Engineering Construction Specification

C15 Subsoil and formation drains

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1 General

1.1 Responsibilities

1.1.1 General

Requirement: Provide subsoil and formation drains, as documented.

1.2 Cross references

1.2.1 General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *C01 General requirements (Construction)*
- *C02 Quality management (Construction)*
- *C03 Control of traffic*
- *C04 Control of erosion and sedimentation (Construction)*
- *C06 Earthworks (Road reserve)*
- *C14 Subsurface drainage (Construction)*
- *C28 Auxiliary concrete works*
- Council's standard drawings

1.3 Interpretation

1.3.1 Abbreviations

General: For the purposes of this worksection the following abbreviations apply:

- CI: Cast Iron.
- HDPE: High Density Polyethylene.

1.3.2 Definitions

General: For the purposes of this worksection the following definitions apply:

- Formation drains: Drainage of seepage, springs and wet areas within and adjacent to the road formations.
- Pavement interface drains: Drain the interface between pavements with different structures and may be oriented transversely or longitudinally.
- Selected material zone: The top part of the upper zone of formation in which material of a specified higher quality is required.
- Subsoil drains: Drainage of ground water and/or the pavement in cuttings.

1.4 Submissions

1.4.1 Tests

Results: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

1.5 Inspections

1.5.1 Notice

General: Give notice so that inspection may be made of the following:

- Grading: Survey of minimum pipe grade.

- Laying of pipe: Compacted filter material, laid to documented line and grade.

2 Materials

2.1 General

2.1.1 Pipes and geotextiles

Requirement: To the **SUBSURFACE DRAINAGE PIPES** and **GEOTEXTILE** in *C14 Subsurface drainage (Construction)*.
Pipes: 100 mm diameter corrugated slotted plastic piping or rigid geocomposite drain.

2.1.2 Filter material

Requirement: Type A or Type B filter material to the **FILTER MATERIAL** in the *C14 Subsurface drainage (Construction)*.

2.1.3 No fines concrete

Requirement: To **NO FINES CONCRETE** in *C14 Subsurface drainage (Construction)*.
Trial mix: Conduct trial mixes to check complete cementitious paste coverage of the aggregate, and check that the paste does not flow during mixing, handling or placing.

2.1.4 Types of subsoil drains

General: To AGPT10 Figure 3.1.

3 Execution

3.1 General

3.1.1 Documentation

Requirement: To *C14 Subsurface drainage (Construction)*.

3.2 Order of construction

3.2.1 Subsoil drains

General: Construct subsoil drains immediately after road earthworks are completed in the area of the drain.
For moderate ground water: If stabilisation of the road subgrade is required, construct subsoil drains after completion of stabilisation.
For excessive groundwater: Conform to the following:

- Construct subsoil drain before stabilisation of the subgrade.
- If a selected road material zone is required and excessive ground water is encountered, install subsoil drains in two stages as follows:

  Stage 1: Install standard subsoil drains below the base of the cutting before placement of select material in the selected material zone.

  Stage 2: Extend subsoil drain to the top of the selected material zone after placement of selected material.

3.3 Excavation

3.3.1 General

Over-excavation: Backfill the trench to the required level, with non-porous subgrade material compacted to a relative compaction of 95% minimum (Standard compaction).
Two stage construction: After placement and compaction of the selected material layer or the stabilised subgrade layer, excavate the Stage 2 trench to the same line and width as the Stage 1 trench, and to a depth for clean, full contact with the filter material placed in Stage 1.

3.4 Laying of pipes

3.4.1 General

Bedding: Lay 50 mm thick compacted filter material or no fines concrete to the documented line and grade in the trench.
Filter material: Nominal aggregate size, 5 or 7 mm or blue metal quarry crusher dust or quarry scalpings.
Pipe: Place pipes centrally within the trench on the filter material bedding.
Joints: Minimise joints in the pipeline.

3.5 Backfill

3.5.1 General

Filter material: Backfill the trench with filter material or no fines concrete to the documented level.
No fines concrete: Backfill with no fines concrete if drains are located under trafficked area of pavement.
Layers: Place and compact the filter material in layers with a maximum compacted thickness of 300 mm.
Upper section of the trench: Backfill above the level documented for filter material backfill, with selected free draining backfill material, conforming to **FILL ADJACENT STRUCTURES**, backfill in *C06 Earthworks (Road reserve)*.

3.6 Geotextile

3.6.1 General

Requirement: To **GEOTEXTILE** in *C14 Subsurface drainage (Construction)*.

3.7 Outlet structures

3.7.1 General

Requirements: Conform to **OUTLET STRUCTURES** in *C14 Subsurface drainage (Construction).*

3.8 Pavement interface drains

3.8.1 General

Application: Used to drain the interface between pavements with different constructions.
Interface: Transverse or longitudinal.
Drain extension: 300 mm below selected material zone.
Filter material: No fines concrete.
Transverse interface: Connect to adjacent formation drains or discharge into stormwater pits or batter outlets.
Longitudinal interface: Create outlets at the same intervals required for formation drains.

- Pipe discharge: Conform to the following:

  Into non-perforated parallel carrier pipe in the same trench or

  Into formation drain or pit at the outer edge of the pavement by a transverse non-perforated pipe.

Discharge to parallel carrier pipe: Widen trench and place additional pipe and conform to the following:

- Spacing between pipes: 50 mm.
- Pipe connection: Connect perforated pipe to the non-perforated carrier pipe with Y-coupling to manufacturer's recommendation.
- Pipe capping: Cap the upstream end of the perforated pipe.

Discharge to transverse non-perforated pipe: Conform to the following:

- Trench dimension: 300 mm width and 300 mm depth.
- Bedding: Lay pipe on a 100 mm thick bed of selected material or backfill.
- In sags or low points: Place pipe on the base of the excavation.

Relative compaction: 95%.

3.9 Testing

3.9.1 Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

3.9.2 Completion tests

- Subsoil drain line: After completion of backfilling, pump clean water into the clean-out at the start of each run, until only clean water discharges at the outlet.
- Minimum rate of flow of flushing water: 100 l/min at the inlet.

4 Annexures

4.1 Annexure - Summary of hold and witness points

Reference No:	Clause and description	Type*	Submission/Inspection details	Submission/Notice times	Process held
C15-HP01	SUBMISSIONS Products and materials	H	Data sheets, compliance certificates and test results Type of filter material and grading Type A and B gradings	7 days before supply of pipes	Pipe and fittings supply and delivery of granular filter material Geotextile supply
C15-HP02	SUBMISSIONS Work- as – executed information sheets for completed subsoil drains and drainage asset attribute tables	H	Show levels and clearance of the subsoil pipes to the finished road construction.	5 days after subsoil pipe completion.	Information sheets given to Superintendent.
C15-WP03	INSPECTIONS Notice Grading	W	Survey top of subsoil pipe every 10 metres.	1 day before backfill with filter material over pipe.	Survey of laid pipe levels and location of centre of pipe.
C15-HP04	INSPECTIONS, Notice Laying of pipes	H	Compacted filter bedding material to the required depth, line and grade.	1 days before laying of pipe	Trench alignment and compaction of bedding prior to pipe placement. For development inspections book through “MyInspect”.
C15-HP05	INSPECTIONS, Notice Flush	H	Clean-outs of subsoil drainage lines are operating effectively	3 days before completion	Completion. For development inspections book through “MyInspect”.
	*H = Hold Point, W = Witness Point				

4.2 Annexure - Maximum lot sizes and minimum test frequencies

Activity	Key quality verification requirements	Test method
Excavation of subsoil trench	Over excavation: Relative compaction of backfill prior to trench bedding filters	AS 1289.5.4.1

4.3 Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1289		Methods of testing soils for engineering purposes
AS 1289.5.4.1	2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio