

DEVELOPMENT DESIGN SPECIFICATION

D4

SUBSURFACE DRAINAGE DESIGN

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Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
0	Customisation for Hastings Council Local Government Area	D4.01 to D4.18	AOM	HC	31/7/03
1	Relocation of Contents page to beginning of document & revision of Figure D4.1 – Typical Sub-surface drainage.	D4.06	AOM	HC	26/02/04

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DEVELOPMENT DESIGN SPECIFICATION D4 SUBSURFACE DRAINAGE DESIGN

GENERAL

D4.01 SCOPE

1. The work to be executed under this Specification consists of the design of the subsurface drainage system for the road pavement and/or subgrade.
2. This Specification contains procedures for the design of subsurface drainage, including:
 - (a) Subsoil and Foundation Drains
 - (b) Sub-Pavement Drains
 - (c) Drainage Mats, including Type A and Type B Mats.
3. Reference guidelines for the application and design of subsurface drainage include ARRB Special Report 35, *APRG Report 21*, and the AUSTROADS publication – Guide to the Control of Moisture in Roads (refer to references below for the full titles of these guidelines).

D4.02 OBJECTIVES

1. The objective in the design of the subsurface drainage system is to control moisture content fluctuations in the pavement and/or subgrade to within the limits assumed in the pavement design.

***Control
Moisture
Content***

D4.03 TERMINOLOGY

1. Subsoil drains are intended for the drainage of ground water or seepage from the subgrade and/or the subbase in cuttings and fill areas.
2. Foundation drains are intended for the drainage of seepage, springs and wet areas within and adjacent to the foundations of the road formation.
3. Sub-pavement drains are intended for the drainage of the base and subbase pavement layers in flexible pavements. They may also function to drain seepage or groundwater from the subgrade.
4. Type A drainage mats are intended to ensure continuity of a sheet flow of water under fills, to collect seepage from a wet seepage area, or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water.
5. Type B drainage mats are constructed to intercept water which would otherwise enter pavements by capillary action or by other means on fills and to intercept and control seepage water and springs in the floors of cuttings.
6. Drainage pipe within pavement. Refer to RTA Roadworks QA Specification R37 - Intra-pavement Drains and R32 - Subsurface Drainage- Materials for further definition.

Subsoil Drains

***Foundation
Drains***

***Sub-pavement
Drains***

***Type A
Drainage Mats***

***Type B
Drainage Mats***

***Intra Pavement
Drain Pipe***

D4.04 REFERENCE AND SOURCE DOCUMENTS**(a) Council Specification**

C230	-	Subsurface Drainage – General
C231	-	Subsoil and Foundation Drains
C232	-	Pavement Drains
C233	-	Drainage Mats
SD305	-	Subsoil Drainage Details
SD316	-	Subsoil Drainage Outlet Details

(b) Australian Standards

AS2439.1	-	Perforated drainage pipe and associated fittings.
AS/NZS 1477	-	Unplasticised PVC (UPVC) pipes and fittings for pressure applications.

(c) Reserved**(d) Other**

AUSTROADS	-	Guide to the Control of Moisture in Roads, 1983
ARRB-SR35	-	Australian Road Research Board, Special Report No. 35 - Subsurface Drainage of Road Structures, Gerke R.J., 1987.
APRG Report 21	-	AUSTROADS – A Guide to the Design of New Pavements for Light Traffic.
RTA Roadworks QA Specification		R37 - Intra-pavement Drains R32 - Subsurface Drainage

SUBSOIL AND SUB-PAVEMENT DRAINS**D4.05 WARRANTS FOR USE**

- | | | |
|----|--|----------------------------|
| 1. | Subsoil drains are designed to drain groundwater or seepage. | Subsoil Drains |
| 2. | Sub-pavement drains shall be designed to drain: | Sub-pavement Drains |
| | a) water from base and subbase pavement layers in flexible pavements, and | |
| | b) Seepage or groundwater from the subgrade. | |
| 3. | Subsoil or sub-pavement drains shall be provided on both sides of the formation. Exceptions to the above will be accepted, after discussion with Council, when any of the following occur: | Geotechnical Survey |
| | a) the pavement has been specifically designed to allow for variations in subgrade and pavement moisture contents, | |
| | b) the table drains are constructed with an invert level lower than the subgrade level, | |
| | c) the water tables do not rise to within 300mm of the subgrade level after | |

prolonged rainfall, and/or

d) only one side of the formation is in cut, and the other side in fill.

4. Additional subsoil and sub-pavement drains shall be constructed, if, during the construction phase, changes in site moisture conditions or areas of poorer subgrade are uncovered, that were not identified in the geotechnical investigation.

***During
Construction***

D4.06 LAYOUT, ALIGNMENT AND GRADE

1. A cross section of typical subsurface drain in a kerbed road is shown below in Figure D4.1.

***Typical Cross
Section –
Kerbed Road***

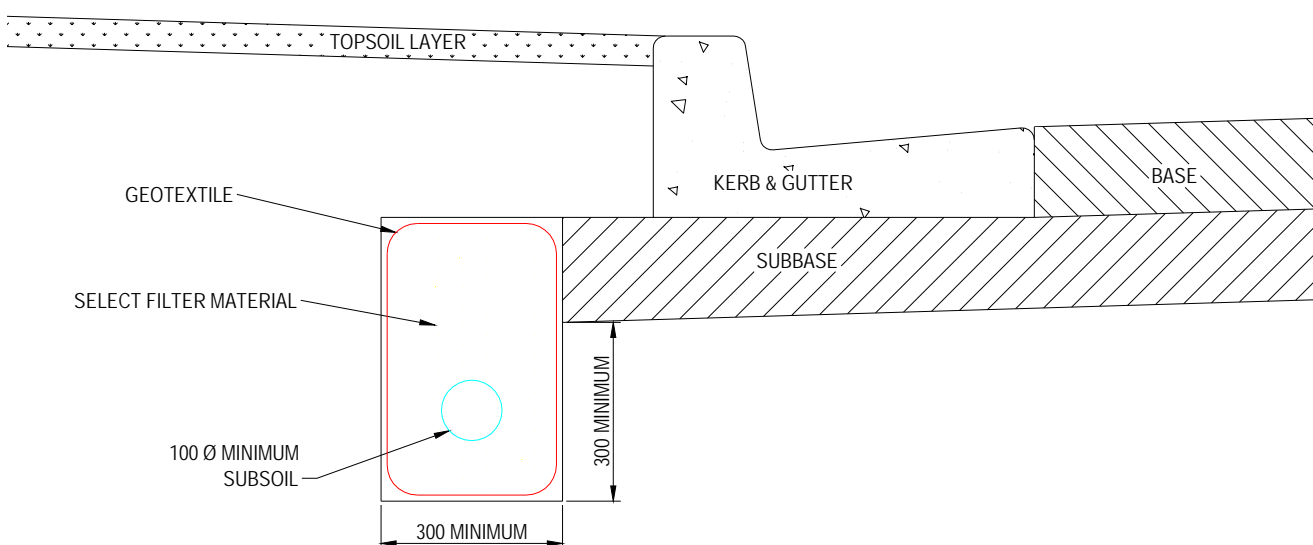


Figure D4.1 Typical Subsurface Drainage

2. In unkerbed roads, subsoil and sub-pavement drains shall be located within the shoulder, at the edge of the pavement layers.

***Unkerbed
Roads***

3. The minimum longitudinal design grade for subsurface drains shall be 1.0%.

Grade

4. Trench details shall be in accordance with manufactures details for the particular product. In the absence of manufacturers details to the contrary, trench details shall be in accordance with Council Standard Drawing ASD 305 and the following:

***Trench
Dimensions***

- a) minimum depth below subgrade – 600 mm in earth;
- b) minimum depth below subgrade – 450 mm in rock; and
- c) trenches near public utilities shall be in accordance with C230.07

5. Outlets shall be spaced at maximum intervals of 100 metres. Where possible, subsoil and sub-pavement drainage pipes shall discharge into gully pits or other stormwater drainage structures. Where not possible, outlets shall be provided through fill batters. Refer to Council Standard Drawing ASD 305 and ASD 314.

Outlets

6. Cleanouts are to be provided at the commencement of each run of drain, and at intervals not exceeding 50 metres. Cleanouts shall be located directly at the rear of kerb or at the edge of shoulder, as applicable. Refer to Council Standard Drawing ASD 305.

Cleanouts

FOUNDATION DRAINS

D4.07 WARRANTS FOR USE

1. Foundation drains are designed to drain excessive ground water areas within the foundation of an embankment or the base of cutting, or to intercept water from entering these areas.

Foundation Drains

2. Foundation drains shall be designed and detailed on the drawings where geotechnical investigation indicates the presence or potential presence of excess groundwater.

Geotechnical Survey During Construction

D4.08 LAYOUT, ALIGNMENT AND GRADE

1. Typical cross-sections of foundation drains are shown below in Figure D4.2.

Typical Cross Section

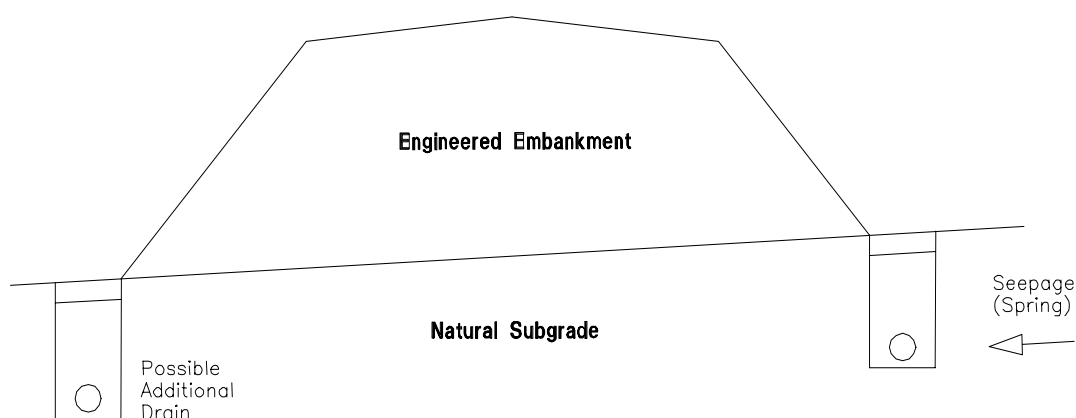


Figure D4.2 - Foundation Drains

2. The minimum design grade shall be 1.0%.

Grade

3. Foundation drains shall be a minimum trench width of 150mm, with a variable trench depth to suit the application and ground conditions on site. Refer to Council Standard Drawing ASD 305.

Trench Dimensions

4. Outlets shall be spaced at maximum intervals of 100 metres. Refer to Council Standard Drawing ASD 305 and ASD 314.

Outlets

5. Cleanouts are to be provided at the commencement of each run of foundation drain and at intervals not exceeding 50 metres.

Cleanouts

DRAINAGE MATS (BLANKETS)

D4.09 WARRANTS FOR USE

- | | |
|---|---|
| <p>1. Type A drainage mats are designed where there is a need to ensure continuity of a sheet flow of water under fills, to collect surface seepage from a wet seepage area, or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water. Type A drainage mats are constructed after the site has been cleared and grubbed and before commencement of embankment construction.</p> | <p><i>Type A Mats</i></p> |
| <p>2. Type B drainage mats are designed where there is a need to intercept water which would otherwise enter pavements by capillary action or by other means on fills and to intercept and control seepage water and springs in the floors of cuttings. Type B drainage mats shall be constructed after completion of the subgrade construction and before construction of the pavement.</p> | <p><i>Type B Mats</i></p> |
| <p>3. The geotechnical survey should address the need for the provision of the drainage mats along the proposed road alignment.</p> | <p><i>Geotechnical Survey</i></p> |
| <p>4. Information on drainage mats is contained in the construction specification, DRAINAGE MATS CONSTRUCTION – C233N.</p> | <p><i>Other relevant Aus-Spec Specifications</i></p> |

MATERIALS

D4.10 SUBSOIL AND SUB-PAVEMENT DRAIN PIPE

- | | |
|--|--|
| <p>1. Pipes designated for subsoil, foundation and sub-pavement drains shall be <i>minimum</i> 100mm diameter or 150 x 50 slotted pipe equivalent.</p> | <p><i>Minimum Pipe Diameter</i></p> |
| <p>2. Corrugated plastic pipe shall conform with the requirements of AS2439.1. The appropriate class of pipe shall be selected on the basis of expected live loading at the surface. Joints, couplings, elbows, tees and caps shall also comply with AS2439.1.</p> | <p><i>Corrugated Plastic Pipe</i></p> |
| <p>3. Slotted rigid UPVC pipe shall comply with AS 1254.</p> | <p><i>Slotted UPVC Pipe</i></p> |
| <p>4. All pipe shall be slotted, and fitted with a suitable geotextile filter tube, except for cleanouts and outlets through fill batters which shall be unslotted pipe.</p> | |
| <p>5. Other types of subsoil drainage systems may be permitted in consultation with Council.</p> | <p><i>Other Drainage System</i></p> |

D4.11 INTRA PAVEMENT DRAIN PIPE

- | | |
|---|--|
| <p>1. Pipes designated for intra pavement drains with crushed rock subbases having layer thicknesses neither less than 150mm nor more than 200mm shall be slotted thick walled UPVC pressure pipe complying with AS/NZS 1477.</p> | <p><i>Slotted UPVC Pipe</i></p> |
| <p>2. Pipes designated for intra pavement drains with crushed rock subbases having layer thicknesses exceeding 200mm shall be slotted pipe of a type and class approved by Council.</p> | |
| <p>3. Pipes for use in Type B drainage mats shall be slotted thick walled UPVC</p> | <p><i>Type B Mats</i></p> |

pressure pipe complying with AS/NZS 1477.

D4.12 FILTER MATERIAL

1. The types of filter material covered by this Specification shall include:

- (a) Type A filter material for use in subsoil, foundation, and sub-pavement (trench) drains and for Type B drainage mats.
- (b) Type B filter material for use in subsoil, foundation and sub-pavement (trench) drains.
- (c) Type C filter material comprising crushed rock for use in Type A drainage mats.
- (d) Type D filter material comprising uncrushed river gravel for use in Type A drainage mats.

Type A Filter

Type B Filter

Type C Filter

Type D Filter

2. Material requirements and gradings for each type of filter material are included in the Construction Specification, SUBSURFACE DRAINAGE GENERAL – C221, and shall be noted on the design drawings.

Grading

3. The type of filter material specified to backfill the sub-surface drainage trenches (subsoil, foundation and sub-pavement drains) shall depend on the permeability of the pavement layers and/or subgrade and the expected flow rate. Generally, Type A filter material is used for the drainage of highly permeable subgrade or pavement layers such as crushed rock or coarse sands, while Type B filter material is used for the drainage of subgrade and pavement layers of lower permeability such as clays, silts or dense graded gravels. Further guidance to the selection of appropriate filter material is contained in ARRB Special Report 35.

Permeability

D4.13 GEOTEXTILE

1. Geotextile shall be provided, and detailed on the drawings, to provide separation (ie. prevent infiltration of fines) between the filter material in the trench and the subgrade or pavement material. Geotextile shall be designated to encapsulate the filter material. The geotextile shall comply with the requirements included in the Construction Specification, SUBSURFACE DRAINAGE GENERAL – C221.

Separation

2. All subsoil drainage systems, including but not limited to, both Type A and Type B Drainage Mats, shall be encapsulated in geotextile.

Encapsulation

DOCUMENTATION

D4.14 DESIGN DRAWINGS AND CALCULATIONS

1. The proposed location of all subsurface drains shall be clearly indicated on the Design Drawings, including the nominal depth and width of the trench, and the location with respect to the line of the kerb/gutter or edge of pavement. Details shall be shown on a typical cross sectional drawing. The location of outlets and cleanouts shall also be indicated on the Drawings.

***Submission
Details***

2. Geotechnical reports, assumptions and/or calculations used in the design of subsurface drainage shall be supplied to Council for approval with the Design Drawings.

***Geotechnical
Reports***

SPECIAL REQUIREMENTS

D4.15 RESERVED

D4.16 RESERVED

D4.17 RESERVED

D4.18 RESERVED

