

## Overview

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| <b>What</b> | <p>These guidelines explain our technical requirements for laying sewers in building basements. The scope of the guide is restricted to reticulation sewers ranging from DN150 to DN225.</p> <p>We will accept works that observe these guidelines. Previous inadequate practices must discontinue.</p> |
| <b>Who</b>  | <p>Developers, architects, hydraulic services consultants, engineers, Water Services Coordinators and designers.</p>                                                                                                                                                                                    |
| <b>Why</b>  | <p>The aim is to avoid internal sewer surcharges by improving the planning, design and construction of sewers in basements.</p>                                                                                                                                                                         |

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## 1 Introduction

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Sydney Water currently allows reticulation sewers to be laid in building basements. This often restricts operation and maintenance access. There have also been a number of surcharge incidents that have disrupted services and damaged property. This is often due to unsympathetic building layout, inadequate design and substandard workmanship.

The Sydney Water edition of *WSA 02 – Sewerage Code of Australia* applies to reticulation sewers. These technical guidelines outline how the code can be adapted and applied inside a building basement. We will accept works that observe these guidelines.

This document covers reticulation sewers of size from DN 150 to DN 225 laid within building basements.

Sewers larger than DN 225 are generally not allowed in basements without our approval.

## 2 Planning

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### 2.1 Hydraulics and servicing options

We will only accept a basement sewer proposal if you can demonstrate that there is no other suitable servicing option, such as relaying the existing sewer outside the building footprint or outside the property boundary.

The capacity of an existing sewer may not be sufficient for future growth. In this case, the new sewer must be re-sized to convey the forecast peak flow from its catchment area, assuming the area is fully developed according to the current and planned land-use zoning. The latest Sewerage Flow Schedule tool must be used to estimate the flow, and size and grade the new sewer. The latest tool can be downloaded from the Sydney Water website.

### 2.2 Building layout

Sewers may surcharge due to blockage or heavy wet weather. Surcharges can cause obnoxious smells, property damage and possible personal injury.

Your building plan must recognise the need to design out these undesirable consequences. An example of a well-planned ground floor building layout is shown in Figure 1.

The alignment and reduced levels of the sewer are restricted and dictated by the hydraulics of the gravity flow. It is usually not possible to retrofit the sewer onto a floor plan without either compromising the intended floor use or reducing sewer performance.

### 2.3 Access to pipe

The sewer pipe and all its appurtenances must be fully visible. Access must not be obstructed by walls, beams and columns. The clearance between the external wall of the sewer pipe and any obstructing surface must be at least 150 mm.

You must provide a passageway to the pipe which is safe and unobstructed at all times for Sydney Water maintenance staff carrying light equipment. You must provide us with an acceptable 24-hour access arrangement.

## 2.4 Pipe alignment

The sewer should take the most direct route possible with minimum changes in direction. The corridor occupied by the sewer must be clear of obstructions to maintain the required uniform grade.

Any change in direction should preferably occur at a maintenance structure. In other cases, we will only allow it to be within 50 m of a maintenance structure, with no bends in between.

The sewer must not have short radius bends of over 45°. Any greater change in horizontal direction must be made using multiple bends.

## 2.5 Separation from other services

The line of the sewer must be clear of other services that may damage or obstruct inspection of the pipe. Any electrical supply cable, gas pipe or water services must be at least 300 mm away. Services crossing the sewer must have minimum clearance of 150 mm under or above the pipe.

The sewer must not be directly above any drinking water or fire sprinkler tanks, or their associated pumping installations. The sewer must not be located inside air plenums.

## 2.6 Maintenance structures

Maintenance structures must be provided for visual or CCTV inspection and for drain clearing. The distance between maintenance shafts (MSs) must not be over 120 m.

The shaft of these structures must be raised to the proposed ground floor level. Unless you have our approval, the access cover must not be lower than the original ground level before development.

These structures should be positioned so that any surcharge is easily visible and will drain away from the building. They should not be in habitable areas or where property damage is likely during surcharge events.

The access covers of these maintenance structures must be readily accessible. A standing space for vehicles carrying jetting hoses or CCTV cameras must be available within 50 m of each cover. We require a clear unobstructed passageway (minimum 1 m wide and 2.4 m headroom) for staff and equipment to reach the maintenance structures.

Maintenance holes must have a clear, unobstructed working space of at least a metre around the rim of the covers and at least 2.4 m headroom above. For maintenance shafts, the space may be reduced to 600 mm around the rim of the covers.

We may require you to install additional maintenance holes (MHs) or maintenance shafts (MSs). You must talk to us before finalising the building layout.

## 2.7 Property connection

The property or the plumbing stack must connect at a maintenance structure. The point of property connection must be shown in your submitted drawings.

To avoid potential sewer surcharge for sanitary fixtures in basements, they must be connected to the sewer through a pumping installation, in accordance with the requirements of the *Plumbing Code of Australia*.

## 2.8 Structural independence

The sewer and its associated structures must be attached to, or supported by the building. It must not be fully or partially enclosed inside any building elements, such as beams, walls or slabs.

## 2.9 Future connections

We may require you to provide for connections to any future upstream or downstream sewers. The installed pipe stub must be in line with and at the grade of the sewer. Your submitted drawing must show the position and invert level of the pipe stub. An example of this is shown in Figure 2.

# 3 Pipework

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## 3.1 Pipes and fittings

Pipes and fittings must be:

- ductile iron pipes certified to *AS/NZS 2280:2014* or *EN 545*
- stainless steel pipes certified to *AS 5200.053*

Joints must be elastomeric-ring or bolted gland joints, or welded in the case of stainless steel pipes. All pipes and fittings, excluding stainless steel, must be, as a minimum standard, externally coated with cold-applied bitumen, and internally lined with calcium aluminate cement or a polymeric lining suitable for use in a sewage environment.

You must not use pipe fittings with access doors or hatches, as they can present a potential flooding hazard when opened in surcharge conditions.

To avoid creating a step in invert of sewer, you must ensure that the internal diameter of the new pipes match the internal diameter of sewer into they are to be connected within the following tolerances:

- $\pm 8$  mm for DN 150; and
- $\pm 10$  mm for DN 225.

Only use metal-banded flexible couplings certified to *AS/NZS 4327* to connect the pipes that are within the tolerance limit. Where the tolerance limit is exceeded, you must construct a maintenance structure (see Section 2.6) to transition between new and existing pipes.

## 3.2 Pipe support

Supports must be designed to take:

- the load of the water-filled pipe plus 115 kg at each point of support
- a nominal internal hydrostatic thrust load of 10 m head, or the height from the support to the surcharge relief point, whichever is the greater.

There must be at least two supports per pipe barrel length. The spacing of supports must not be over 3 m for both graded and vertical pipes. Additional supports must be installed at bends, junctions or closing pipe lengths.

Pipe supports may be in the form of hook bolts, saddle clamps, rod hangers and cantilever brackets. Lateral restraints must be provided to fix the pipe in steady and firm position

without side-sways. They must be made of mild steel with hot-dip galvanised zinc coating complying with AS 4680.

### 3.3 Maintenance structures

Maintenance holes must be reinforced concrete structures attached to or supported by the structural members of the building. Precast concrete construction is not allowed.

Prefabricated PE or PVC maintenance shafts must be encased in concrete. The riser may be in grey or ductile iron. Maintenance shafts may also be made of stainless steel, or other non-combustible and corrosion resistant materials.

### 3.4 Protection from damage

Where the clear headroom of the sewer from the floor is less than 1.8 m, you must have appropriate barriers to prevent mechanical damage caused by floor users.

Vehicular barriers must be installed if the sewer is located near parking spaces, driveways or vehicular ramps.

### 3.5 Vehicular barriers

Vehicular barriers must be designed to the following horizontal imposed loadings:

- 30 kN for light vehicle traffic areas (parking, garages, driveways and ramps restricted to cars, light vans, etc) not exceeding 2,500 kg gross mass.
- 240 kN for light vehicle traffic at the end of straight ramps over 20 m in length and intended for downward travel.
- 40 kN for medium vehicle traffic areas (vehicles between 2,500 kg and 10,000 kg).

For guardrails, the impact force should be assumed to act at 0.5 m above floor level for light traffic areas and at 1 m for medium traffic areas.

### 3.6 Penetration

Pipes must not be embedded in concrete walls or beams. There must be openings in the structural element for the pipe to pass through, which are at least 150 mm larger than the pipe barrel external diameter.

For external walls, the annular space between the opening and the pipe must be sealed against water penetration using an EDPM mechanical seal (See Figure 3).

The designer may require an articulated pipe joint, immediately at the buried side of any external wall.

### 3.7 Labelling

The pipework must be labelled with markers complying with the requirements of AS 1345 – *Identification of the contents of pipes, conduits and ducts*. The markers must have:

- the words 'Sewer – Sydney Water' on a black label with a white outer contrasting border
- an arrow indicating the direction of flow
- white, uppercase letters at least 28 mm high.

Markers must be printed labels made of durable materials and fixed to the pipe wall. They must be placed next to junctions, wall penetrations and the like, and at spacing not greater than 8 m along the pipework.

### 3.8 Acceptance testing

The completed sewer pipe must be tested for leaks either by the vacuum test or pressure test methods, as described in *WSA 02 (Sydney Water Edition) Sewerage Code*.

All maintenance holes and shafts must be tested using the vacuum pressure test method outlined in the code.

Figure 1 – Illustration of ground floor layout

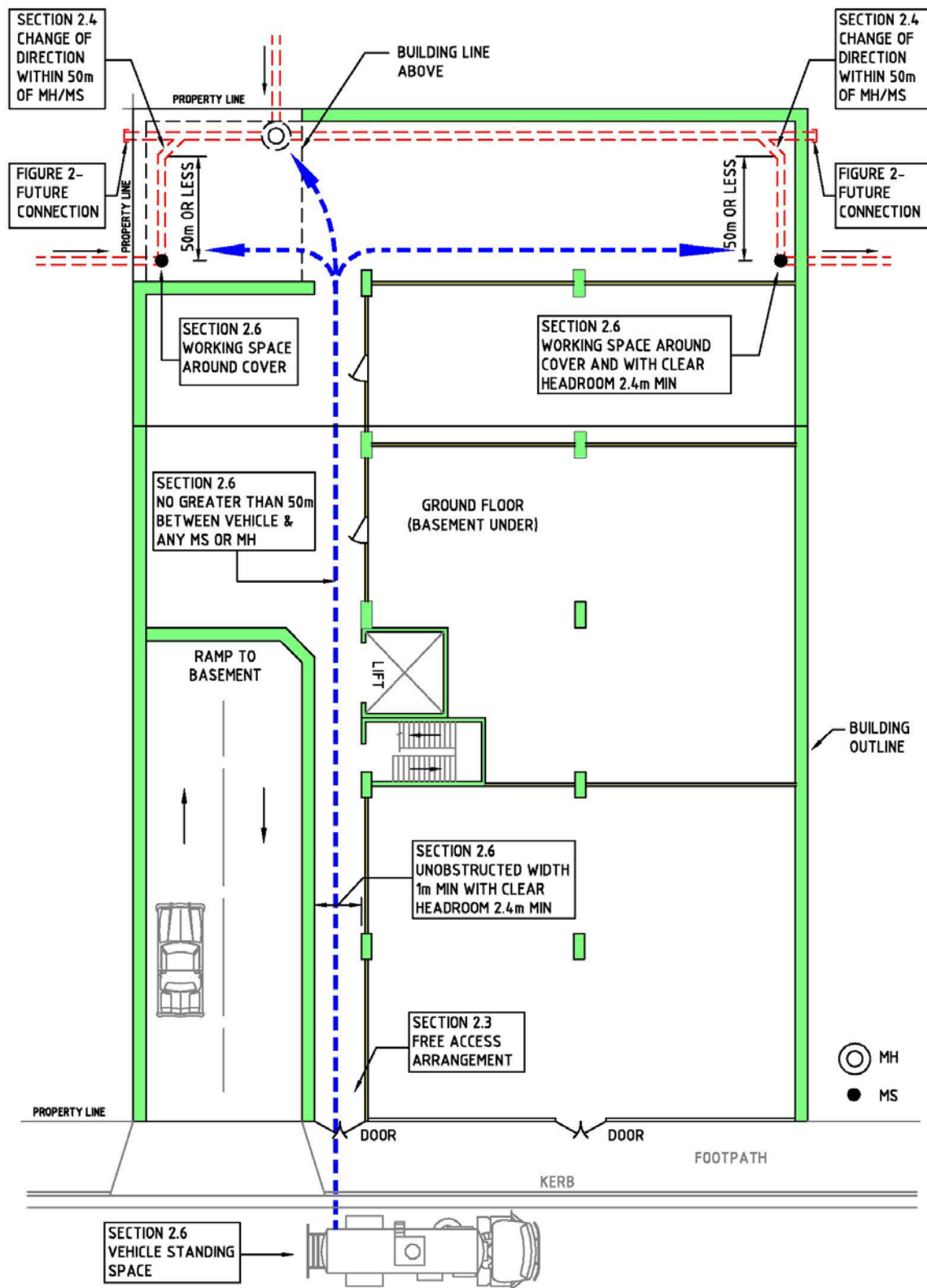


Figure 2 – Example of future connection provision

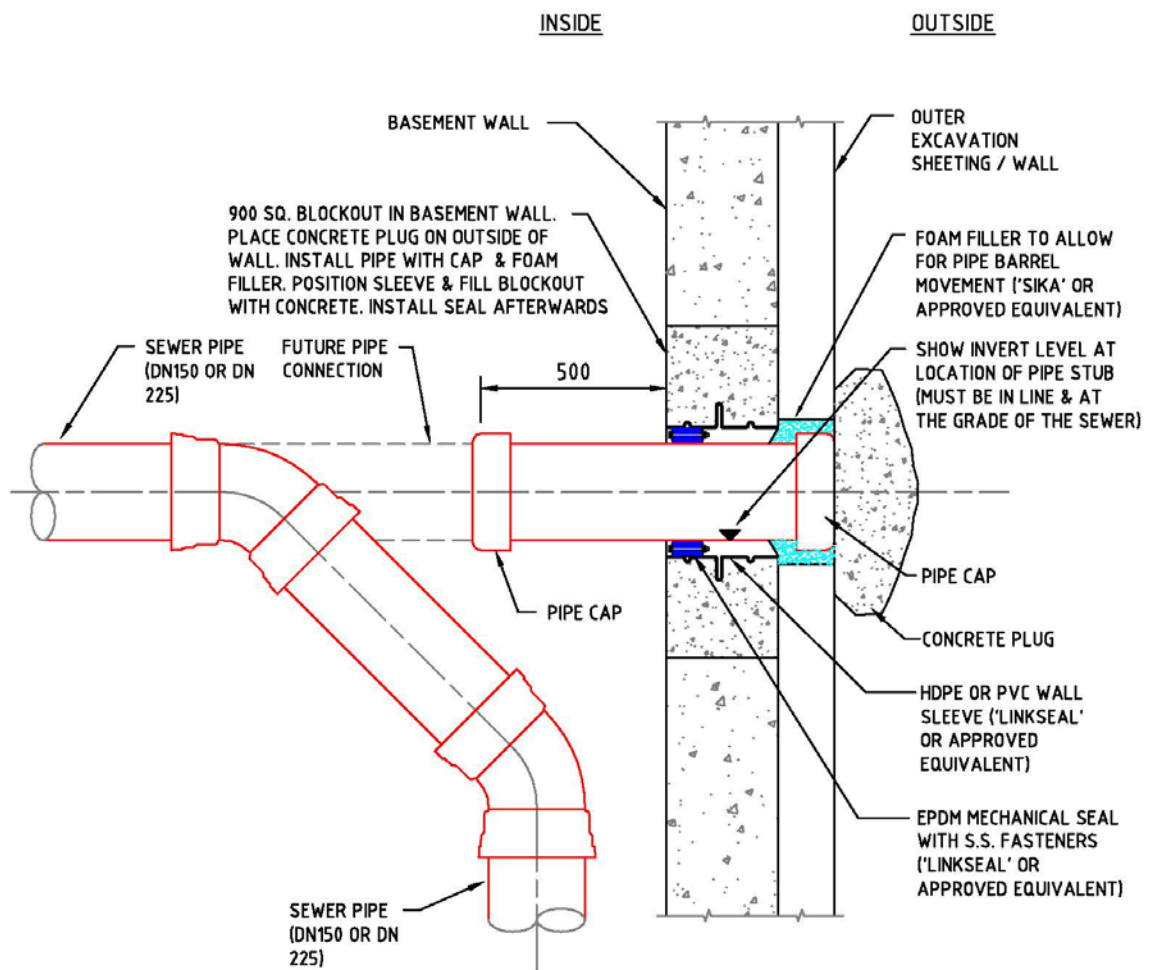
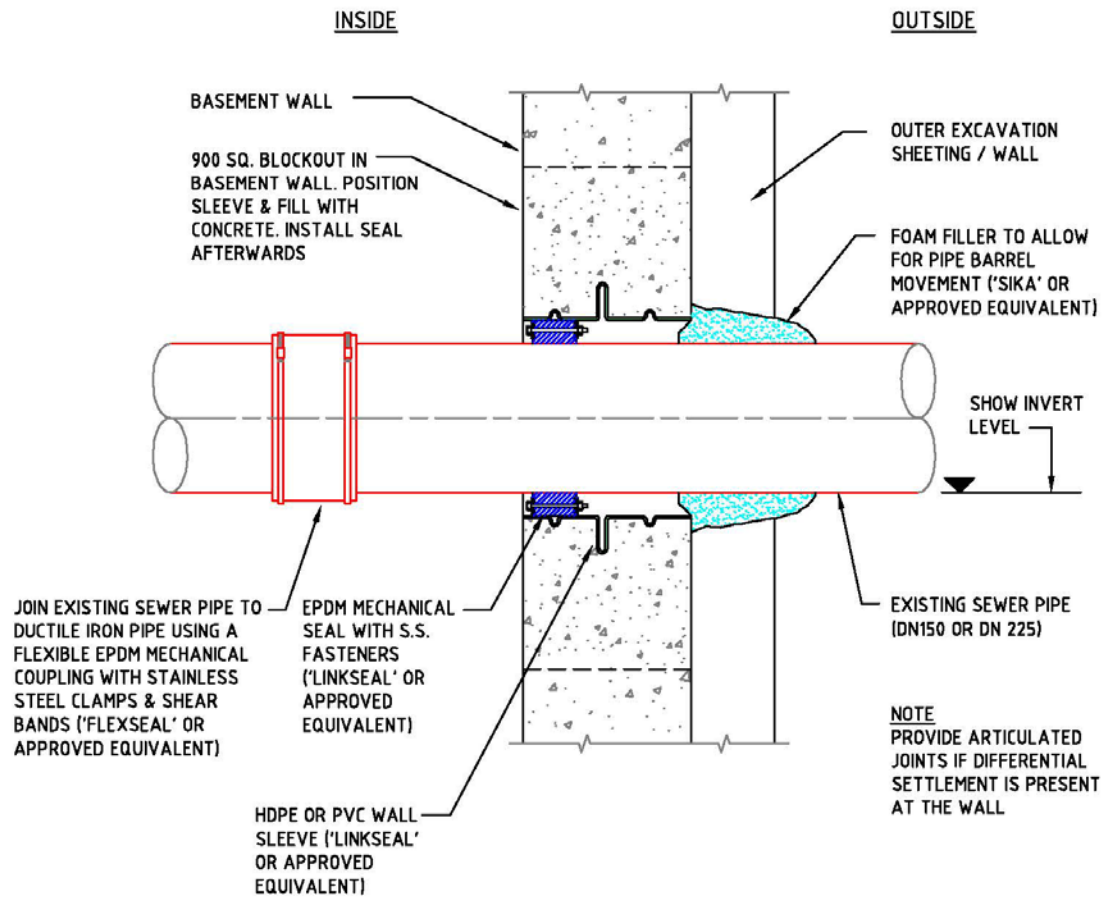


Figure 3 – Basement wall pipe penetration details



## Review

| Stage          | Date          |
|----------------|---------------|
| Original guide | April 2015    |
| This review    | 15 April 2016 |
| Next review    |               |

## Change history

| Version | Key changes                                                                                                                                                                                                                                                                                                                                             |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | New document                                                                                                                                                                                                                                                                                                                                            |
| 2       | 23 April 2015 – Reviewed for plain English & adherence to Sydney Water style guide – Toulia Arronis, Senior Policy, Pricing & Program Specialist – Residential                                                                                                                                                                                          |
| 3       | 24 April 2015 – Reviewed for brand and style and alignment with other Sydney Water documents – Julie Bye                                                                                                                                                                                                                                                |
| 4       | <ul style="list-style-type: none"><li>• Acceptance of EN 545 ductile iron and AS 5200.053 stainless steel pipes</li><li>• Deletion of AS 1631 grey cast iron pipes</li><li>• Specifying internal tolerance limit between new and existing pipes</li><li>• Specifying AS/NZS 4327 metal-banded couplings</li><li>• Minor editorial corrections</li></ul> |