Technical Solution Sheet 4.06
4: Drainage (below ground storm water)

Bedding Site Stormwater Drains

AIM
The aim of this technical solution is to provide guidance to the industry on the correct deemed to satisfy requirements for below ground site stormwater drains including gradient, depth of cover, bedding, embedment and backfill material; And to provide guidance on when sand can be utilised as an alternative solution.

PLUMBING REGULATIONS 2008
The *Plumbing Code of Australia* (PCA) is adopted by and forms part of the *Plumbing Regulations 2008*. Part D1 of the PCA specifies the Scope, objectives and performance requirements related to the installation of roof drainage systems including the site stormwater drains. ***AS/NZS 3500.3: Plumbing and drainage Part 3: Stormwater drainage*** is a "Deemed-to-Satisfy" document listed in Part D1 of the PCA and contains a section on site stormwater drains.

BACKGROUND
Prior to March 1997, site stormwater drainage work fell under the purview of the local council. Councils located in areas with soils consisting of sandy loam or sand permitted site stormwater drains to be bedded and embedded with material excavated from site as long as the material was sandy loam or free running sand capable of passing through a 2mm mesh sieve.

From March 1997 the Victorian self-certification regime came into effect and the installation of compliant site stormwater drains became the responsibility of the practitioner.

Site stormwater drains are not required to be offered for inspection but form part of the normal audit process. As a result of on-site auditing the Victorian Building Authority (VBA) has become aware of an industry trend to embed and backfill site stormwater drains with any soil excavated from site.

EMBEDMENT AND TRENCH FILL TERMINOLOGY
Embedment or drain bedding and trench fill are two separate requirements. (see Figure 1)

- Embedment is to support, envelop or enclose the stormwater drain.
- Trench fill is the backfill used above the drain embedment to the ground surface.

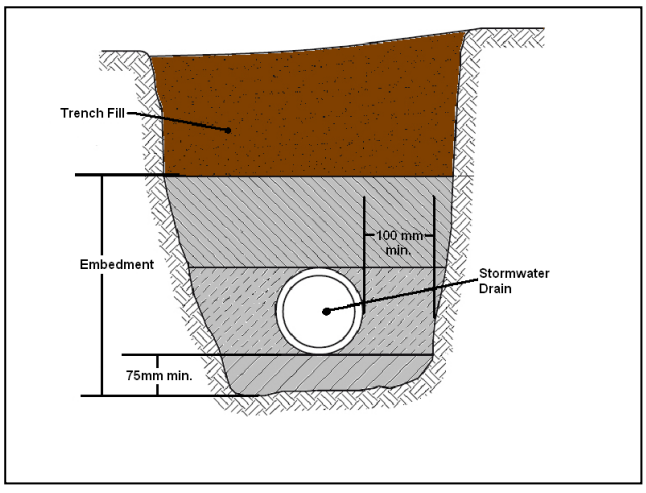

FIGURE 1 - TRENCH TERMINOLOGY

BEDDING AND EMBEDMENT MATERIAL
AS/NZS 3500.3 Clause 2.11.1 Site stormwater drains reads:

Embedment material for below ground site stormwater drains shall be as specified in Clause 7.4.2.1.

Clause 7.4.2.1 Materials reads:
The material for bedding, haunch support, side support and overlay is determined by—
(a) the characteristics of the ground in which the subsoil drain is located;
(b) the type of geotextile material used (if applicable).
Where the conduit consists of a pipe, the embedment material shall be crushed hard rock or natural gravel with not less than 90% by mass retained on a 9.5mm sieve.

Note:
The VBA will accept the use of quarter minus or scoria of a nominal size of 6.5mm -10.0mm as bedding and embedment material. (see Figure 2 (c & e))

DRAINS LAID IN STABLE GROUND

Where stormwater drains are laid in stable ground such as sandy loam or free running sand deemed as Class A non-reactive soils, the stormwater drain where not laid on an approved bedding material must be laid on the undisturbed base of the trench. (see Figure 2 (a))

Note: The use of sand as embedment material that is not spoil excavated at the site is not permitted as the profile of the material can affect its ability to bind with the surrounding soils.

DRAINS IN OTHER THAN STABLE GROUND

Where excessive soil movement due to filled, unstable or water-charged ground may affect the performance of any site stormwater drain, the drain shall be installed in accordance with plans and specifications, based on geotechnical reports and calculations, prepared by a suitably qualified competent person.

For more information on drains in unstable ground please refer to Technical Solution Sheet 3.06 Drains in Reactive soils, unstable or water charged ground.

TRENCH FILL (BACKFILL) MATERIAL

Trench fill shall either—
(a) be material excavated from the trench or imported, provided that the material placed within 300 mm of the top of pipes is free from builders' waste, bricks, pieces of concrete, rocks or similar material that would be retained on a 75 mm sieve; or
(b) be embedment material

GRADIENT

Nominal Size	Minimum gradient
DN	Grade
90	1:100
100	1:100
150	1:100
225	1:200
300	1:250
375	1:300

The minimum gradient of a site stormwater drain shall be as given in the table below

Where the minimum gradient is not achievable please refer to Technical Solution Sheet 4.02 Below ground stormwater installations for further information.

FIGURE 1 - DEPTH OF COVER

MINIMUM PIPE COVER
(from finished surface to top of pipe)

Location	Cast iron, ductile iron, galvanized steel	Other authorized* products
	Minimum cover millimetres	
1 Not subject to vehicular loading:		
(a) without pavement—		
(i) for single dwellings	Nil	100
(ii) for other than Item (i)	Nil	300
(b) with pavement of brick or unreinforced concrete	Nil†	50†
2 Subject to vehicular loading:		
(a) other than roads—		
(i) without pavement	300	450
(ii) with pavement of—		
(A) reinforced concrete for heavy vehicular loading	Nil†‡	100†‡
(B) brick or unreinforced concrete for light vehicular loading	Nil†‡	75†‡
(b) roads—		
(i) sealed	300	500‡
(ii) unsealed	300	500‡
3 Subject to construction equipment loading or in embankment conditions	300	500‡

* Includes overlay above the top of the pipe of not less than 50 mm thick.
† Below the underside of the pavement.
‡ Subject to compliance with AS 1762, AS 2033, AS/NZS 2566.1, AS 3725 or AS 4060.

FIGURE 2 - EXAMPLES OF STORMWATER DRAIN BEDDING