Technical Specification

For

Leak Tight Sewer Systems

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8 December 2015

Revision Log:

Version	Description	Prepared by	Date	Approved for use
1.0	Preliminary Issue	SC, ST, RL, BS	04/11/2010	-
2.0	Final Draft Issued to Steering Committee for Comment	SC, ST, RL, BS	04/02/2011	-
3.0	Final – Issued to Steering Committee	SC, ST, RL, BS	22/07/2011	
4.0	Changes to LT3.7; LT4.3.2; LT9.1	AK	14/12/2011	AZK
5.0	Changes to LT3.4.1 – testing frequency; LT3.4.2 - testing frequency; LT9.2 - infiltration checking maintenance holes	AK	13/04/2012	DZ
6.0	Changes to; LT1.3; LT1.4, LT3.4, LT 4.2.1; LT 4.3.2; LT4.4.2,LT 6.2; LT6.3; Figure LTS-1; Figure LTS-2; Figure LTS-4, Figure LTS-5, Figure LTS-6 Added Figure LTS-9, Figure LTS-10	AK	18/07/2012	DZ
7.0	Changes to LT1.1; LT:1.3; LT2.2; Table 3; LT4.1; LT4.2.1; LT4.3.1;LT4.3.2; LT4.3.4; LT4.4.1;LT4.4.2; LT4.5; LT6.1; LT6.3; LT9.1; LT9.2;LT9.3; LT10.1;LT10.2; LT10.3.1 Figure LTS-5; Figure LTS-6 Figure LTS-9, Figure LTS-10	AK	14/12/2012	DZ
8.0	Significant revision, allowing RRJ pipes.	RL	17/12/2014	KW
8.1	Minor amendment to LT6	RL	8/12/2015	KW

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LT1 GENERAL

LT1.1 Background

Conventional gravity sewers in the Sydney Water network can be subjected to high levels of inflow and infiltration. In new systems, Sydney Water aims to limit inflow and infiltration to not more than 2% of rainfall ingress for a period of 30 years after completion. Reduced inflow and infiltration in the sewer system will result in reduced potential for wet weather overflows, reduced treatment costs and improved treatment plant performance.

To reduce inflow and infiltration, Sydney Water developed Leak Tight (LT) and Low Infiltration (LI) specifications covering planning, design, construction and quality assurance of new gravity sewers. LT sewers featured construction with fully welded polyethylene (PE) pipes, whereas LI sewers featured construction with rubber ring jointed (RRJ) pipes.

Trials were carried out in various catchments to validate expected performance of LT and LI systems. Analysis of flow monitoring data has shown that both LT and LI sewers performed equally, achieving zero leakage in most cases. Based on monitoring outcomes from trial areas, a revised leak tight (LT) specification has been developed, incorporating use of RRJ pipes. The previous LI specification is withdrawn.

This revised LT specification describes requirements for improved pipe systems of:

- Polyvinylchloride (PVC) with rubber ring joints (RRJ) or solvent weld joints (SWJ)
- Polypropylene (PP) with RRJ
- Glass Reinforced Plastic (GRP) sewers RRJ
- Fully welded polyethylene (PE).

This is an interim document only. This specification is valid until it is incorporated into the next Sydney Water Edition of the Sewerage Code of Australia, WSA 02-2002.

LT1.2 Scope

The scope of this specification is limited to property connection sewers and reticulation sewers (DN100 to DN300). However, the principles described in this specification may also be applied to branch sewers and trunk sewers (DN375 and larger).

This specification covers planning, design, construction and quality assurance of LT sewer systems and is applicable for all new works including, greenfield developments, infill developments, renewals and asset or system upgrades.

LT1.3 Basis of Design

This specification shall be used in conjunction with the Sewerage Code of Australia, WSA 02-2002 (Sydney Water Edition). The requirements of WSA 02-2002 (Sydney Water Edition) still apply, except where varied by this specification. Requirements of this specification take precedence over the requirements of WSA 02-2002 (Sydney Water Edition).

LT sewer systems are generally similar to conventional gravity systems, with enhanced planning, design, construction and quality assurance requirements to achieve reduced inflow and infiltration. Major enhancements include:

- Pipe materials are generally limited to PVC-U, PP, GRP or PE
- Increased design and operational requirements for maintenance structures
- Revised arrangement for property connections

- Vacuum testing of 100% of sewers, maintenance structures and property connection sewers
- Infiltration testing of each catchment or sub-catchment based on an absolute zero infiltration at the outlet of the test area
- Provision of flow gauging maintenance holes to allow performance validation.

LT2 FLOW ESTIMATION

LT2.1 Average Dry Weather Flow

Average dry weather flow (ADWF) shall be calculated using a rate of 150 Litres/EP/day.

LT2.2 Peak Dry Weather Flow

Peak dry weather flow (PDWF) shall be calculated using the peaking factor 'd' for the proposed catchment, and the following equation:

PDWF = d*ADWF

Peaking factor values shall be obtained from Figure B.1, Appendix B of the Planning and Design section of WSA 20-2002 (Sydney Water Edition).

LT2.3 Inflow and Infiltration Flow

Inflow and infiltration flow (IIF) shall be determined by hydraulic/hydrological modelling based on 2% rainfall ingress. Rainfall ingress refers to the percentage of rainfall falling on a contributing area that will enter the sewer system. Modelling shall be carried out for a ten-year period and based on rainfall data from the period 1985 to 1994. Modelling shall be in accordance with Sydney Water's standard modelling processes.

LT2.4 Design Flow

Design flow shall be equal to the total of PDWF and IIF. Design flow can be approximated as being equal to 3*PDWF for reticulation sewers only. A Sewerage Flow Schedule, available on Sydney Water's website, has been developed which may be used for design of reticulation sewers. Hydraulic and hydrological modelling shall be carried out to confirm pipe size and design for branch and trunk sewers.

LT3 LEAK TIGHT SEWER PIPES

Pipe materials are limited to PVC-U, PP, GRP or PE. Other pipe systems may be used under special circumstances, subject to Sydney Water approval. Clay pipes are not recommended due to their brittle nature and reduced ability to cater for incidental or unintended loads or actions.

LT3.1 PVC-U, PP and GRP Sewers

Requirements for PVC-U, PP and GRP sewers are provided in Table 1.

Table 1 Pipe and Fitting Requirements

	PVC-U	PP	GRP
Size Range	DN100-DN375	DN150-DN900	DN150-DN1000
Pipe Stiffness (Minimum)	DN100: SN10 DN150-DN375: SN8	SN10	SN10000
Joint Type	DN100: SCJ DN150-DN225: SCJ or RRJ DN300-DN375: RRJ	RRJ	RRJ
WSAA Product Specification	WSA PS-230 WSA PS-236	WSA PS-240	WSA PS-205S
Relevant Standards - Pipes	AS/NZS 1260:2009	AS/NZS 5065:2005	AS 3571.1:2009
Relevant Standards - Installation	AS/NZS 2566.2:2002 AS/NZS 2032:2006	AS/NZS 2566.2:2002	AS/NZS 2566.2:2002

LT3.2 PE Sewers

Requirements for PE sewers are provided in Table 2.

Table 2 Pipe and Fitting Requirements

	PE
Size Range	DN110-DN1200
Pipe Stiffness (Minimum)	PN8 SDR21 (PE100), or SN8 SDR21
Joint Type	Butt fusion or electrofusion All internal weld beads formed during butt-welding shall be removed for visual examination by an approved bead removal tool. Electrofusion fittings shall comply with the requirements of AS/NZS 4129:2008
WSAA Product Specification	WSA PS-207 WSA PS-208 WSA PS-242
Relevant Standards - Pipes	AS/NZS 4130:2009 (PE100 material to AS/NZS 4131:2010), or AS/NZS 5065:2005
Relevant Standards - Installation	AS/NZS 2566.2:2002 Polyethylene Pipeline Code, WSA 01-2004 AS/NZS 2033:2008
Weld Testing	Electrofusion and butt-welding shall be subject to the pre-qualification requirements of the Polyethylene Pipeline Code, WSA 01-2004. Ongoing quality of welds shall be demonstrated by the testing of sample welds. For reticulation sewers, one in 60 welds, or part thereof, shall be selected at random for destructive testing. For branch and trunk sewers, one in 20 welds, or part thereof, shall be selected at random for destructive testing.
Other	PE sewer pipes shall be black and have a co-extruded white or light grey interior suitable for CCTV inspection.

LT3.2.1 PE Pipe Sizes

PE pipe sizes to be used for LT sewers are listed in Table 3.

Table 3 PE Pipe Sizes

PE Sewer Pipe Sizes – SDR21			Corresponding PVC-U Sewer Pipe Sizes – SN8		
DN	**OD (mm)**	**ID (mm)**	**DN**	**OD (mm)**	**ID (mm) (Indicative)**
110	110	99	100	110	102 (SN10)
160	160	144	150	160	150
250	250	226	225	250	234
315	315	285	300	315	294
400	400	362	375	400	374
500	500	452	-	-	-

LT3.2.2 Maximum Depth to Invert

Maximum depths to invert for PE sewers, with trench details complying with the requirements of WSA 02-2002, are listed in Table 4.

Project-specific designs may be accepted when assumptions stated in the Code or this specification is varied. Structural design shall be in accordance with the requirements of AS/NZS 2566.1:1998 *Buried Flexible Pipelines; Part 1: Structural Design*.

Table 4 Maximum Depth to Invert for PE Pipe – With Vehicular Loading (Note 6)

Pipe Size	**Minimum Trench Width (mm) (Note 2)**	**Maximum Depth to Invert (m)**	
		SDR21 – SN8 (Note 8) AS/NZS 5065:2005	**PN8 SDR21 – PE100 AS/NZS 4130:2009**
DN110	410	5.9	6.5
DN160	460	5.1	5.6
DN250	550	4.4	4.8
DN315	615	4.1	4.5
DN400	800	4.1	4.4
DN500	900	3.9	4.3

Assumptions and notes:

1. Calculations based on the requirements of AS/NZS 2566.1:1998 *Buried Flexible Pipelines; Part 1: Structural Design*.

2. Minimum trench width for each pipe size is based on the minimum spring line trench clearance values given in drawing number SEW-1201 in WSA 02-2002 (Sydney Water Edition).

3. Calculations based on native soil modulus (E'_n) value of 2MPa and embedment soil modulus (E'_e) value of 6MPa.

4. Embedment and fill unit weight (γ) assumed to be 20kN/m; specific gravity of soil particles (ρ_s) assumed to be 2.65.

5. Water depth above pipe (H_w) assumed to be equal to cover above pipe (H).

6. Vehicle loading based on W80 wheel load and A160 axle load, as defined in AS 5100.2:2004 *Bridge Design; Part 2: Design Loads*.

7. Calculations for long-term deflection, strain and buckling are based on 50-year ring bending stiffness values.

8. SDR21 SN8 PE pipe calculations based on PE80B typical material characteristics. Pipe manufacturer to confirm validity of this assumption and provide alternative data for project designs if required.

LT3.3 Marking Tape

Non-detectable marking tape shall be laid on top of the pipe embedment material for all trunk, branch, reticulation and property connection sewers.

Detectable marking tape and a wooden peg shall be used to mark locations of property connection points by placing marking tape from the property connection point to the surface.

LT4 MAINTENANCE STRUCTURES

LT4.1 Types of Maintenance Structures

The following types of maintenance structures are permitted:

- Maintenance holes (MH)
- Maintenance chambers (MC)
- Maintenance shafts (MS)
- Terminal maintenance shafts (TMS)

LT4.2 Location and Spacing of Maintenance Structures

Location and spacing of maintenance structures shall be in accordance with WSA 02-2002 except as varied below.

MH shall be provided for reticulation sewers at the following locations:

- Intersections with three or more incoming sewers
- External drops

MC or MS shall be provided for reticulation sewers only, and are suitable at the following locations (in cases where maintenance holes are not required):

- Intersections with up to two incoming sewers (not including property connection sewers)
- Changes in sewer size
- Changes in sewer pipe material or wall thickness
- Changes in horizontal or vertical alignment

TMS shall be provided at permanent upstream end of a sewer regardless of the distance to the nearest downstream maintenance structure.

Where buildings, fences or other obstructions could reduce accessibility and the effective range of maintenance equipment, maximum spacing requirements shall be reduced accordingly. Jetting equipment is assumed to operate in an upstream direction and typically have a maximum hose length of 150m.

LT4.3 Maintenance Holes

LT4.3.1 Design

Maintenance holes (MH) shall be in accordance with WSA 02-2002 (Sydney Water Edition), except as varied below. Maintenance holes may be of cast in-situ or precast concrete construction.

Structural design of cast in-situ reinforced concrete MH shall be in accordance with the requirements of AS 3600:2009 *Concrete Structures* and AS 3735:2001 *Concrete Structures Retaining Liquids.*

Subject to approval by Sydney Water, circular plain (unreinforced) concrete MH may be used for reticulation sewers up to a maximum depth of 6m. Maximum internal diameter of plain concrete MH shall be 1200mm. Plain concrete MH (walls only) may only be used where it can be demonstrated that crack formation will not induce collapse. Design of plain concrete MH shall address the following:

- Live loads and earth pressure loads acting on non-uniform shaped elements (e.g. conical tapered section)
- Internal water pressure with no external soil support (e.g. due to shrinkage of clay backfill)
- Unbalanced earth pressures loads (e.g. due to sloping ground, non-uniform backfill etc)
- Non uniform surcharge loads (e.g. due to adjacent concentrated wheel load)
- Any other load or action, including but not limited to, temperature gradients, moisture variation, ground movements and construction loads that may affect stability, strength, serviceability or durability.

Structural design of precast MH shall comply with the requirements of AS 3600:2009 *Concrete Structures,* and AS 3735:2001 *Concrete Structures Retaining Liquids.* Alternatively, for DN1050 and DN1200 MH on reticulation sewers only, precast maintenance holes complying with requirements of WSA PS-323 and WSA PS-333 may be used, subject to requirements for plain concrete MH described above.

Epoxy mortars, where used for joining precast components, shall be proprietary products installed strictly in accordance with the manufacturer's specification, and shall have the following properties:

- Minimum compressive strength of 40 MPa at 7 days
- Minimum tensile strength of 6 MPa at 7 days
- Minimum bond strength of 1 MPa to the substrate material

Plain concrete and precast MH shall be used in residential areas only, and shall be not be used in road carriageway. Precast MH shall not be used in water charged ground or areas that may become water charged (e.g sewers adjacent to watercourses).

Acceptable design solutions for MH are provided in Deemed to Comply Drawings available on Sydney Water's website.

LT4.3.2 Internal Corrosion Protection

Corrosion protection shall be provided to internal surfaces of MH (other than benching) where there is a high risk of H_2S corrosion, including, but not limited to the following locations:

- Maintenance holes with an outlet sewer DN375 or greater in size
- Pressure main discharge maintenance holes
- The next two maintenance holes downstream of a pressure main discharge maintenance hole

At these locations, corrosion protection shall be provided in accordance with WSA 201 Manual for Selection and Application of Protective Coatings and Sydney Water Supplement to WSA 201. Protective coating system shall be CPL, NOV or EUH.

LT4.3.3 Pipe Connections

Pipe connections for PVC-U, PP and GRP sewers may be cast-in during maintenance hole construction, or block-outs provided for future connection. Pipe connections for PE sewers shall be of cast in during MH construction and shall have sufficient strength to withstand pull out forces due to thermal contraction of the pipe.

Where block-outs are used, the designer shall provide an engineered connection detail, incorporating as appropriate:

- Block out dimensions
- Treatment of block-out surfaces
- Hydrophilic seals to prevent water ingress
- Details of infill products/materials
- Reinforcement details
- Articulation to allow differential settlement between the pipe/structure
- Any other requirements as necessary to ensure a robust long term seal

Acceptable design solutions for pipe connections are provided in Deemed to Comply Drawings available on Sydney Water's website.

LT4.3.4 Access Covers for Maintenance Holes

Access covers shall comply with requirements of WSA 132-2011. Class of cover shall be as follows:

- Class D – for public and private road carriageways, footpaths/verges/median strips not restricted to vehicles, driveways in areas zoned 'residential, industrial or commercial', and parkland with no restriction to vehicular access.
- Class B – for areas within private properties, and public places, pedestrian malls and footways not subjected to vehicular loading or have no access for vehicles.

A make up ring (maximum of 1 only) shall be provided immediately below the access cover to allow minor height adjustments to suit finished surface level. Minimum height of the make up ring shall be 100mm.

A converter slab or conical tapered section shall be provided to connect the access cover to the MH wall. Conical tapered sections are only permitted on DN1050 MH.

The make up ring may be omitted where an integral riser is provided with the converter slab or conical tapered section. The access cover frame may be cast in with the riser, or fixed to the top of the riser.

Acceptable design solutions for access covers are provided in Deemed to Comply Drawings available on Sydney Water's website.

LT4.4 Maintenance Chambers and Maintenance Shafts

Maintenance Chambers (MC), Maintenance shafts (MS) and Terminal Maintenance Shafts (TMS) shall be proprietary products that comply with requirements of WSA 137-2013 *Industry Standard for Maintenance Shafts and Maintenance Chambers for Sewerage.* Only PE maintenance shafts and chambers shall be used with PE pipe systems.

MC and MS shall also comply with the following requirements:

- Do not permit persons to enter the sewer through the riser
- Maximum number of inlets at the base shall be 2. Inlets to the chamber shall be located between 90° and 270° from the chamber outlet. Deflections may also be accommodated by the provision of a horizontal bend immediately upstream of a chamber inlet (minimum radius of curvature 900mm), with a maximum deflection of 45°.
- The invert of the outlet pipe shall be flush with the chamber base. For same-size inlet and outlet pipes, the inlet pipe invert shall be a maximum of 10mm above the chamber base. At change in sewer size, the inlet and outlet pipes shall be designed soffit to soffit.
- MC shall have a channelized base to achieve change in flow direction and direct flow to the outlet.

LT4.4.1 High-level Connections

Not more than one high level reticulation sewer connection is allowed per MS, servicing a maximum of 20 single dwelling residential properties or equivalent. Where there are no inlet sewers at the base, the MS shall be a TMS type. High level connections to MC are not permitted.

High-level connections shall not connect less than 750mm above the base of the chamber, and not less than the minimum height above the chamber specified by the manufacturer. Where the difference in elevation is less than 750mm, the grade of the incoming sewer shall be increased to allow direct connection to the chamber.

High-level connections for property connection sewers are not permitted.

LT5 MAINTENANCE HOLES FOR MONITORING PURPOSES

LT5.1 Flow Gauge Maintenance Holes

Maintenance holes for flow gauging purposes, with an internal dimension of 1200mm, shall be nominated on the sewer design plans and long sections to allow effective performance monitoring and identification of branches within the sewer network with significant wet weather flows. Nominated locations shall be reviewed and approved by Sydney Water prior to adoption. A flow gauging maintenance hole shall be provided for each catchment in a development with size 50-100Ha, or having an 8-15km total length of sewer pipes.

The location of the flow gauging maintenance hole shall satisfy the following requirements:

- Flow depth shall not be affected by downstream backwater effects
- Upstream and downstream sewers shall be straight, with no change in horizontal or vertical alignment for 50m upstream and 10m downstream of the maintenance hole
- Upstream and downstream sewers shall have equal and constant grade, with grade greater than 0.5% and less than 1.5%
- The maintenance hole shall have one inlet only
- When near an emergency relief structure, the flow gauging station is to be immediately upstream of the structure

Design of a flow gauging MH shall allow for the installation, operation, maintenance and removal of the flow gauging system. General arrangement of a flow gauging MH is shown on Figure LT-1.

The following deviations from typical MH construction are required:

- A full pipe shall be cast in the base during MH construction. Following completion oif benching, the upper half of the pipe within the MH (to the spring line) shall be removed. Pipe cuts shall be neat, clean and square.
- Benching shall be provided to the spring line of the pipe only;
- Grade shall be maintained from inlet sewer through maintenance hole to outlet sewer. No additional fall shall be provided across the maintenance hole.

LT5.2 Infiltration Checking Maintenance Holes

Infiltration checking MH to allow infiltration testing shall be nominated on the sewer design plans and long sections at the following locations:

- For any single development up to 100 lots
- Groups of 100 lots for larger single developments
- Each stage of a multi stage community titled development

Infiltration checking MH shall be a typical MH satisfying requirements of clause LT4.3 and sub clauses, except that flow gauging maintenance holes are not to be used.

LT6 PROPERTY CONNECTIONS

A Property Connection Sewer (PCS) shall be provided for each property to be serviced by the LT sewer network. PCS shall not be connected directly to maintenance holes.

The standard PCS configuration for a single property is provided in Figure LT-2. PCS shall be minimum DN100 in size. DN100 PCS shall have a minimum grade of 1.65%. Minimum grades for larger PCS shall be in accordance with WSA 02-2002 (Sydney Water Edition).

A PCS serving multiple properties shall be in accordance with Figure LT-3, and incorporate the following requirements:

- Minimum DN150 in size
- A PCS configuration for each property (refer Figure LT-2)
- A rodding point (RP) or TMS at the upstream end to facilitate maintenance.

For all connections, the inspection shaft shall be:

- Located inside the property boundary
- Less than 25m from the reticulation sewer

The constructor shall construct the PVC-U inspection shaft up to and including the threaded access cap to enable easy retrieval and identification. The plumbing Licensee shall be responsible for connecting the CSD and reinstating the inspection shaft to suit finished surface levels.

LT7 ACCEPTANCE TESTING

On completion of each section of the works, acceptance testing including visual inspection, compaction testing, vacuum testing, infiltration testing, deflection testing and CCTV inspection shall be undertaken in accordance with Part 3 (Construction) of WSA 02-2002 (Sydney Water Edition), except as varied below:

- Vacuum testing of 100% of sewers, maintenance structures and property connection sewers
- Infiltration testing of each catchment or sub-catchment based on an absolute zero infiltration at the outlet of the test area

LT8 PERFORMANCE VALIDATION

Sydney Water will conduct regular monitoring in flow gauge MH to validate that the sewerage system is leak tight.

Where undertaken, flow monitoring shall commence after satisfactory completion of acceptance testing. Results shall be used to identify leaks due to poor design and/or construction of the reticulation sewers.

Cost for flow monitoring and analysis will be borne by Sydney Water. If rainfall ingress is found to be in excess of 0%, the constructor shall conduct an investigation to identify sources of inflow and infiltration, and rectify any faults. Cost for investigation and rectification shall be borne by the constructor.

LT9 DESIGN DOCUMENTATION

Design drawings, specifications, Work as Constructed information and associated documentation shall be in accordance with WSA 02-2002 (Sydney Water Edition), except as varied below.

The designer shall prepare design documentation to allow construction of a leak tight sewerage system. The designer shall provide sufficient details such that all items and components can be constructed, or procured from the market, without further interpretation or analysis by the constructor.

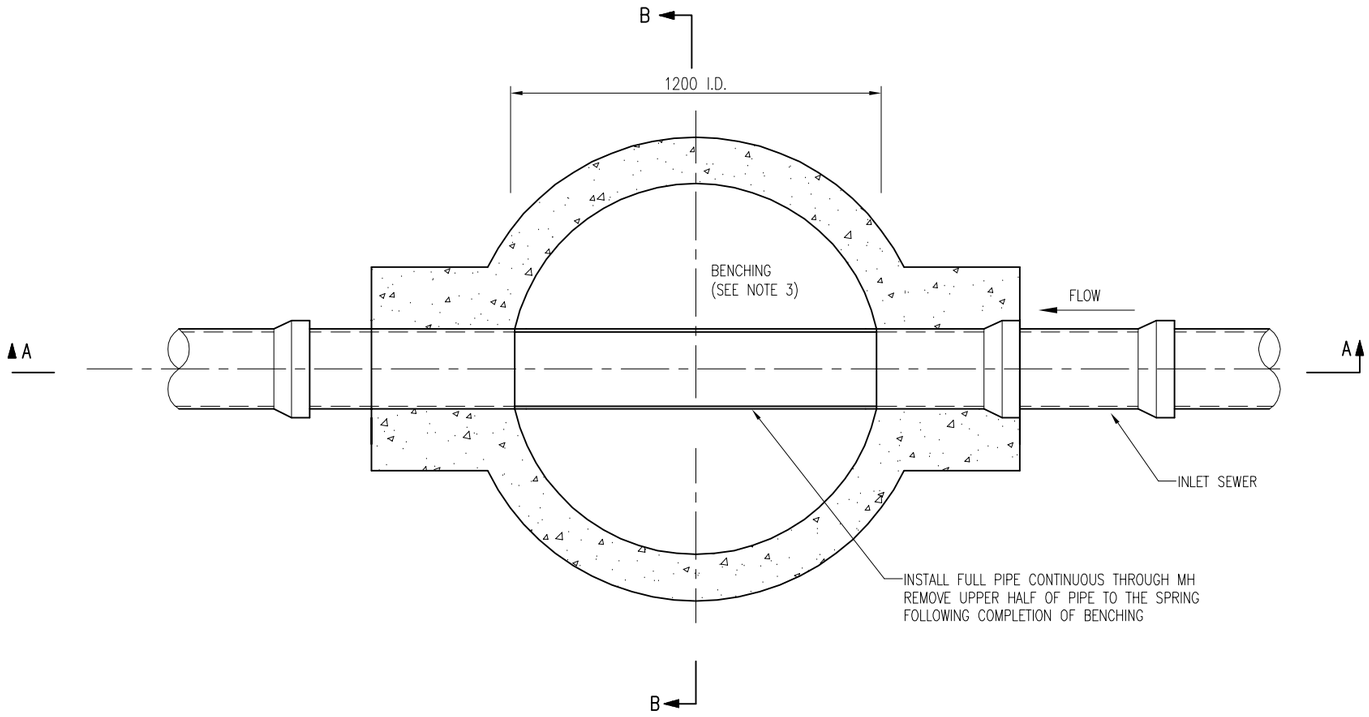
Concept drawings for components of an LT sewer system are shown in the following figures. The figures are not suitable for construction and shall not be referred to in design documentation.

Deemed to Comply (DTC) drawings, available on Sydney Water's website, provide acceptable design solutions for various sewerage system components. Where DTC drawings are not applicable, or not considered suitable, the designer shall provide the necessary details.

Construction of Sydney Water assets in accordance with DTC drawings is not mandatory. The designer may submit alternate designs in place of DTC solutions. Alternate designs will be assessed by benchmarking against the DTC solution.

Table 4 List of Figures

Figure Number	Figure Title
LT-1	Flow gauge maintenance hole
LT-2	DN100 PVC-U property connection sewer for single properties
LT-3	Property connection sewer general arrangement

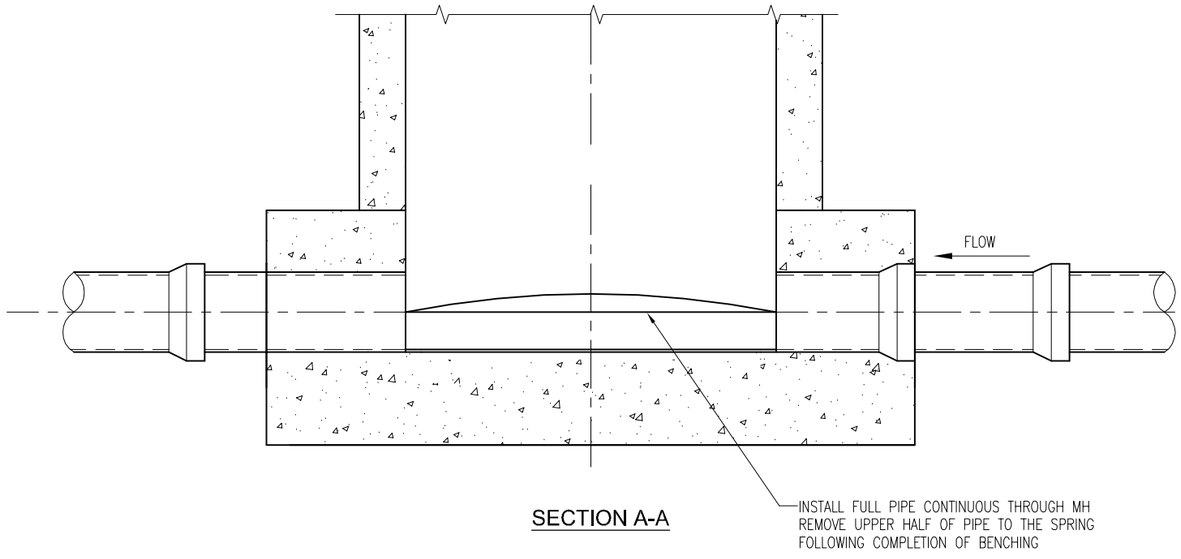


FLOW GAUGING MAINTENANCE HOLE - PLAN

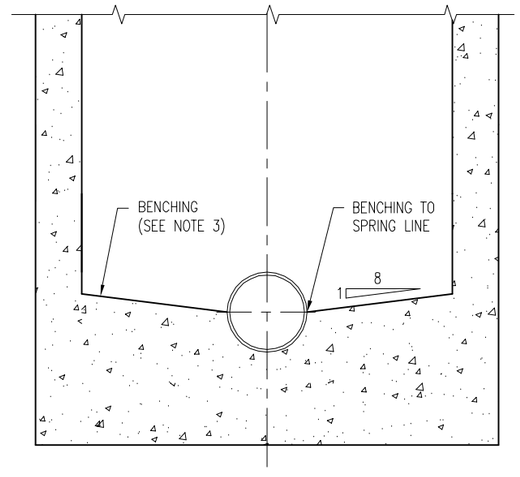
NOTES:–

1. DESIGN AND CONSTRUCTION OF CONCRETE MAINTENANCE HOLES SHALL BE IN ACCORDANCE WITH CL LT4.3.
2. SEWER GRADE TO BE MAINTAINED ACROSS FLOW GAUGING M.H. NO ADDITIONAL FALL ACROSS MH TO BE PROVIDED.
3. BENCHING SHALL BE TO SPRING LINE OF INLET/OUTLET SEWER PIPES WITH 8:1 (H:V) SLOPE.

NOT FOR CONSTRUCTION



SECTION A-A



SECTION B-B

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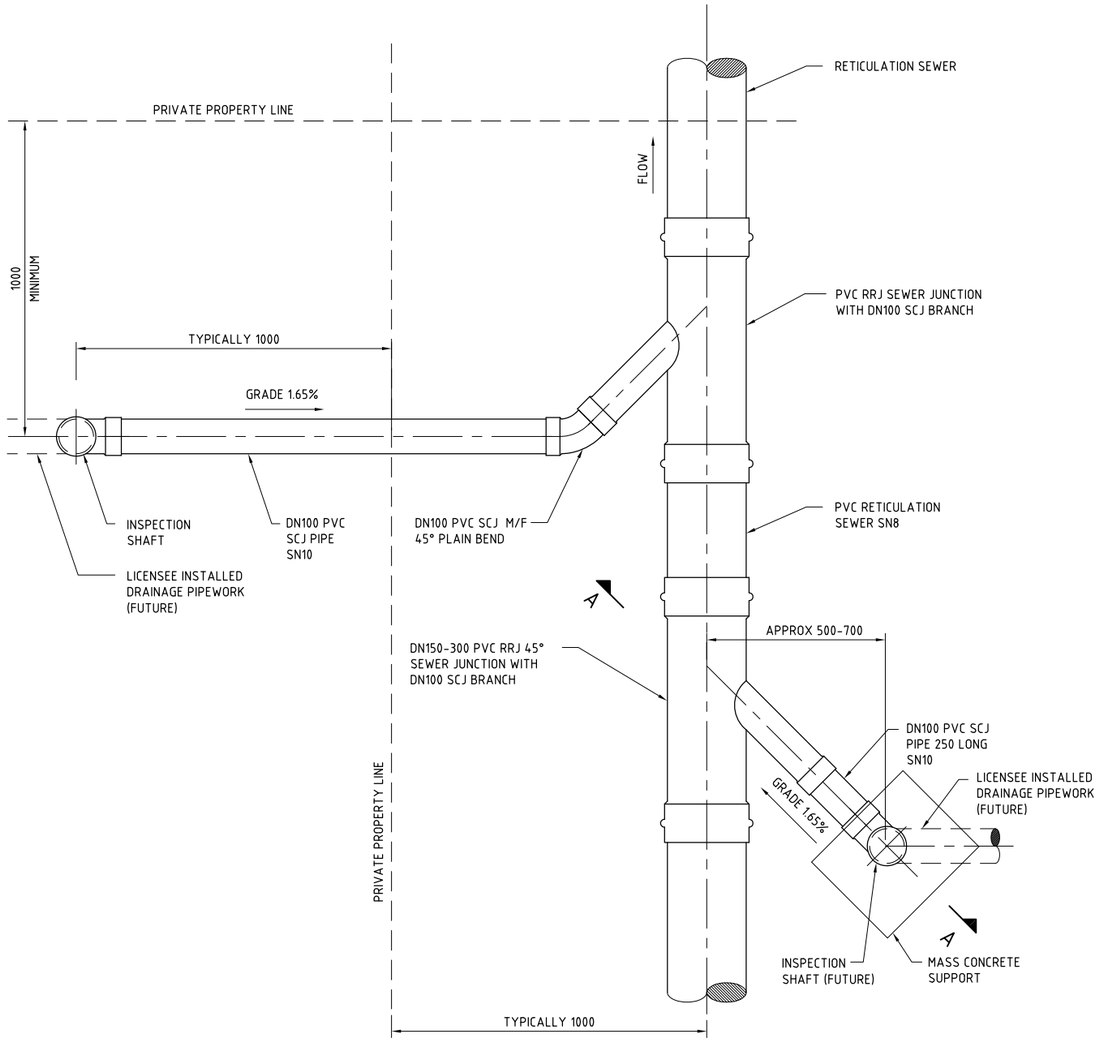
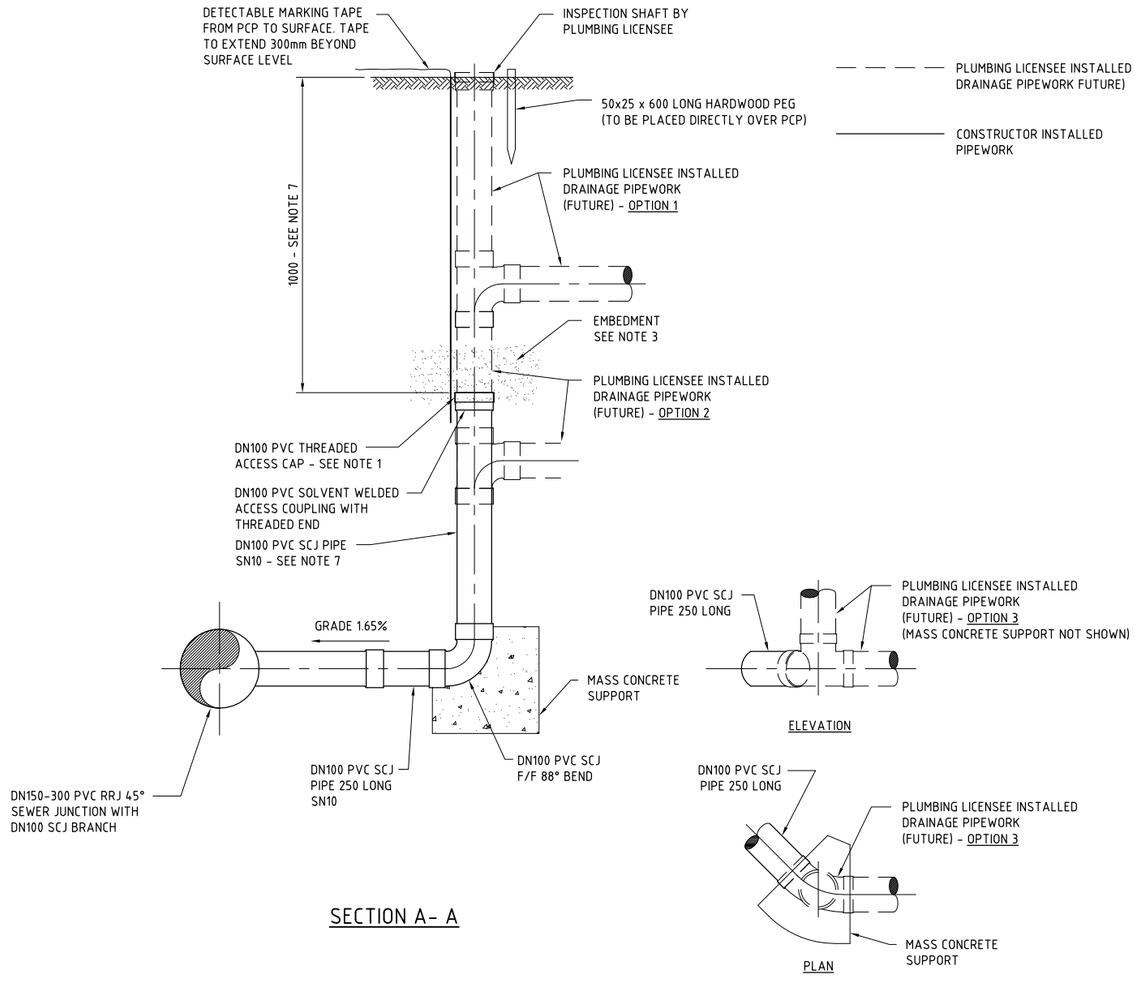
Sydney WATER

FIGURE LT-1

FLOW GAUGING MAINTENANCE HOLE
GENERAL ARRANGEMENT
LEAK TIGHT SEWER SYSTEMS



PLAN



SECTION A- A

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 SYDNEY WATER.
3. PROPERTY CONNECTION SEWERS SHALL BE SURROUNDED BY PIPE EMBEDMENT MATERIAL WITH MINIMUM COVER OF 150mm TO ALL COMPONENTS. EMBEDMENT MATERIAL SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF WSA-02 (SYDNEY WATER EDITION). 150mm THICK EMBEDMENT MATERIAL SHALL ALSO BE PLACED ABOVE THE ABOVE THREADED ACCESS CAP.
4. A BOUNDARY TRAP SHALL BE PROVIDED FOR EVERY PCS LOCATED IN AN AREA IDENTIFIED BY SYDNEY WATER AS A BOUNDARY TRAP AREA. WHERE APPLICABLE, SYDNEY WATER WILL PROVIDE A TECHNICAL ADVISORY NOTE DESCRIBING THE ADDITIONAL DESIGN REQUIREMENTS.
5. FOR PVC RETICULATION SEWERS, RUBBER RING JOINTS PERMITTED FOR PIPE SIZE DN150 AND LARGER. SOLVENT CEMENT JOINTS PERMITTED FOR PIPE SIZE DN150 AND DN225 ONLY.
6. DN100 PROPERTY CONNECTION SIZE SHOWN. PIPEWORK AND FITTING ARRANGEMENT MAY BE ADOPTED FOR LARGER CONNECTIONS TO SUIT DEVELOPMENT.
7. THE MINIMUM LENGTH OF RISER PIPE SHALL BE 250mm. DEPTH TO PROPERTY CONNECTION POINT MAY BE LESS THAN 1000mm FOR SHALLOW INSTALLATIONS TO PROVIDE THE MINIMUM LENGTH OF RISER PIPE.
8. REFER TO DRAWING No. DTC/2120 FOR FURTHER DETAILS.

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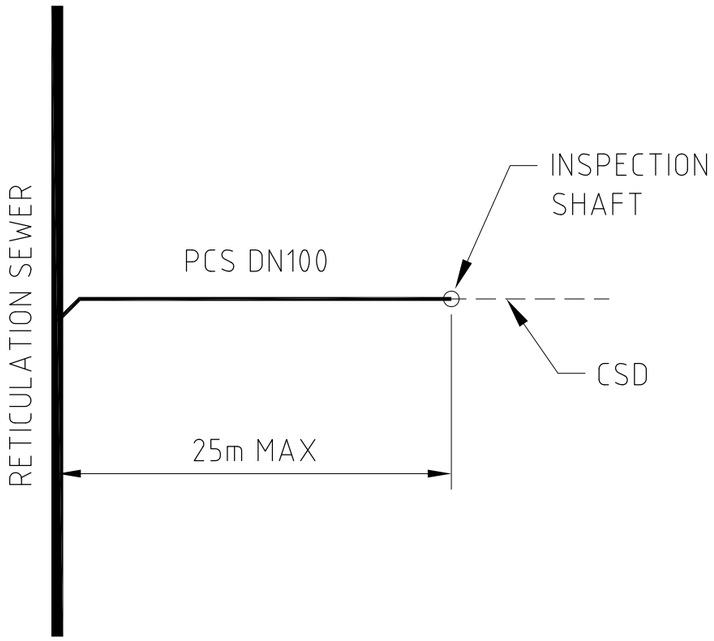
SCALE - 1:10

NOT FOR CONSTRUCTION

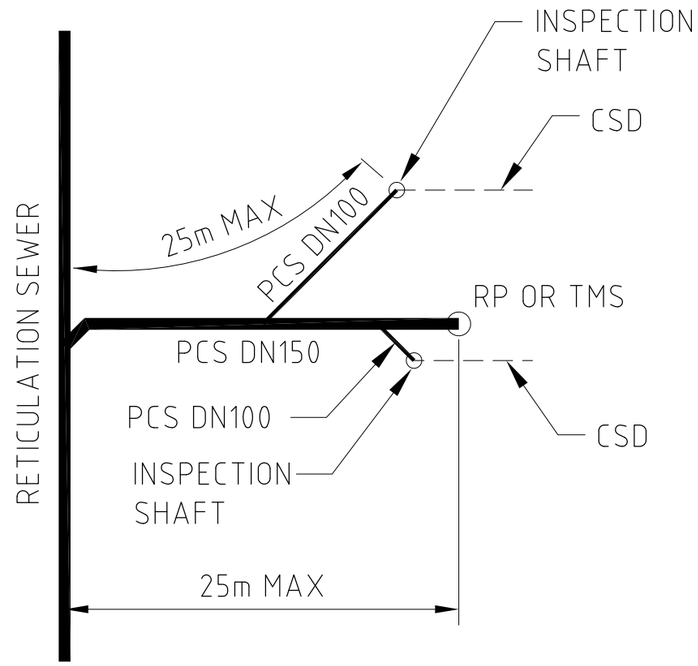
Sydney WATER

FIGURE LT-2

DN100 PVC-U PROPERTY CONNECTION SEWER FOR SINGLE PROPERTIES LEAK TIGHT SEWER SYSTEMS



SINGLE PROPERTY



MULTIPLE PROPERTIES

NOT FOR CONSTRUCTION

Sydney WATER

FIGURE LT-3

PROPERTY CONNECTION SEWER
GENERAL ARRANGEMENT
LEAK TIGHT SEWER SYSTEMS