

TECHNICAL MANUAL



SLIMDRAIN
Linear Grated Drainage



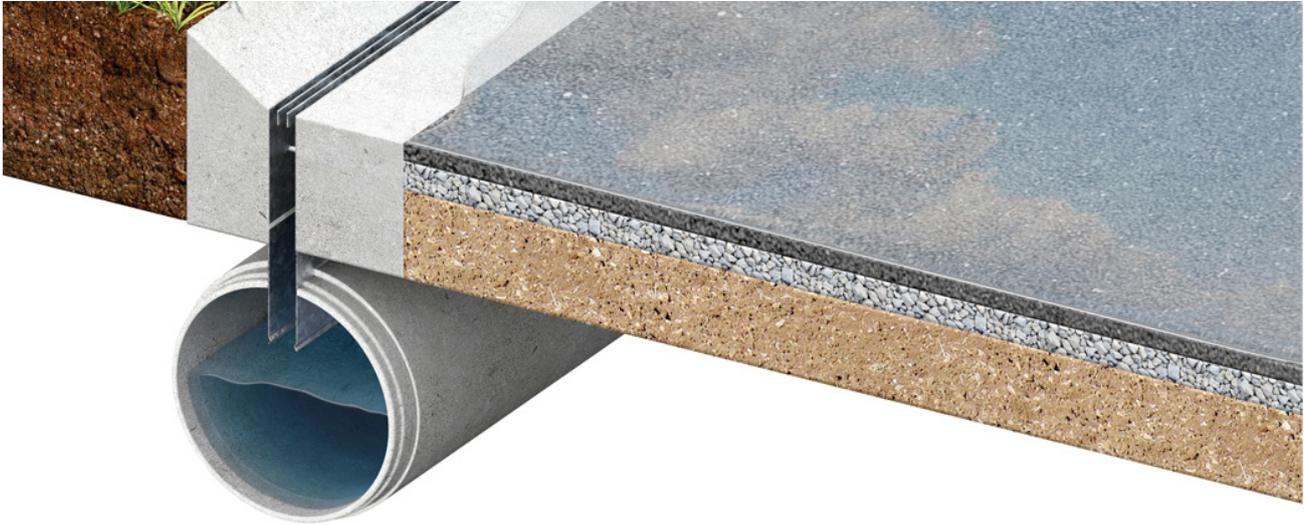
THE AUSTRALIAN PIPE COMPANY



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INTRODUCTION



SlimDrain System Overview

The importance of motorist safety heightens the need for safer, innovative road design. Sheet water can create a major hazard, causing vehicles to aquaplane and lose control. Aquaplaning is only one of many factors that can influence the road user's ability to maintain control of their vehicle, however through good product selection the risks of aquaplaning can be minimized.

To aid road designers in overcoming this problem, RCPA has developed the revolutionary SlimDrain drainage system to help alleviate the problem of sheet water and aquaplaning.

Reduces Surface Water Hazards

Designed to form a continuous narrow drainage slot; the SlimDrain drainage system collects and captures sheet water as it approaches the grate rather than channelling water along a gutter to an inlet unit. This design feature reduces flow widths and ponding associated with traditional gully inlet units.

Smart

The unique configuration of the SlimDrain drainage system gives designers the option to incorporate the SlimDrain pipe as a main trunk drainage line while collecting surface run-off in the process.

Smooth 'Bike-Safe' Surface

The SlimDrain drainage system consists of a riser grate, which meets the requirements of AS 3996 for bicycle safety, fitted into a continuous slot in the top of a specially manufactured reinforced concrete pipe.

Hydraulically Efficient

SlimDrain is available in a range of pipes from 225-750mm diameter which is combined with a series of galvanised steel inlet grates for pipe cover heights of 125mm up to 495mm. This allows the collection and conveyance of stormwater in a safe and hydraulically efficient manner, eliminating the need for secondary drainage lines which are often required with alternative grated drainage solutions.

The SlimDrain drainage system provides a safe, attractive and cost-effective solution to surface stormwater drainage.

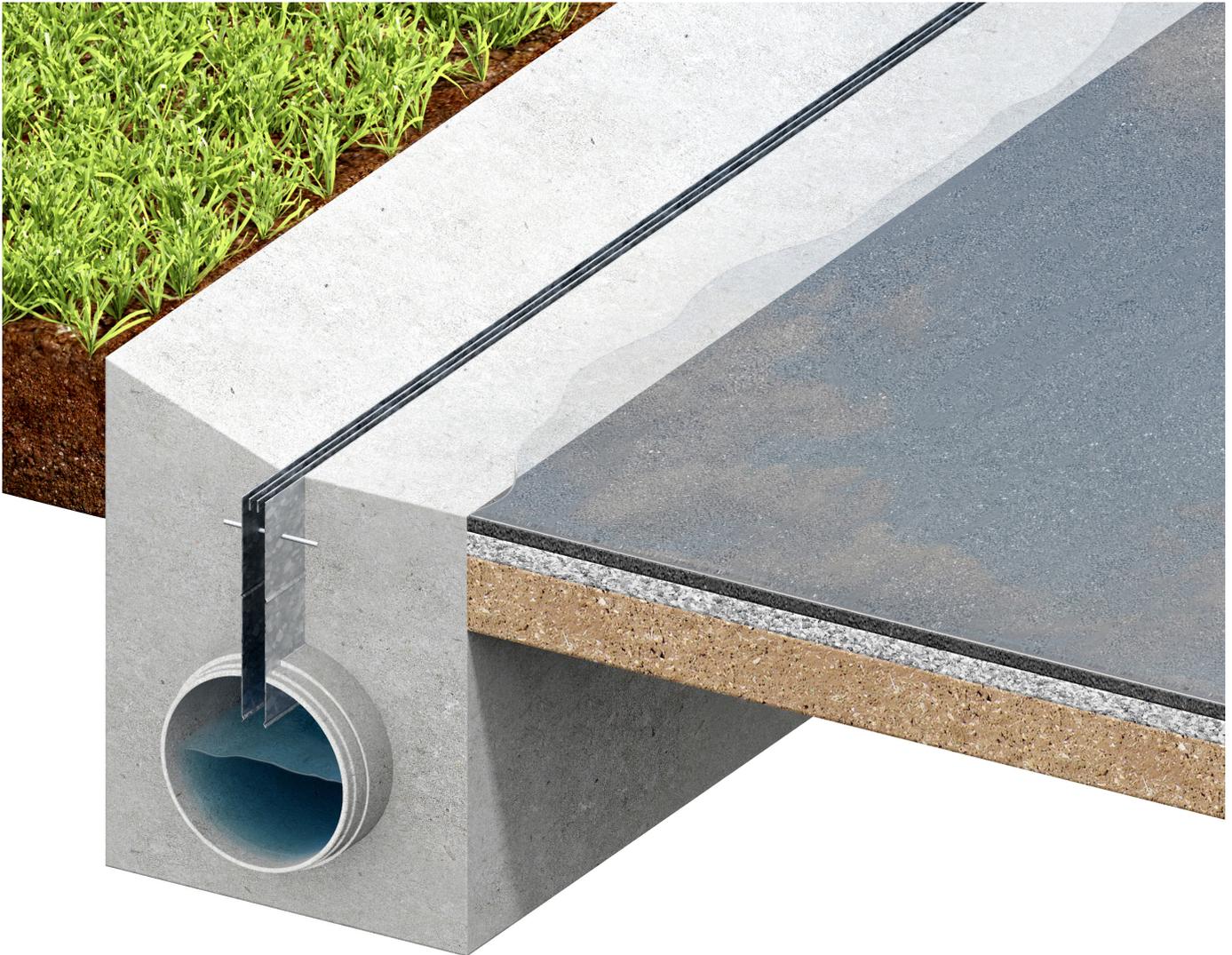


SYSTEM DESCRIPTION

Available in many configurations

The SlimDrain drainage system is available in several configurations to meet individual project requirements. SlimDrain grates can be used with any size of SlimDrain concrete pipe, from 225 up to 750mm internal diameter, creating a high capacity surface drainage system.

At surface level, the SlimDrain inlet is an unobtrusive galvanized steel grate with a standard opening of 48mm. This bike-safe design includes two longitudinal bars with a 14mm maximum opening.



The SlimDrain drainage system can be utilized in a number of different configurations:

- Invert of kerb
- Against a median barrier
- Line drainage in various applications

SlimDrain provides flexibility in surface finishes that can be used, such as hand placed concrete, slip-formed kerbing or AC pavement.

The narrow profile of the SlimDrain grates results in a solution that is almost invisible once installed. Avoiding the use of multiple kerb entry pits, the SlimDrain drainage system produces a safer, more visually appealing kerb line and avoids ponding or excess water flow widths.

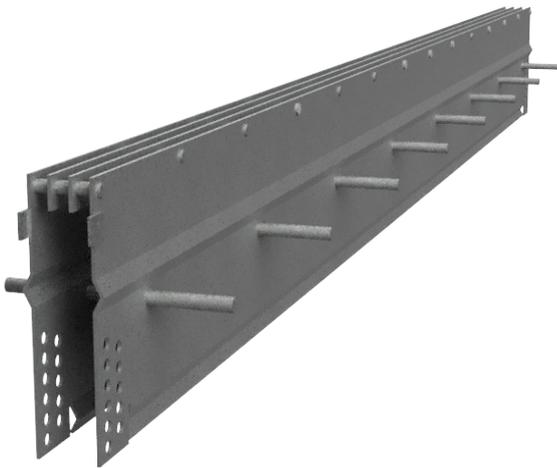
The smooth, hydraulically efficient pipe aids the system to be self-cleansing at low flow velocities, reducing maintenance and disruption to traffic. The range of FRCPipe fittings can be used to incorporate flushing and inspection points where required.

SLIMDRAIN CONCRETE PIPE SIZES



SlimDrain Pipe Nominal Internal Diameter (mm)	SlimDrain Pipe Wall Thickness (mm)	SlimDrain Pipe Outside Diameter (mm)
225	20	270
300	22	346
375	25	427
450	28	512
525	30	594
600	34	678
675	39	752
750	42	803

SLIMDRAIN STEEL RISER GRATE SIZES



SlimDrain Riser Grate Height (mm)
125-200
200-275
275-350
350-425
425-500

Other components:

- SlimDrain Support Block
- Height Adjustment Pins
- SlimDrain End Cap
- SlimDrain End Cap with Flushing Point

SYSTEM DESIGN

IMPORTANT NOTE: The following information has been prepared as a guide to the SlimDrain System. While all due care has been taken in the preparation of this document, it is the responsibility of designers to ensure that the SlimDrain drainage system is suitable for the intended project, including all hydraulic and structural requirements.

Traffic Loads

SlimDrain drainage system has been designed to meet Class D load conditions, in accordance with AS 3996-2006. To meet these load requirements, VSlimDrain is installed encased in minimum 32MPa concrete surround.

SlimDrain is most commonly used in a kerb invert with a concrete finished surface, however if required asphalt or other surface treatments may be used in conjunction with the SlimDrain drainage grate.

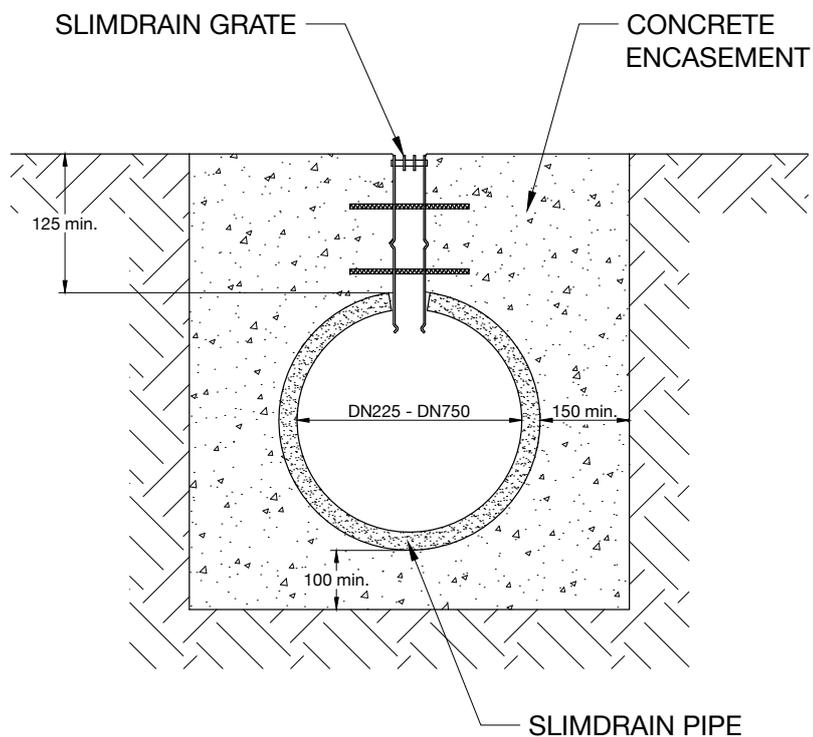
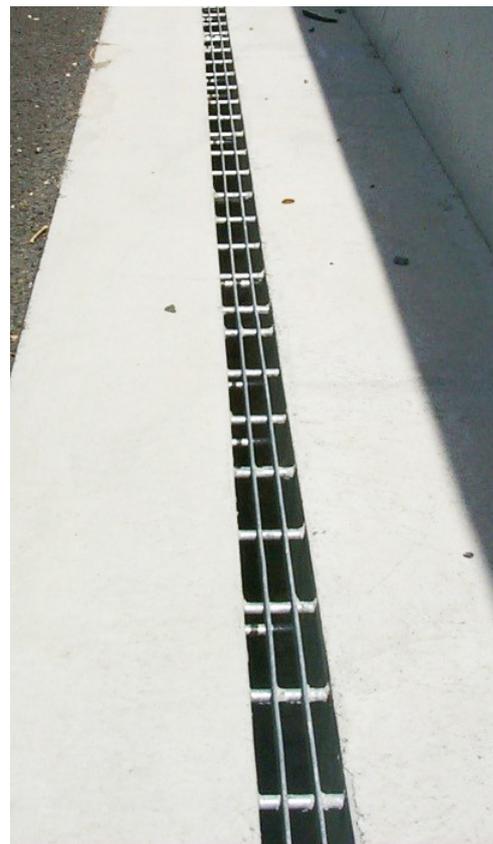


Figure 1 - SlimDrain Standard Trench Installation Detail



Sloping Surface Gradient

Where the surface slope is the same as the pipe slope, SlimDrain pipe can be installed with a constant grate depth. This simplifies set-out and installation, and when combined with the variety of SlimDrain pipe diameters available the SlimDrain system can convey large amounts of water without the need for additional drainage lines.

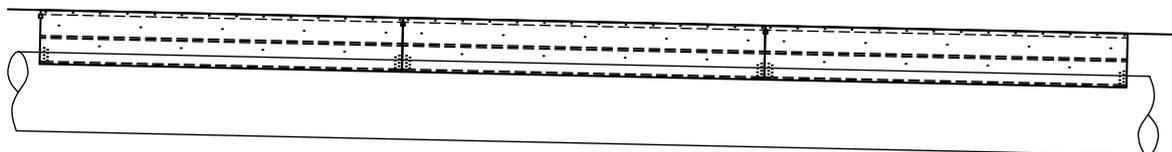


Figure 2 - SlimDrain pipe at constant depth

SlimDrain grates are available in a range of sizes, designed to provide a variety of pipe installation depths for maximum flexibility. By using Table 1 the designer or contractor can work out what grate depths will be required.

TABLE 1 - SLIMDRAIN GRATE SIZES		
Nominal Grate Depth (mm)	Depth from Pipe Crown to F.S.L. (mm)	
	Minimum	Maximum
125-200	125	200
200-275	200	275
275-350	275	350
350-425	350	425
425-500	425	500

Flat Surface Gradient

The unique SlimDrain drainage system format allows the designer to create a hydraulically efficient drainage system in situations where the longitudinal surface grade is very low or totally flat. The variable depth range of SlimDrain grates allows the pipeline to be installed with variable fall from the surface level. Depending upon the pipe grade, SlimDrain can have continuous runs up to 185 metres, creating a high capacity water capture and conveyance system.

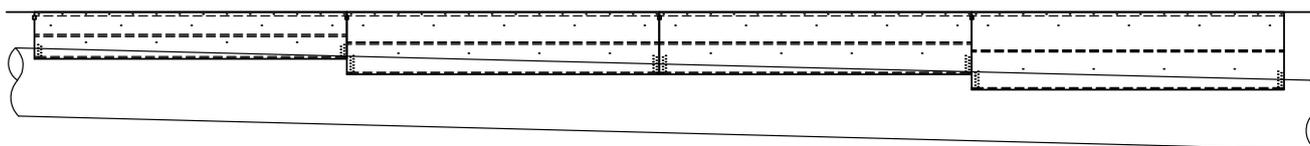


Figure 3 - SlimDrain pipe at varying depth

TABLE 2 - SLIMDRAIN LENGTH FOR VARYING GRADES (*ASSUMING SURFACE IS FLAT)	
Pipe Gradient (%)*	Maximum SlimDrain run length (m)
0.2	185
0.33	110
0.5	74
1.0	37

Where a range of grates are required, it will be necessary to calculate the points along the SlimDrain length where the grate size changes. RCPA can provide assistance with calculating grate requirements. Please contact RCPA on 1800 659 850.

SYSTEM DESIGN (CONT.)

System Maintenance

Installed as a continuous slot, SlimDrain grates capture rainwater as soon as it approaches the grate. As there is no flow build up along the kerb, rubbish, litter or debris is not conveyed along the kerb to build up and cause drainage blockages. Cleaning of the SlimDrain grate is accomplished simply using street-sweeping equipment.

Maintenance of the underground SlimDrain drainage system is minimised due to the hydraulically efficient carrier pipe. RCPA recommend installing SlimDrain with a pit at either end of the grated drain. Normal maintenance practices can be done with drainage pipe cleaning equipment when installed in this manner.

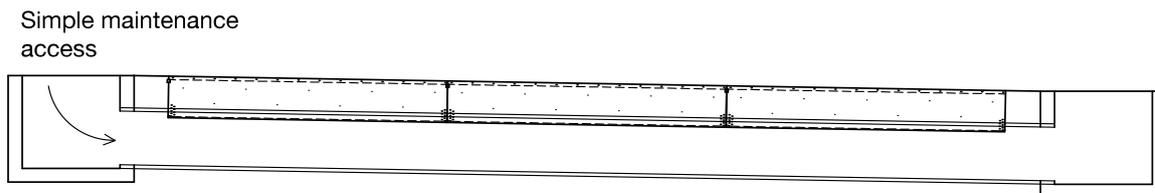


Figure 3 - SlimDrain grates installed pit to pit

If the SlimDrain line is constructed without a starter pit, a flushing point may be required for access to the pipe. Flushing points can be incorporated using a SuperTite saddle connected to a flushing point located off the roadway. Pipe cleaning can be done without the need for traffic control or removal of grates.

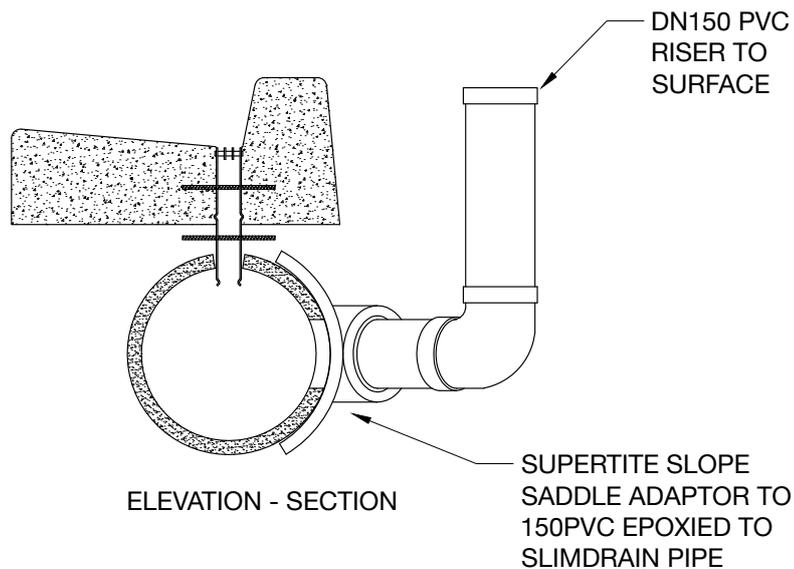


Figure 4 - Flush point cross section

The narrow inlet grate combined with the self-cleaning circular pipe section means that SlimDrain effectively resists the growth of weeds in the drainage line. Numerous installation of SlimDrain have been in service for many years without any sign of blockage due to vegetation growth.

INSTALLATION

The SlimDrain drainage system consists of a number of simple, easy to install components. To achieve long term structural capacity, SlimDrain is encased in 32MPa concrete from 100mm below the pipe to finished surface level, and 150mm minimum concrete thickness on either side of the SlimDrain pipe.

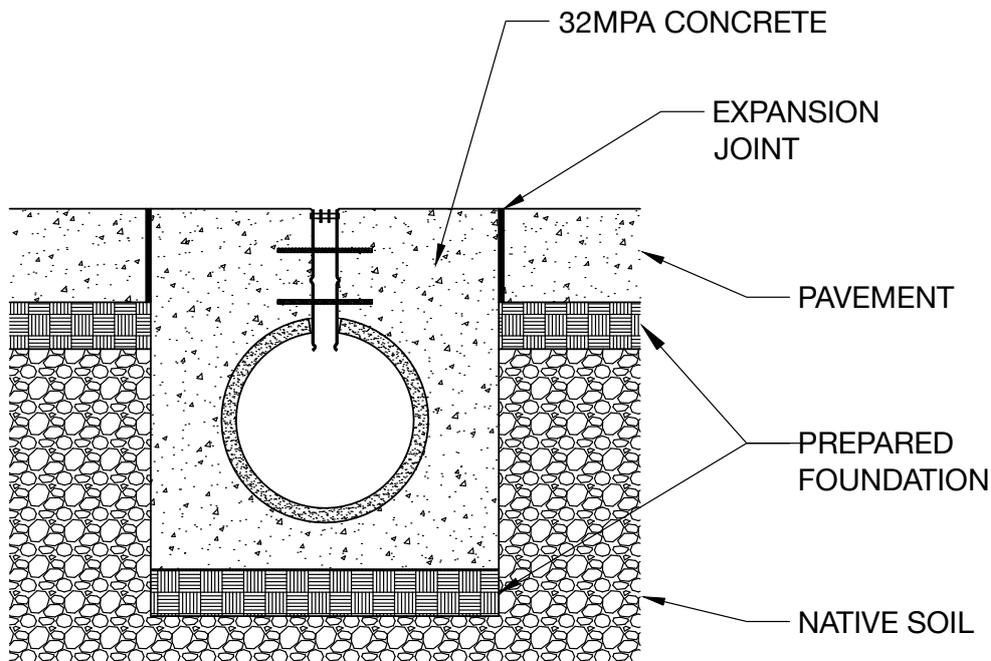


Figure 5 – Trench Section

The components of the SlimDrain drainage system should be handled with care, as there is a possibility of damage to the SlimDrain grates or SlimDrain pipe if struck against other objects or machinery.

What Is Required?

- Safety equipment (Eye and hearing protection, gloves & respirator)
- Excavation equipment
- Laser level and/or string line
- Measuring tape
- Wet cutting saw suitable for cutting concrete pipes
- Angle grinder for trimming VSlimDrain grates

Step 1: Trench Excavation

Excavate the trench for the SlimDrain drainage system, allowing additional depth for a minimum 100mm concrete encasement underneath the pipe. The trench should be excavated to the widths and depths as indicated in the figure below. The minimum trench width for any pipe size is the pipe outside diameter plus 300mm.

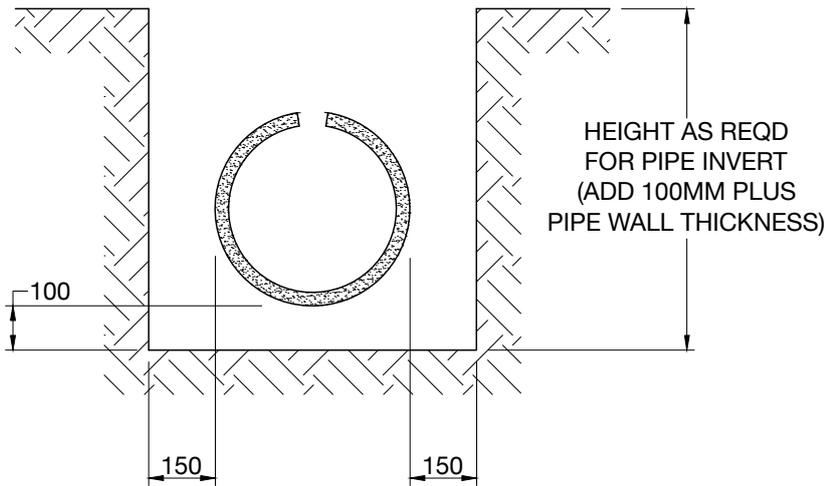
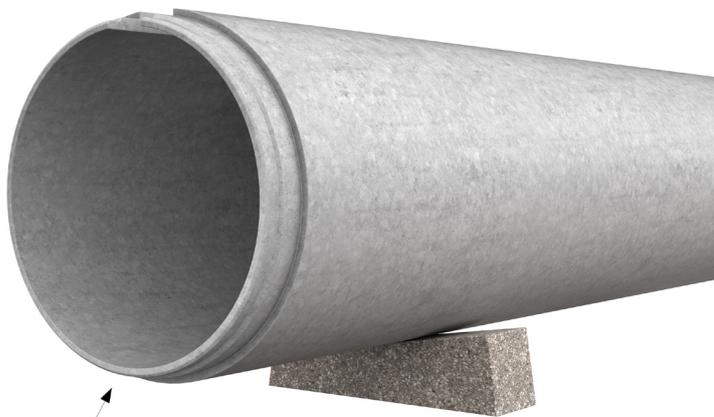


Figure 6 - Trench Detail

Step 2: Setting Out SlimDrain concrete pipe

At the core of the SlimDrain drainage system is the SlimDrain concrete pipe made from durable fibre reinforced concrete material. During installation, the SlimDrain pipe is positioned on a series of plastic support blocks to allow a minimum 100mm void underneath the pipe for concrete encasement.

The trench should be prepared by placing concrete supports to elevate the pipe during concreting along the trench base, using a bedding layer of stabilized sand or similar to achieve the correct heights. The supports can be set to line and level using a pipe laser, ensuring that an allowance is made for the pipe wall thickness.



Allow for pipe wall thickness when setting out concrete supports

Figure 7 – SlimDrain pipe setup

INSTALLATION (CONT.)

Step 2: Setting Out SlimDrain concrete pipe (continued)

Two supports should be used per pipe length to ensure stability. Once the concrete supports are set to required location and height, place the first SlimDrain concrete pipe onto the support ensuring the slot is at the top of the pipe. Check the pipe invert for level and adjust the supports at either end as required to achieve correct height and fall. Prop the end of the first SlimDrain pipe to prevent movement when subsequent pipes are installed.

Ensure that the pipe is laid with the slot at the top. A spirit level can be used along the pipe to check for position of the slot.



Figure 8 – Pipe slot level

A rubber v-ring is placed onto the spigot of the next pipe to be laid and pipe jointing lubricant applied to the other pipe socket.

Lift the pipe into position, and ensuring the slot is facing upwards and aligned correctly make the joint, taking care to ensure the previously laid pipes do not move during jointing. The small piece of rubber v-ring that is exposed can be cut out using a pair of scissors and discarded.



Figure 9 – SlimDrain pipe setup on concrete supports

Step 3: Setting Out SlimDrain Grate

Positioning of the grate is critical to achieving correct surface level, and the SlimDrain grate is manufactured with pre-punched alignment holes to allow adjustment to the required finished surface level, see Figure 10 below.

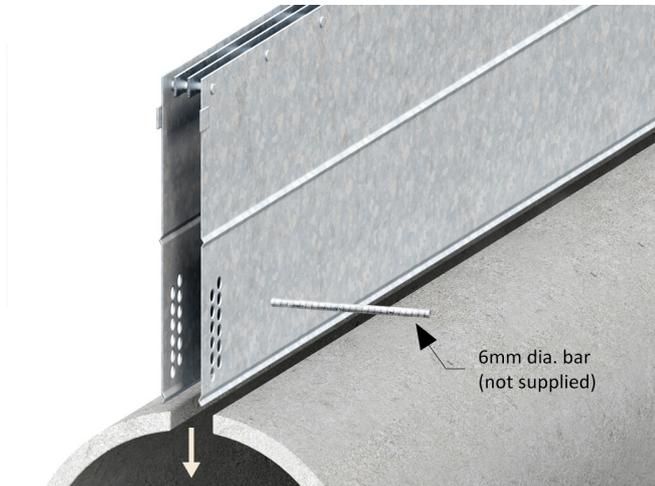


Figure 10 – SlimDrain grate setup

Using the alignment holes and a 100mm length of 6mm diameter galvanized bar (galvanized nails are also suitable), adjust the height of the SlimDrain grate by placing the bar through the appropriate hole to achieve the correct finished surface level. Additional shim material between the bar and pipe may be used if required to gain precise height control. When adjustment is completed, seal any holes remaining above the bar with tape. Alternatively, the grates can be suspended from bracing formwork.

Bracing can be done with timber brackets securing the grate in position. A length of threaded rod can be used to form a hooked end which attaches to the grate bars, passing through a spacer piece (25Wx50Dx50H mm timber) and brace (50x50mm minimum), then secured with a nut and washer. The brace should extend past the trench edges onto either formwork (if used) or to stakes driven securely into position. The positioning of the grate base in the pipe slot is sufficient and does not need additional securing.

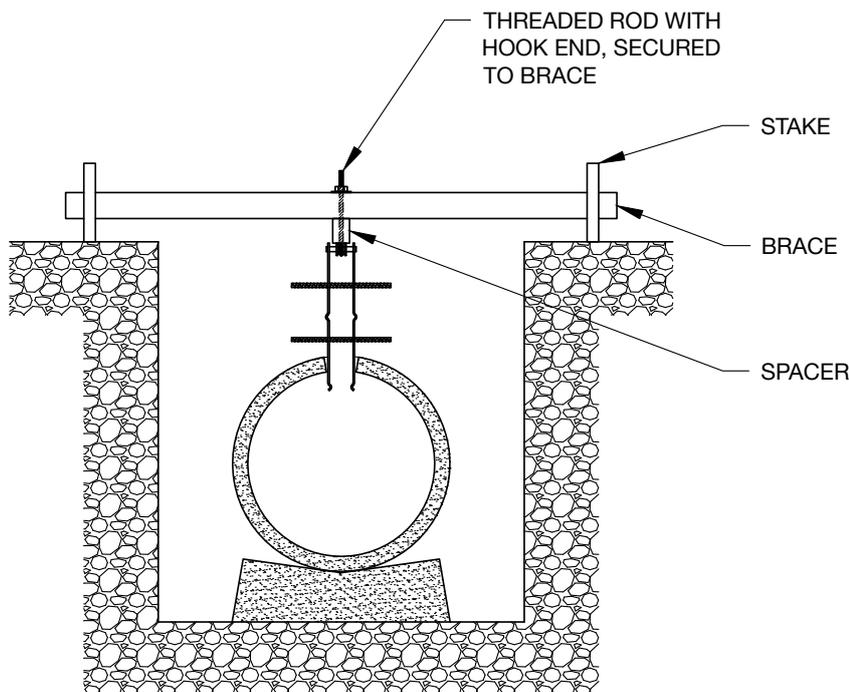


Figure 11 – SlimDrain bracing detail

INSTALLATION (CONT.)

Step 3: Setting Out SlimDrain Grate (continued)

If required, a tek-screw can be used to secure adjacent grates to prevent any movement and to ensure accurate alignment of the grates is maintained during concrete pouring.

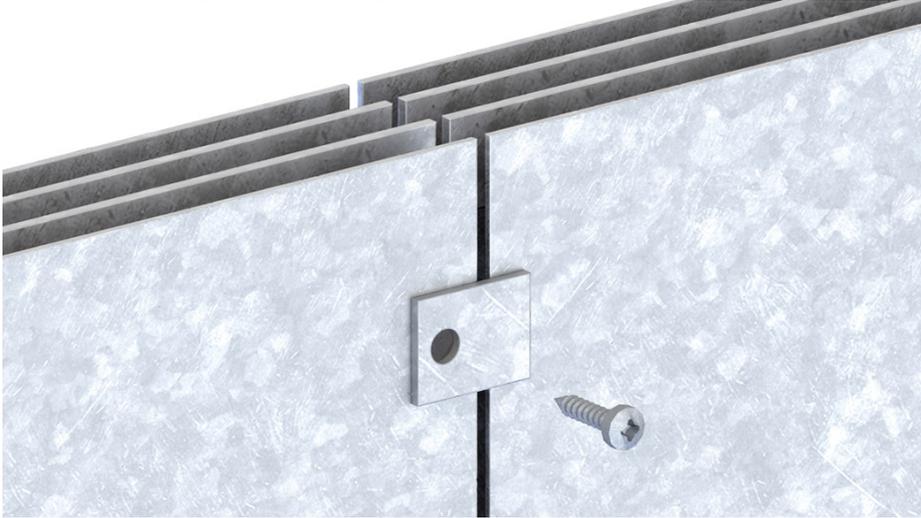


Figure 12 – Securing SlimDrain grate tabs

Step 4: Sealing the SlimDrain Grate

Prior to pouring concrete, it is good practice to seal the top of the SlimDrain grate to prevent concrete entering the grate section. Using self-adhesive tape, mask the grate inlet securely.

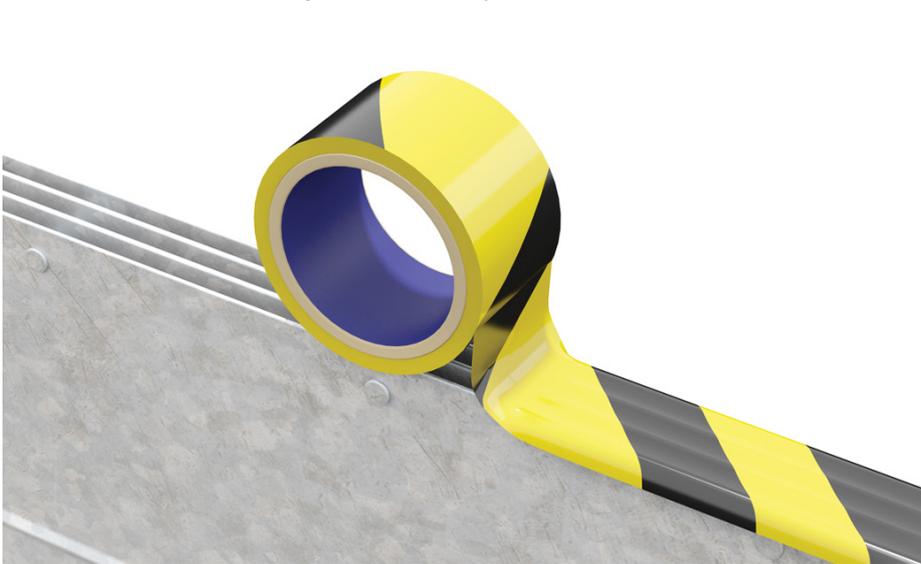


Figure 13 – Taping VSlimDrain grates

Another method for preventing concrete ingress into the SlimDrain grate is to fabricate a block-out strip with a 50mm wide strip of 12mm form-ply, with 12x12x50mm ply tabs nailed underneath in 3 or 4 locations along the strip to drop in between the SlimDrain grate bars. Two or three block-out strips of around 2 metres in length can be used while concrete is being placed, moving the strips along the SlimDrain grate as required.

Adhesive tape or filler/sealant may also be used between the SlimDrain pipe slot and grate to prevent leakage of concrete into the pipe during concrete placement.

Step 5: Concrete Encasement - Initial Pour

Concrete for the encasement of the SlimDrain pipe and lower grate section must have a minimum compressive strength of 32MPa. Bracing of the grate is required for deep installations (>300mm grate depths), and can also be used to set the grate height instead of using the pre-punched holes.

To prevent pipe movement or flotation, concrete placement should be done in a minimum of two lifts. The first concrete pour should be no higher than the height listed in Table 3.

TABLE 3 - DEPTH OF FIRST CONCRETE POUR	
Pipe Diameter	Maximum Depth of Concrete Above Trench Base (mm)
225	190
300	210
375	230
450	240
525	260
600	270
675	290

Extra care must be taken on the initial pour to avoid movement of the pipe or grate. Use rodding and/or vibration to ensure even compaction of the concrete around the SlimDrain pipe.

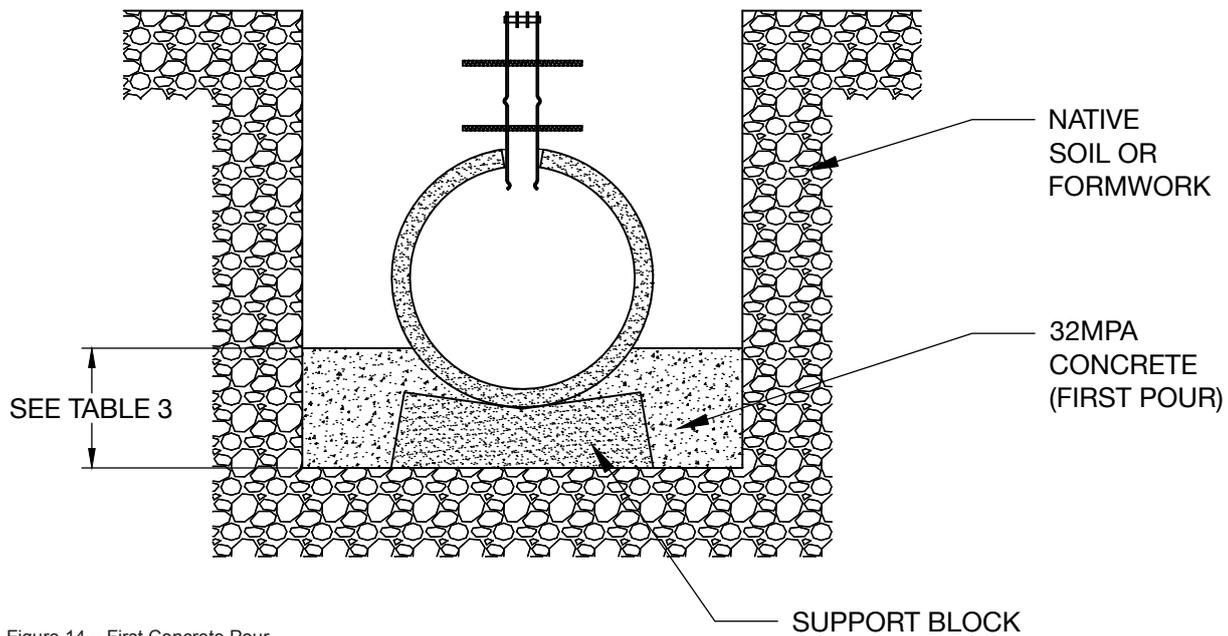


Figure 14 – First Concrete Pour

INSTALLATION (CONT.)

Step 6: Concrete Encasement - Second Pour

Once the initial pour has set, a second concrete lift should cover the first row of deformed bars. This locks the grate into final position, so ensure the grate alignment is completed and the grate is firmly braced before pouring concrete.

Place concrete evenly on both sides of the pipe and grate to prevent uneven forces causing misalignment of the finished grate. Leave sufficient height for the required surface finish, or continue pouring concrete to finished surface level if required.

For shallow installations, the second pour of concrete can be continued to surface level or to a suitable height to allow for the required final placement (i.e. kerb profile). Use rodding and/or vibration to ensure even compaction of the concrete around the SlimDrain pipe and grate.

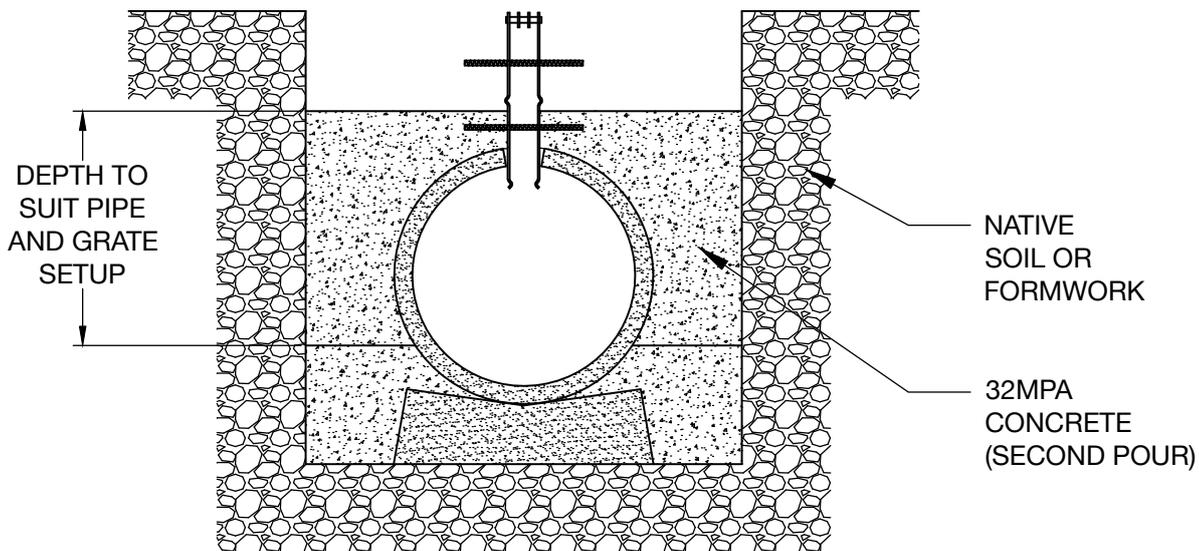


Figure 15 – Second Concrete Pour

Step 7: Finished Surface Treatment

Alternative surface treatments can be used with the SlimDrain drainage system. The suggested method is to utilize SlimDrain at the invert of a kerb, however other methods are possible. Refer to the Design Engineer for alternative design details.

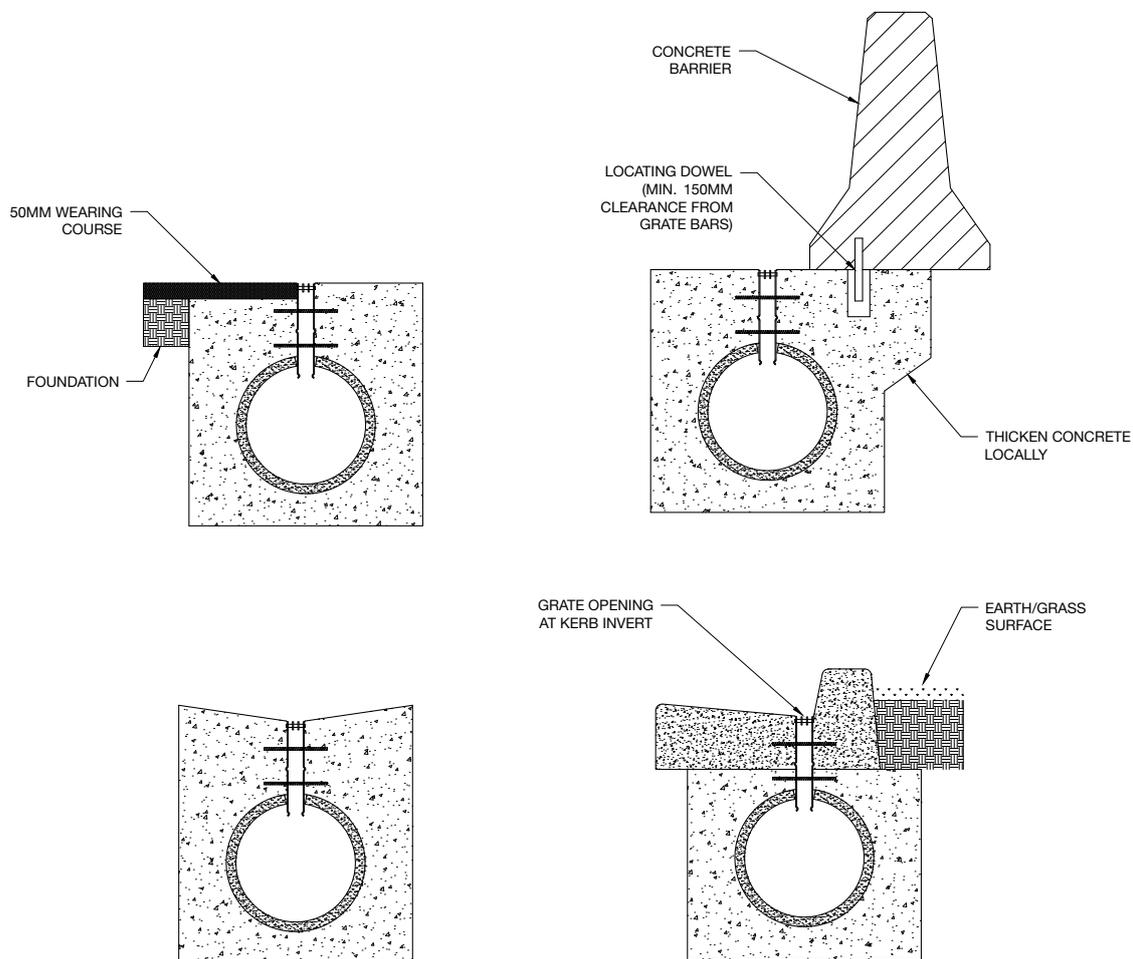


Figure 16 – Surface treatment options

If asphalt is used up to the SlimDrain grate, it is important to use small hand-controlled compaction equipment for the area next to the SlimDrain grate to ensure no damage occurs to the grate.

The surrounding surface must fall towards the SlimDrain grate, with a nominal 3mm drop from the surrounding surface into the SlimDrain grate. Once the surface concrete has been poured, remove any sealing tape used and trowel the concrete to the required surface finish.

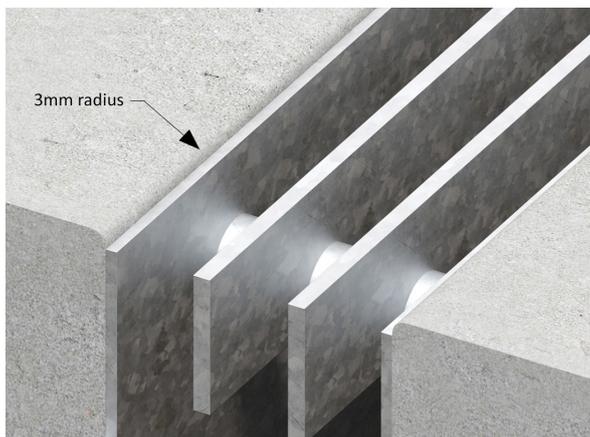


Figure 17 – Edge Radius

INSTALLATION (CONT.)

Step 8: Connection to Pits

SlimDrain can be connected directly into pre-cast storm water pits by terminating the grate at the outside pit face. The pipe is continued into the pit opening. The SlimDrain pipe slot should be formed up from the inside and mortar used to fill the gap between the pipe and pit in accordance with local requirements.

For cast in-situ pits, form up around the SlimDrain pipe as normal. Seal the opening in the SlimDrain pipe top and the SlimDrain grate end before pouring concrete for the pit walls.

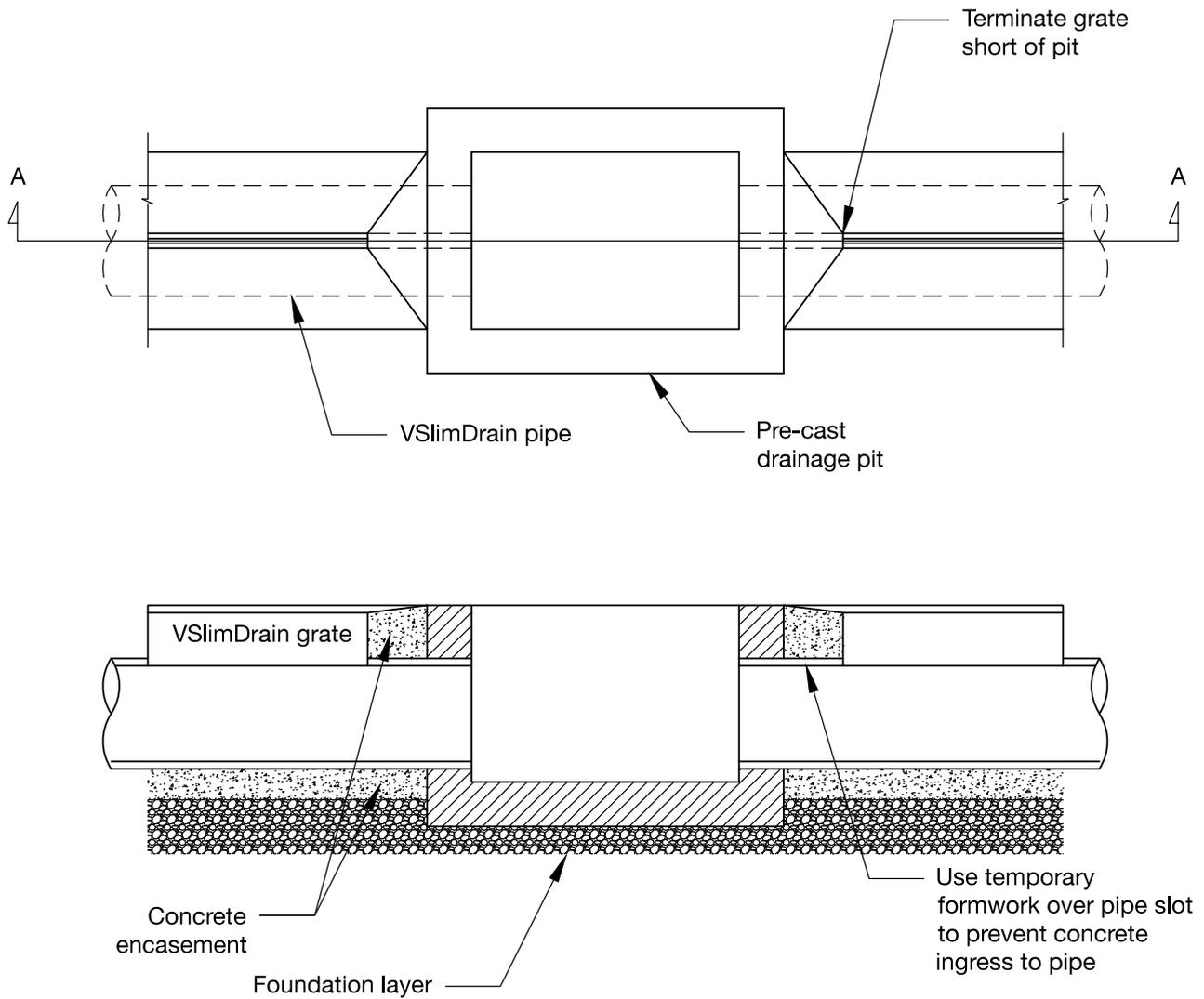


Figure 18 – Connection to Pits

SLIMDRAIN INSTALLATION EXAMPLES



PROJECT: Third Ave, Berrinba QLD



PROJECT: Pacific Motorway, Eight Mile Plains QLD



PROJECT: Lake Burley Griffin Foreshore, Kingston ACT
INSTALLED: 2004

PROJECT: Neilsons Rd, Carrara QLD
INSTALLED: 2001

PROJECT: Terminus St, Castle Hill NSW
INSTALLED: 2011



PROJECT: Westgate Freeway VIC
INSTALLED: 2009

PROJECT: Winnetts Rd, Daisy Hill QLD
INSTALLED: 2010

PROJECT: Augusta Parkway, Springfield QLD
INSTALLED: 2009



PROJECT: Nerang-Broadbeach Rd, Carrara QLD



PROJECT: Millerman Power Station, QLD



PROJECT: Windsor Rd, Kellyville NSW
INSTALLED: 2006

PROJECT: Young St, Southport QLD
INSTALLED: 2013



PROJECT: South East Busway, QLD
INSTALLED: 2009

PROJECT: Railway Ave, Cowra NSW
INSTALLED: 2012

SAFE WORKING PRACTICES

Health & Safety Information

WARNING - DO NOT BREATHE DUST AND CUT ONLY IN WELL VENTILATED AREA.

RCPA products contain sand, a source of respirable crystalline silica which is considered by some international authorities to be a cause of cancer from some occupational sources. Breathing excessive amounts of respirable silica dust can also cause a disabling and potentially fatal lung disease called silicosis, and has been linked with other diseases. Some studies suggest smoking may increase these risks.

1. During installation or handling;
2. Work in outdoor areas with ample ventilation;
3. Minimise dust when cutting by only using suitable cutting equipment capable of adequately suppressing dust;
4. Warn others in the immediate area to avoid breathing dust;
5. Wear a properly fitted, approved dust mask or respirator (e.g. P1 or P2) in accordance with applicable government regulations and manufacturer instructions to further limit respirable silica exposures. During clean-up, use HEPA vacuums or wet clean-up methods - never dry sweep.

For further information such as Safety Data Sheets please contact RCPA FRCPipes on 1800 659 850.

Cutting SlimDrain Concrete Pipes

From time to time it will be necessary to cut pipes and install fittings. Only use suitable cutting equipment capable of adequately suppressing dust. All power cutting operations should be carried out in an open-air situation or in well ventilated spaces.

As there is no steel reinforcement present, no corrosion protection is required to be applied to the cut end.

Use appropriate safety precautions when operating cutting equipment in accordance with manufacturers recommended practices.

Cutting guide:

1. Mark a cut line on the outside of the pipe.
2. Make sure pipe is stable before cutting.
3. Cut length of pipe to the cut line marked.
4. When cutting a length of pipe, it will be necessary to roll the pipe to get access to the entire circumference. After rolling make sure pipe is stable before resuming cutting. It is recommended pipe be chocked to prevent the pipe rolling during cutting.
5. Proper safety gear must be worn to protect operator in accordance with applicable safety standards and manufacturers recommendations.



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