAND OR ABRASIVE FOR THE LENGTH OF WALL PENETRATION.
 5. FILL JOINT AROUND INSERT PIPE WITH AUTHORISED EPOXY OR MASTIC SEALING MATERIAL.
 6. FOR DETAILS OF PIPE CONNECTION TO MH SEE SEW-1302.
 7. ROCKER PIPE LENGTHS AND CONNECTION SYSTEMS TO BE AS SHOWN IN SEW-1302.
 8. MAXIMUM FALL ACROSS MH TO BE 150

| FALL ACROSS MH (INLET TO OUTLET INVERT) | |
|--|---------|
| DEFLECTION ANGLE | "G" MIN |
| 0° - 30° | 30 |
| >30° - 60° | 50 |
| >60° | 80 |

| VERTICAL DROP | |
|--------------------|---------|
| PIPE SIZE DN | MINIMUM |
| 150 | 460 |
| 225 | 710 |
| 300 | 880 |

▲ BASED ON CURRENT
FITTING AVAILABILITY

CHANGE IN DIRECTION THROUGH
MAINTENANCE HOLE

PVC (RRJ) PIPES SHOWN



WATER SERVICES ASSOCIATION
of Australia

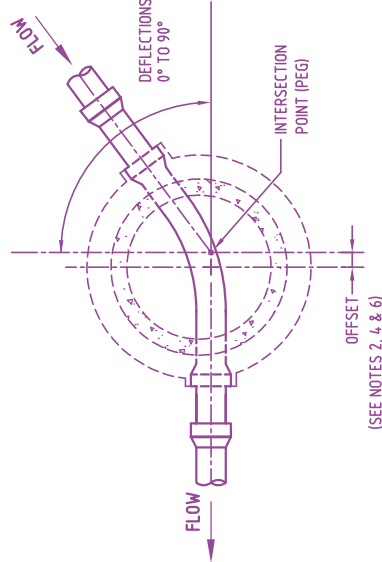
SEWERAGE CODE OF AUSTRALIA

MAINTENANCE HOLES
SEWERS ≤ DN 300
CHANGES IN LEVEL DETAILS

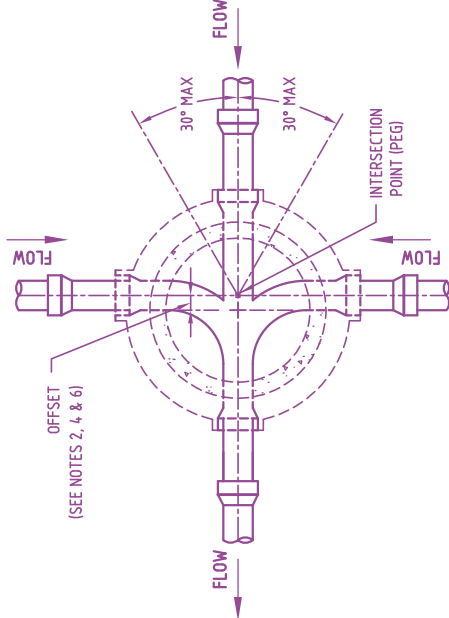
NOT TO SCALE

SEW-1303

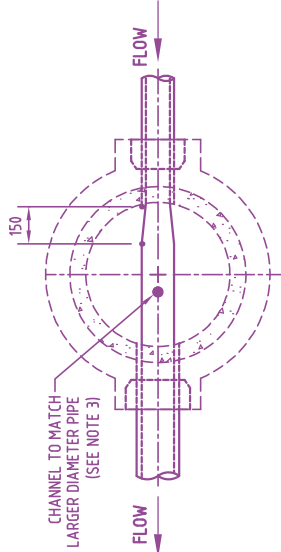
© WSAA, 2002 V2.1



CHANGE IN DIRECTION OF SEWER



MULTIPLE INCOMING SEWERS



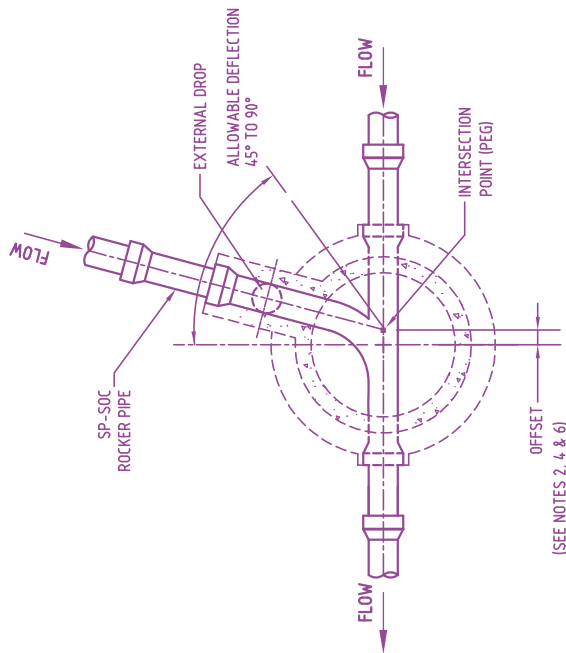
CHANGE IN DIAMETER OF SEWER

LEGEND

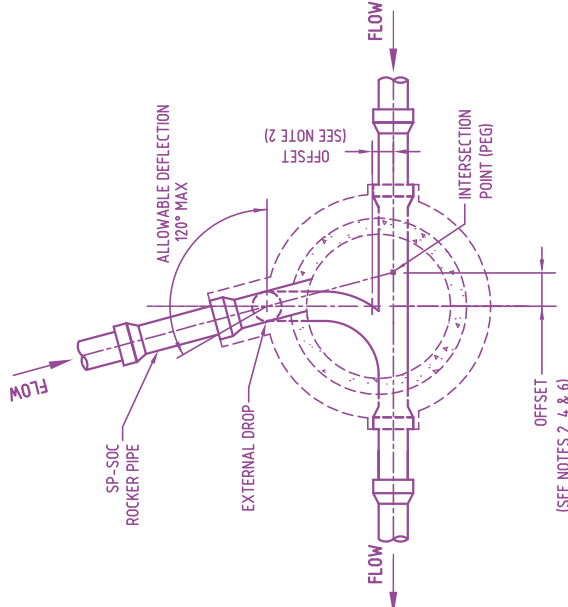


NOTES

1. ALL DIMENSIONS IN MILLIMETRES.
2. WHERE NECESSARY PULL MH OFF CENTRELINE OF SEWER (MAX 200) TO IMPROVE FLOW AND ACCESSIBILITY PROVIDED THE FOLLOWING CONDITIONS ARE MET:
 - ALL TANGENT POINTS TO BE CONTINUED WITHIN MH.
 - SUFFICIENT WORK AREA AVAILABLE.
 - MAINTENANCE EQUIPMENT CAN BE USED IN ALL MAINS.
 - OFFSET AS SPECIFIED.
3. INVERT LEVELS TO BE AS SHOWN IN DESIGN DRAWINGS.
4. FOR CHANNEL INTERSECTION AND OFFSET DETAILS SEE SEW-1305.
5. FOR INLET - OUTLET ARRANGEMENTS SEE SEW-1303.
6. FOR SEWERS ON STEEP GRADES OR WHERE THE INTERSECTION ANGLE IS <45° USE DROP JUNCTION AS SHOWN ON SEW-1306-V.
7. PROVIDE BENCHING COMPRISING TWO UNOBSTRUCTED AREAS OF AT LEAST 750 DIAMETER, SUITABLY SPACED TO ALLOW A PERSON TO STAND WITHOUT OBSTRUCTION BY DROPS, STEP IRONS OR LADDERS. PROVIDE ALSO A MINIMUM 750 X 750 WORKING AREA CLEAR OF ANY OBSTRUCTION.
8. PROVIDE FALL ACROSS MH:
 - FOR DEFLECTIONS UP TO 30 DEGREES, FALL TO BE NOT LESS THAN 30.
 - FOR DEFLECTIONS BETWEEN 30 AND 60 DEGREES, FALL TO BE NOT LESS THAN 50.
 - FOR DEFLECTIONS >60 DEGREES, FALL TO BE NOT LESS THAN 80.



INCOMING SEWERS HAVING EXTERNAL DROP



PREPARED BY
**ASSET
MANAGEMENT**

RECOMMENDED
for WASTEWATER SYSTEMS MANAGER

© COPYRIGHT

ADDITIONAL INFORMATION PROVIDED IN SEW-1300 SERIES COMMENTARY

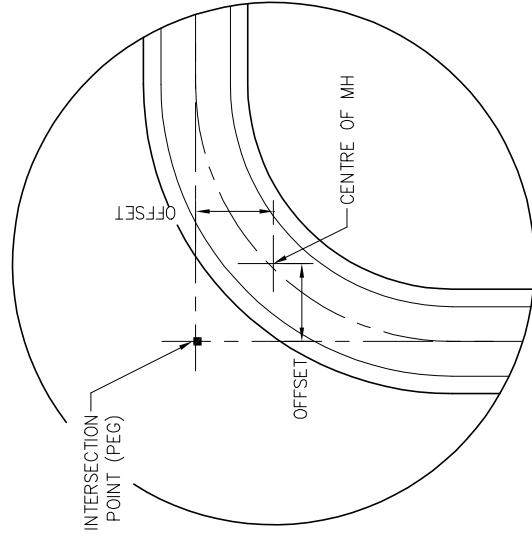
**Sydney
WATER**
WITH
ACKNOWLEDGMENT
TO
WATER SERVICES ASSOCIATION
of Australia

SEWERAGE CODE WSA 02
MAINTENANCE HOLES
SEWERS ≤ DN 300
TYPICAL CHANNEL ARRANGEMENTS

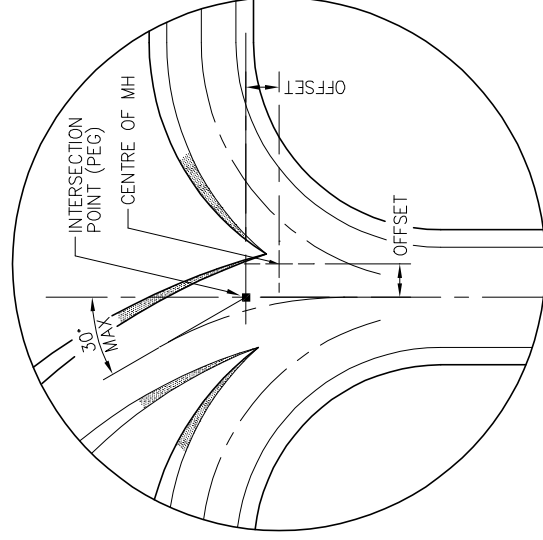
Sydney **WATER**

SEW-1304-V

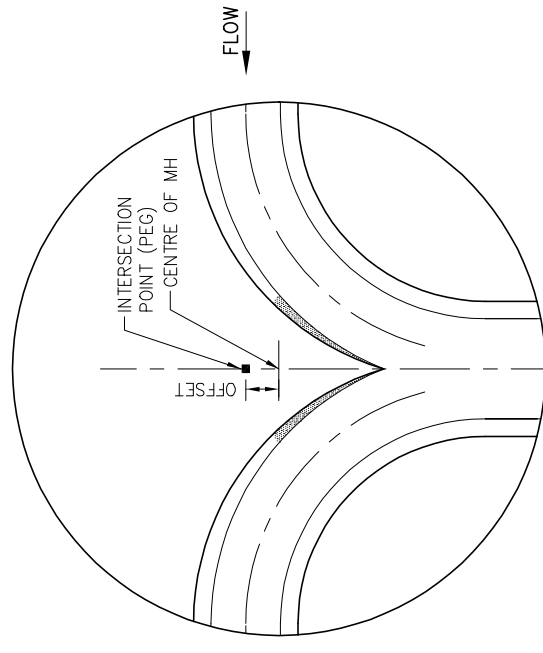
ISSUED 2006 VERSION 1



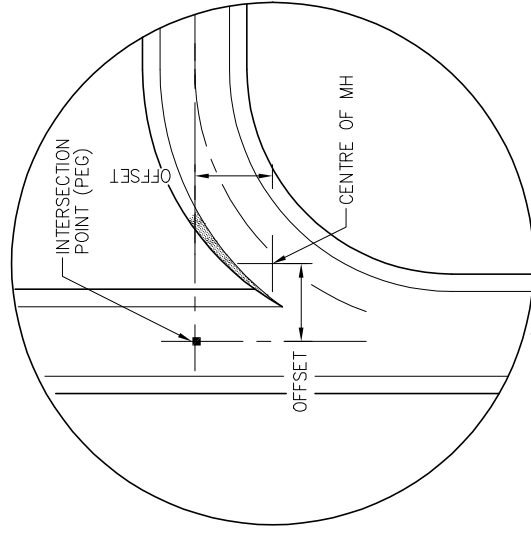
90° BEND



**LARGER MAIN LINE WITH BEND &
2 x SMALLER 90° OPPOSING INLETS**



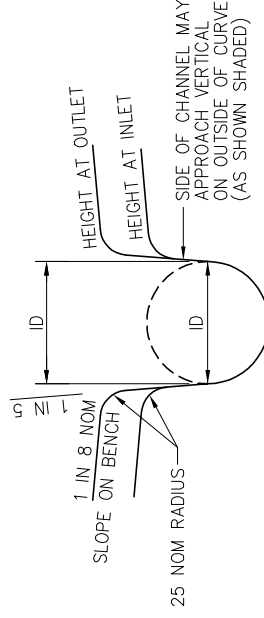
**OPPOSING INLETS
90° OUTLET**



STRAIGHT THROUGH & 90° INLET


LEGEND

R RADIUS
TP TANGENT POINT



TYPICAL CHANNEL DETAILS

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. AREAS SHOWN  INDICATE WHERE THE SIDE OF THE CHANNEL APPROACHES VERTICAL ON OUTSIDE OF CURVE
3. CHANNELS SHOWN ARE FOR DN 150 & DN 225 PIPES IN STANDARD DN 1050 MH.
4. SHAPES ARE OPTIMUM HYDRAULICALLY, BUT MAY NOT ALLOW SOME MAINTENANCE EQUIPMENT ENTRY. MODIFY SHAPE TO SUIT WATER AGENCY EQUIPMENT.
5. WHERE ONE OR MORE INCOMING SEWERS EXCEED 10% GRADE DESIGNER TO CONSIDER SPECIAL DESIGN SUCH AS CURVED SEWERS OR OUTLET TRANSITIONS.
6. ACUTE ANGLE ENTRY MAY BE APPROVED BY WATER AGENCY FOR LOW FLOWS OR MAY BE ACCOMMODATED BY EXTERNAL DROP JUNCTION OR DROP CHAMBER SEE SEW-1304 & SEW-1306.



WATER SERVICES ASSOCIATION
of Australia

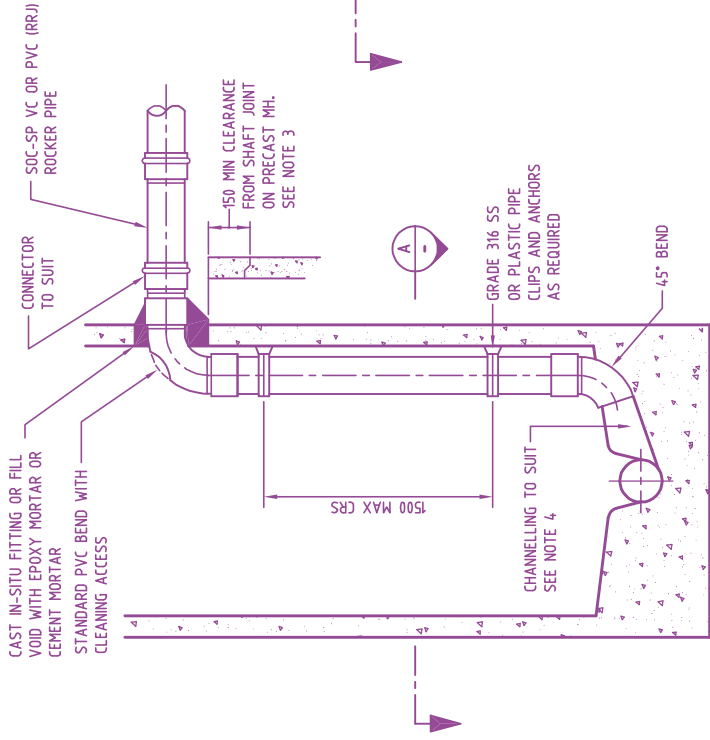
SEWERAGE CODE OF AUSTRALIA

MAINTENANCE HOLES
TYPICAL CHANNEL DETAILS

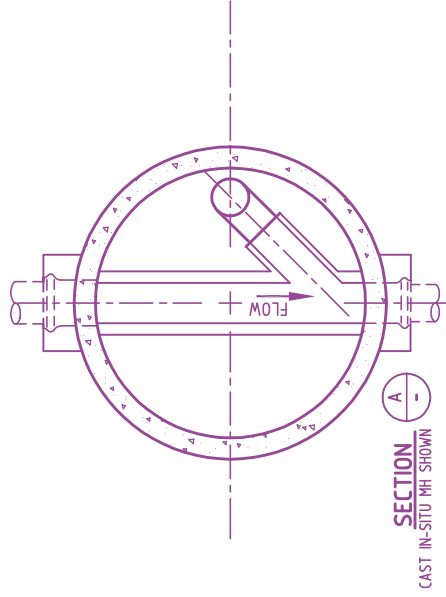
NOT TO SCALE

SEW-1305

© WSAA, 2002 V2.1



ELEVATION

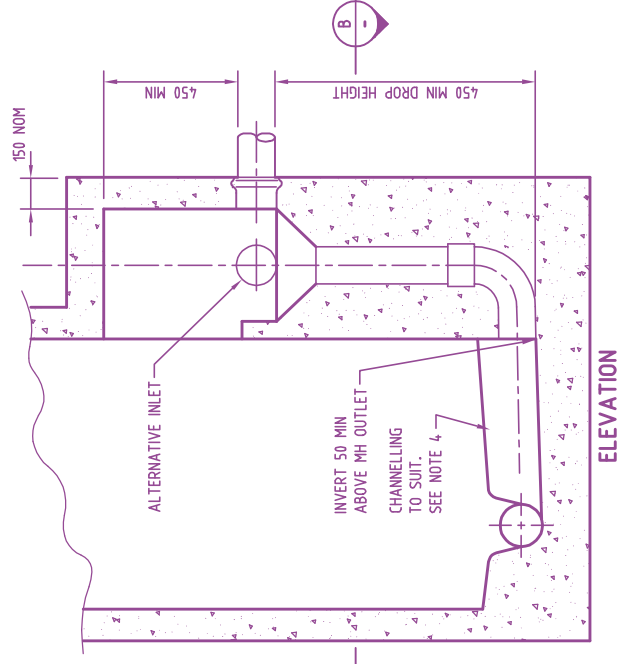


SECTION A-A
IN-SITU MH SHOWN

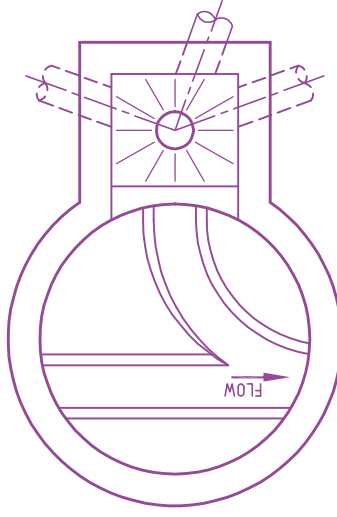
TYPICAL INTERNAL DROP

SUITABLE FOR CAST IN-SITU AND PRECAST MH
WHERE AUTHORISED BY SYDNEY WATER

| | |
|---|--|
| PREPARED BY ASSET MANAGEMENT ASSET PLANNING | RECOMMENDED for PROCESS LEADER, WASTEWATER OPERATIONS APPROVED B. Nelson 2/5/23 for PROCESS LEADER, ASSET PLANNING |
| | © COPYRIGHT |

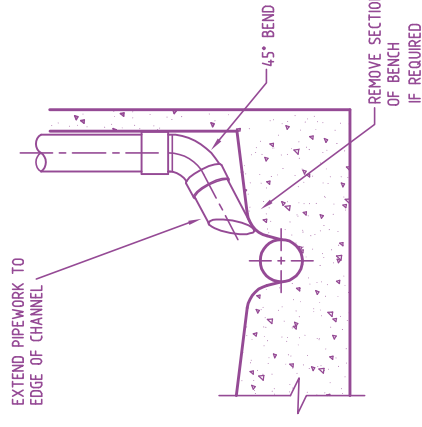


ELEVATION



SECTION B-B
IN-SITU MH SHOWN

TYPICAL DROP CHAMBER

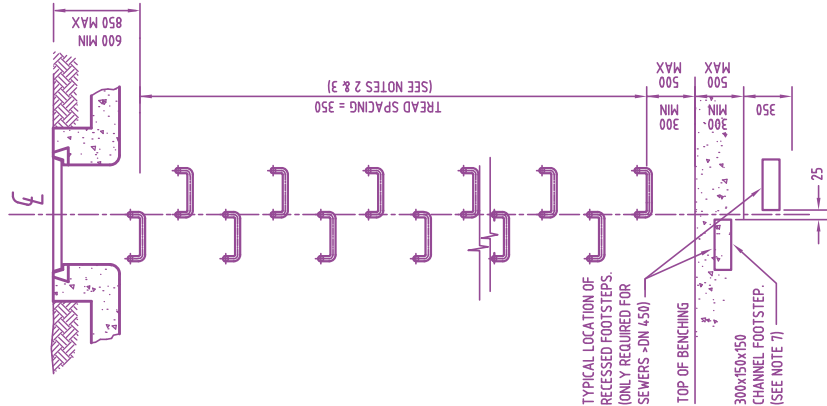


POST-CONSTRUCTION INSTALLATION DETAIL

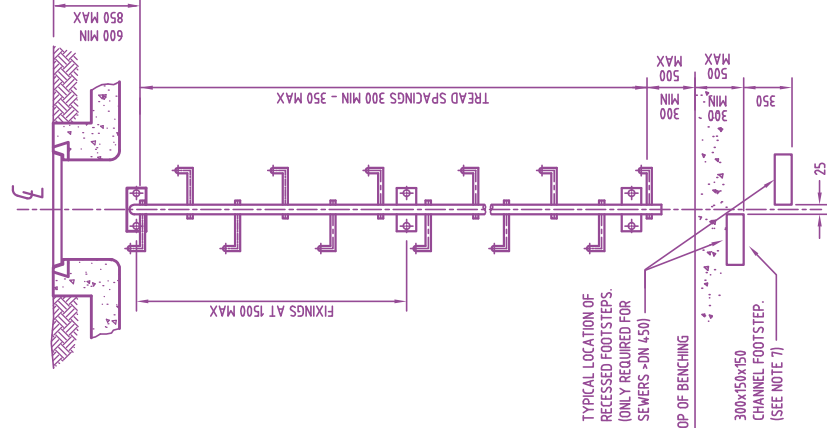
WHERE AUTHORISED BY SYDNEY WATER

NOTES

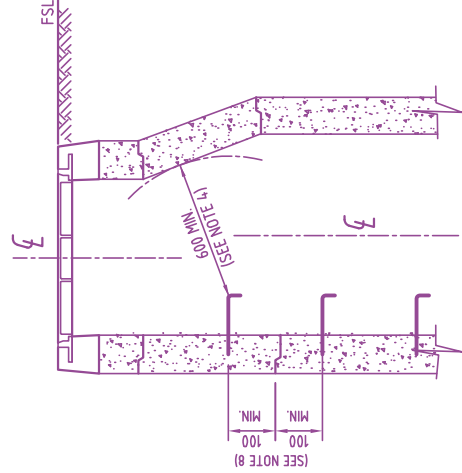
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH SEW-1300, SEW-1301, SEW-1302-V & SEW-1303.
3. FOR PRECAST MH APPLICATIONS, CORED HOLE TO BE 150 MIN ABOVE OR BELOW SHAFT SECTION JOINT.
4. DISCHARGE PIPE AND CHANNEL PLACEMENT TO DIRECT SEWAGE IN DIRECTION OF MAIN FLOW. SEE SEW-1304 AND SEW-1305.
5. DN 1200 MH TO BE USED WHERE DROP PIPE > DN 150 OR MORE THAN TWO x DN 150 INTERNAL DROPS ARE USED.



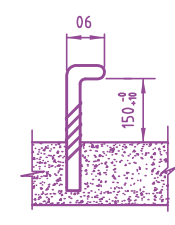
**STEP IRONS
AND CHANNEL FOOTSTEPS
(STAGGERED STEP IRONS SHOWN)**



**MONORAIL LADDER
AND CHANNEL FOOTSTEPS**



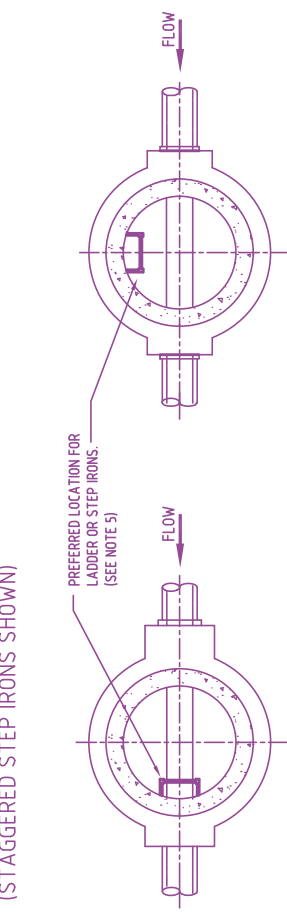
**SPACING OF STEP IRONS
TYPE P (PRECAST) SHOWN**



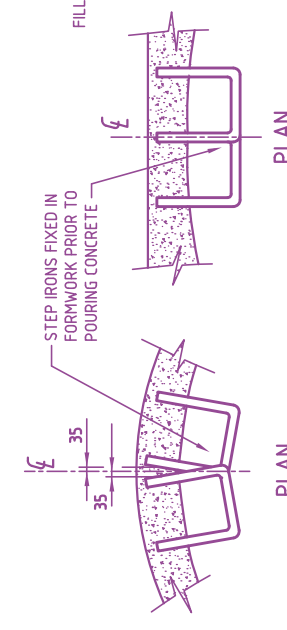
**STEP IRON FIXING DETAIL
SIDE ELEVATION**

NOTES

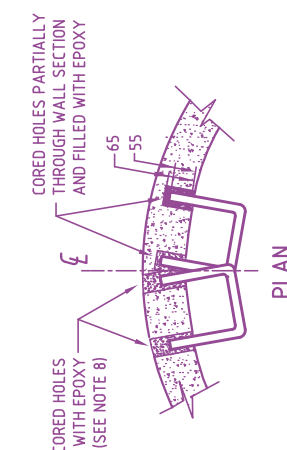
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. LADDERS AND STEP IRONS TO BE IN ACCORDANCE WITH WSA 02 PART 2 - PRODUCTS AND MATERIALS.
3. SPACING BETWEEN STEP IRONS TO BE 350 +0 -10.
4. STEP IRONS AND LADDERS NOT TO OBSTRUCT ENTRY/EGRESS OF PERSONNEL AND EQUIPMENT (eg PLUGS) INTO THE MH. MAINTAIN A CLEAR OPENING OF AT LEAST 600 PAST THE PROTRUDING EDGE OF A STEP IRON OR LADDER.
5. LOCATE STEP IRONS AND LADDERS SO THAT PERSONNEL CAN SAFELY STEP ONTO LARGEST SUITABLE BENCH AREA.
6. FOR MHS DEEPER THAN 6m DEPTH TO INVERT CONSULT SYDNEY WATER REGARDING REQUIREMENTS FOR STEP IRONS, LADDERS AND PLATFORMS.
7. FOR SEWERS >DN 450, CONSULT SYDNEY WATER REGARDING REQUIREMENTS FOR RECESSED FOOTSTEPS IN CHANNELS.
8. CORED HOLES FOR FIXING STEP IRONS TO BE MINIMUM 100 FROM A JOINT.



**PREFERRED LADDER OR STEP IRON LOCATION
FOR SEWERS ≤ DN 300**



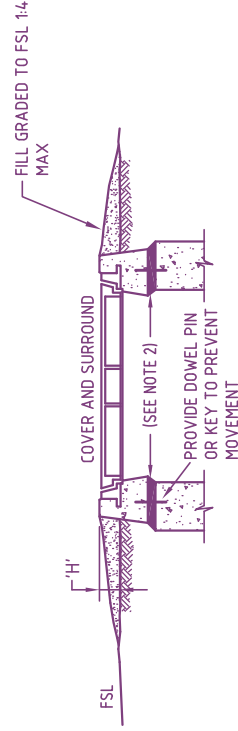
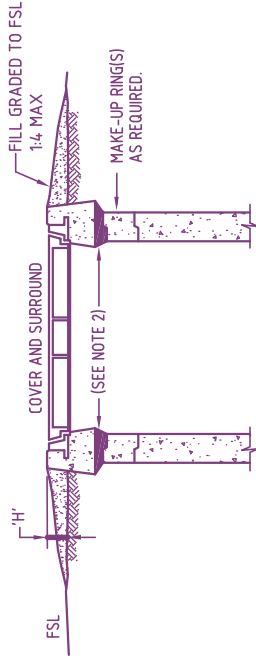
**TYPE B (CONICAL)
MAINTENANCE HOLE**



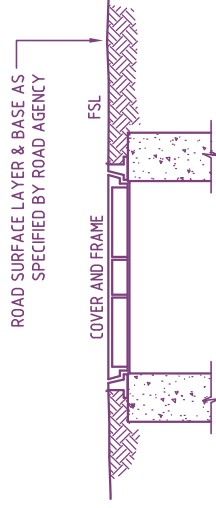
**TYPE P (PRECAST)
MAINTENANCE HOLE**

| | | | |
|---|---|--|---------------------------------------|
| SEWERAGE CODE WSA 02 MAINTENANCE HOLES STEP IRONS, LADDERS & FOOTSTEPS IN CHANNELS | | Sydney WATER SEW-1307-V | |
| ASSET MANAGEMENT | RECOMMENDED for WASTEWATER SYSTEMS MANAGER | APPROVED for MANAGER, STRATEGIC ASSET MANAGEMENT | ISSUED 2006 VERSION 2 |
| © COPYRIGHT | ADDITIONAL INFORMATION PROVIDED IN SEW-1300 SERIES COMMENTARY | | |

NON-TRAFFICABLE COVERS



PRECAST MAINTENANCE HOLES



CAST IN-SITU MAINTENANCE HOLES

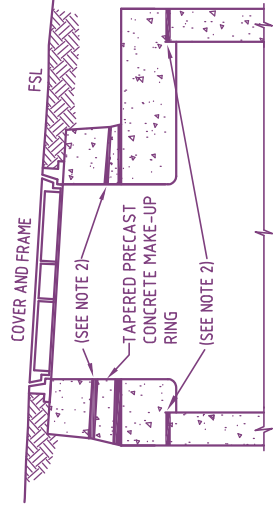
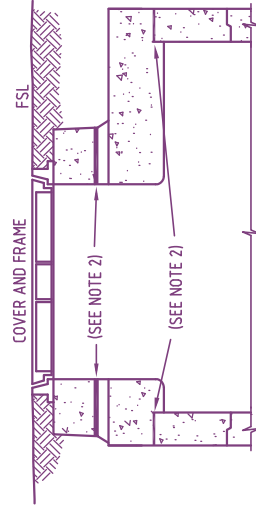


SLOPING GROUND

(SEE NOTE 5)

| FINISHED LEVELS OF MH COVERS | |
|---|-------|
| LOCATION | H |
| UNDEVELOPED AREAS | 100 |
| NEW SUBDIVISIONS | 75 |
| ROADS, LANeways, FOOTWAYS & DRIVEWAYS | FLUSH |
| EXISTING BUILT UP AREAS | 25 |
| OTHER AS SPECIFIED (EG ABOVE FLOOD LEVEL) | |

TRAFFICABLE COVERS



NOTES

- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
- SEALING METHODS:
 - MAKE JOINTS BETWEEN SHAFT TOP/MAKE-UP RING AND COVER SUPPORT RING USING:
 - MASTIC, OR
 - MORTAR MADE FROM 3 PARTS SAND TO 1 PART CEMENT.
 - APPLY BUTYL-MASTIC IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION.
 - THICKNESS OF CEMENT MORTAR AT ANY JOINT TO BE NO GREATER THAN 50.
 - SCABBLE AND CLEAN JOINT SURFACES SO THAT ALL LOOSE OR SOFT MATERIAL IS REMOVED.
 - JOINT SURFACES TO BE BRUSHED CLEAN, SPONGED WET AND PRIMED WITH A CEMENT/WATER SLURRY PRIOR TO PLACING THE CEMENT MORTAR.
- IN AREAS SUBJECT TO SURCHARGE, USE CAST IN-SITU MH DOWEL OR BOLT COVER SLABS, DI COVER AND FRAME TO THE SHAFT SECTION IN SUCH A MANNER THAT SEPARATION DURING SURCHARGE IS PREVENTED. SEE SEW-1301-V.
- JOIN METAL FRAME TO MH RISER AS FOLLOWS:
 - MAKE JOINTS BETWEEN SHAFT TOP AND METAL FRAME USING BUTYL-MASTIC AND LOCKING DOWN BOLTS, EQUALLY PLACED AROUND THE CIRCUMFERENCE.
 - USE 12 DIAMETER GALVANISED OR STAINLESS STEEL BOLTS EXTENDING 75 MIN INTO CONCRETE.
 - FOR NON-TRAFFICABLE LOCATIONS USE A MINIMUM OF TWO BOLTS.
 - FOR TRAFFICABLE LOCATIONS USE A MINIMUM OF FOUR BOLTS.
- MAXIMUM PERMISSIBLE SLOPE OF COVERS:
 - 1 IN 4 IN NON-TRAFFICABLE AREAS
 - 1 IN 10 IN ROADWAYS AND TRAFFICABLE AREAS
- DO NOT INSTALL PRE-CAST MH'S IN MAIN ROADS.

| SELECTION OF MH COVERS | |
|------------------------------|---|
| ALL COVERS TO BE WATER TIGHT | |
| LOCATION | SPECIFICATION/CLASS |
| RESERVES | WSA PS-290 SWC/CLASS B OR WSA PS-291 SWC/CLASS B125 |
| ROADWAYS | WSA PS-290 SWC/CLASS D OR WSA PS-291 SWC/CLASS C250 |

PREPARED BY
**ASSET
MANAGEMENT**

RECOMMENDED

PRODUCT AND MATERIALS SPECIALIST, SAM
APPROVED

© COPYRIGHT

APPROVED

for MANAGER, STRATEGIC ASSET MANAGEMENT

**Sydney
WATER**
WITH
ACKNOWLEDGMENT
TO
WATER SERVICES ASSOCIATION
of Australia

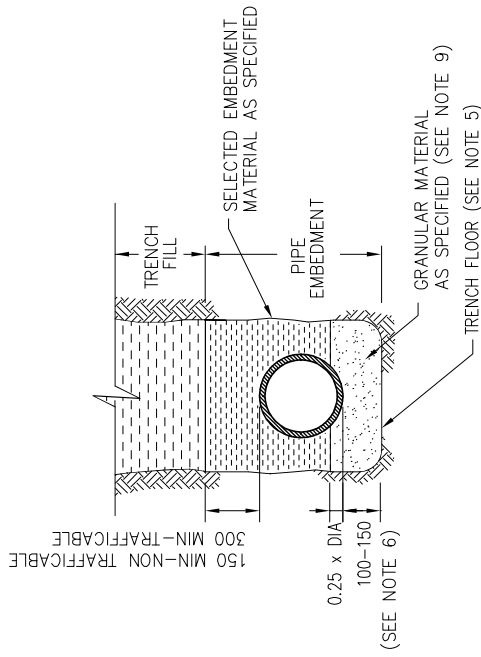
SEWERAGE CODE WSA 02

MAINTENANCE HOLES
TYPICAL MH COVER ARRANGEMENTS

Sydney **WATER**

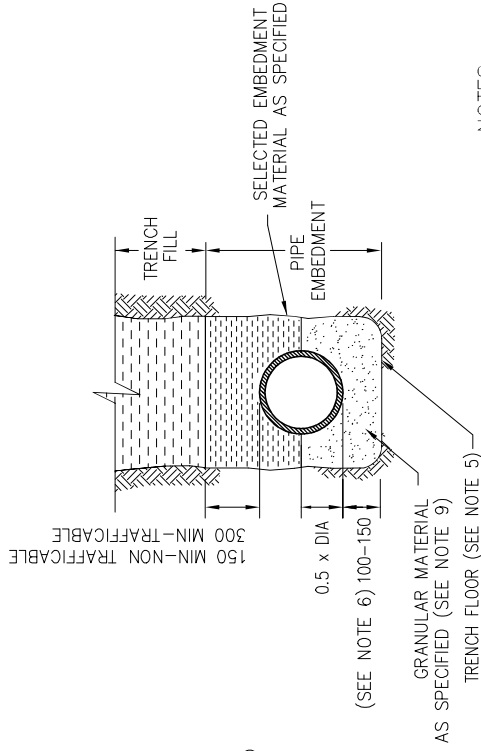
SEW-1308-V

ISSUED 2009 VERSION 4



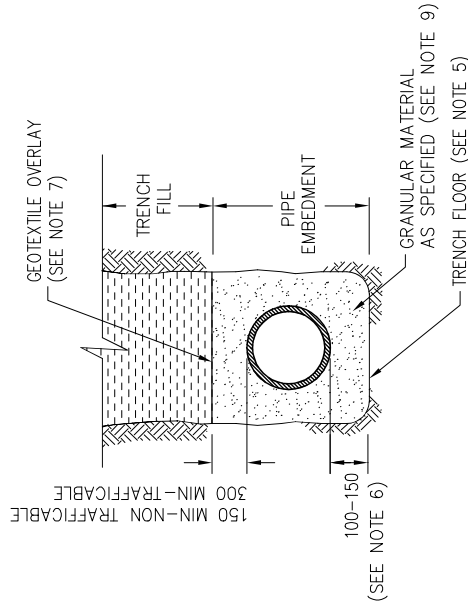
TYPE 1 SUPPORT

FOR RIGID PIPES ONLY (SEE NOTE 3)



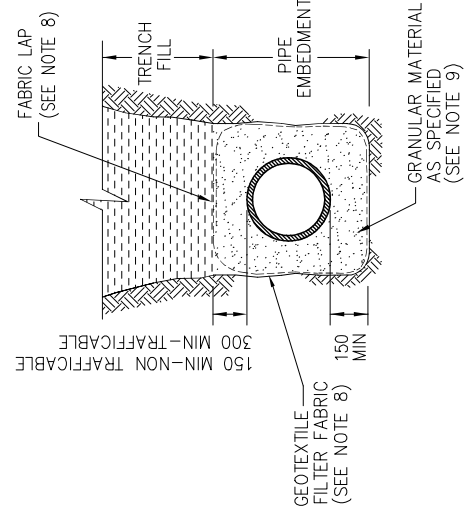
TYPE 2 SUPPORT

FOR RIGID PIPES ONLY (SEE NOTE 3)



TYPE 3 SUPPORT

FOR FLEXIBLE & RIGID PIPES (SEE NOTE 3)



TYPE 4 SUPPORT

WITH GEOTEXTILE
FOR FLEXIBLE & RIGID PIPES
(SEE NOTE 3)

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH SEW-1201.
3. PIPE CLASSIFICATION
(a) RIGID PIPES: VC AND RC
(b) FLEXIBLE PIPES: PVC, GRP, STEEL, DI AND PE.
4. PLACEMENT OF EMBEDMENT, TRENCHFILL & COMPACTION TO MEET THE REQUIREMENTS OF WSA 02 PART 3.
5. EXCAVATE OR COMPACT TRENCH FLOOR TO PROVIDE A FLAT FIRM BASE TO SUPPORT BEDDING MATERIAL AND MINIMISE PIPELINE SETTLEMENT.
WHEN EXCAVATED, REPLACE WITH GRANULAR MATERIAL AS SPECIFIED FOR BEDDING OR ADOPT TYPE 5, 6, 7 OR 8 SUPPORT AS REQUIRED.
6. ENSURE BEDDING IS DEEP ENOUGH THAT PIPE JOINT PROJECTIONS (SOCKETS, FLANGES) DO NOT TOUCH TRENCH FLOOR.
7. TYPE 4 SUPPORT TO BE USED WHERE MIGRATORY NATIVE SOILS (SANDS & CLAYS) ARE ENCOUNTERED ADJACENT TO THE EMBEDMENT ZONE AND SINGLE SIZE AGGREGATE IS USED:
8. GEOTEXTILE OVERLAY IS REQUIRED FOR COARSE AGGREGATE EMBEDMENT $\geq 5mm$.
LAY GEOTEXTILE FILTER FABRIC AGAINST TRENCH FLOOR AND WALLS SUCH THAT IT FULLY ENCASES THE EMBEDMENT.
- PRESS FILTER FABRIC INTO THE VOIDS BEFORE INSTALLING EMBEDMENT TO PREVENT FABRIC TEARING.
- PROVIDE A MINIMUM OF 250 OVERLAP AT ALL FILTER FABRIC JOINTS.
9. PURCHASE SPECIFICATIONS FOR TRENCH FILL AND EMBEDMENT MATERIAL ARE DETAILED IN WSA 02 PART 2.

EMBEDMENT TYPES TO BE SPECIFIED
IN DESIGN DRAWINGS



SEWERAGE CODE OF AUSTRALIA

STANDARD EMBEDMENT
FLEXIBLE & RIGID PIPES

NOT TO SCALE

SEW-1202

© WSAA, 2002 V2.1