

# Engineering Construction Specification C16 Pavement Drains

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This document is a modified version of AUS-SPEC 1173  
Pavement Drains October 2018 version

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# 1 General

## 1.1 Responsibilities

### 1.1.1 General

Requirement: Provide sub-pavement drains, intra-pavement drains and edge 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*
- *C06 Earthworks (Road reserve)*
- *C08 Flexible pavement base and subbase*
- *C10 Asphalt (Roadways)*
- *C14 Subsurface drainage (Construction)*

## 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:

- Edge drains: Drainage of rigid pavements from the interface between the base and subbase.
- Intra-pavement drains: Drainage of pavement layers of a flexible pavement on steep grades and sag curves where water flows are likely to be more parallel than transverse to road alignment. The subbase material is open graded asphaltic concrete.
- Selected material zone: The top part of the upper zone of formation in which material of a specified higher quality is required.
- Sub-pavement drains: Drainage of the pavement layers where the subbase is not a macadam crushed rock.

## 1.4 Submissions

### 1.4.1 Execution details

Intra-pavement drains: Conform to the following:

- Submit details of the proposed method and locations for installing transverse pavement drain pipes.
- Submit test results of the permeability of the base and subbase material based on the type of treatment selected from AGPT 10, Figure 3.2.
- Submit evidence of suitability of pipes selected to resist crushing damage if in the pavement compaction work zone.

Edge drains: Conform to the following:

- Excavation: If proposed, submit details of strip filters.
- Laying of pipe: Submit details of the proposed method of locating the pipes within the rigid flexible pavement without crushing of the pipes during subgrade compaction.

## 1.5 Inspections

### 1.5.1 Notice for inspections

Laying of pipes: Inspect compaction of pipe bedding and placement of pipes.

## 2 Materials

### 2.1 General

#### 2.1.1 Pipes and geotextiles

Requirement: To the **SUBSURFACE DRAINAGE PIPES** and **GEOTEXTILE** in *C14 Subsurface drainage (Construction)* worksection.

Sub-pavement drains: 100 mm diameter corrugated plastic piping or prefabricated geocomposite drain on the compacted bed, as documented.

Intra-pavement drains: Slotted thick walled PVC-U pressure pipe.

Edge drains: Conform to the following:

- Corrugated circular plastic pipe: 65 mm diameter pipe enclosed in seamless tubular filter fabric to conform to Corrugated plastic pipe and fittings, and Seamless tubular filter fabric to *C14 Subsurface drainage (Construction)*.
- Rigid geocomposite drains: To Prefabricated geocomposite drains and fittings in *C14 Subsurface drainage (Construction)*.

#### 2.1.2 Filter material

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

Edge drains: Install geotextile wrapping trench extremities. Backfill the pipe bedding and after the subsoil pipe laid in trench with Type A or B filter material to **FILTER MATERIAL** in *C14 Subsurface drainage (Construction)*.

## 3 Execution

### 3.1 General

#### 3.1.1 Documentation

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

#### 3.1.2 Pipe

Continuous length without junction pit: Less than 100 to 150 m dependent on gradient.

### 3.2 Order of construction

#### 3.2.1 Sub-pavement drains

Requirement: Construct sub-pavement drains immediately after road earthworks are completed in the area of the drains.

Stabilisation: If stabilisation of the subgrade is required, construct the sub-pavement drain after completion of stabilisation except where excessive ground water is encountered; construct sub-pavement drains before stabilisation of the subgrade.

Excessive groundwater: Where a Selected Material Zone is required and excessive ground water is encountered, sub-pavement drains may be installed in two stages as follows:

- Stage 1: Install standard sub-pavement drains below the base of the cutting before placement of select material in the selected material zone.
- Stage 2: Extend sub-pavement drain to top of the selected material zone after placement of selected material.

### **3.2.2 Intra-pavement drains**

Requirement: Construct intra-pavement drains after construction of the road impervious subbase gravel and below the pervious base road pavement.

### **3.2.3 Edge drains**

Requirement: Construct edge drains (geocomposite strip filters) after the construction of the rigid pavement and before the placement and compaction of verge table drain material.

## **3.3 Sub-pavement drains**

### **3.3.1 Excavation**

Two stage construction: If two stage construction of the sub-pavement drain is required, for Stage 1 trim the trenches 300 mm wide to the required line and to a depth of 600 mm below the bottom of the subbase or below the base of the cutting and conform to the following:

- Carry out excavation for Stage 2 after placement and compaction of the Selected Material Zone.
- Excavate the Stage 2 trench to the same line and width as Stage 1 and maintain a clean, full contact with the filter material previously placed in Stage 1.

### **3.3.2 Laying of pipe**

Bedding: Lay 50 mm thick compacted filter material to the documented line and grade.

Filter material type: As documented.

Pipe: 100 mm diameter corrugated slotted plastic piping or the corrugated flat plastic panel drain on the compacted bed as shown on the drawings. Comply with the specification for *C14 subsurface drainage*.

Joints: Minimise joints in the pipeline.

### **3.3.3 Backfilling**

Filter material: Backfill the trench with filter material to the documented level.

Layers: Place and compact the filter material in layers with a maximum compacted thickness of 300 mm.

Pipe outlets: Conform to the following:

- Backfill the trench on the outlet section of pipes discharging through the fill batters with the selected filter material to a depth of 50 mm above the pipe.
- Backfill the balance of trench with earth backfill material of maximum particle size of 50 mm and compact for the full depth to a relative compaction of 95% (Standard compaction).
- Provide a paved area around the outlet to prevent scour, growth of grass and to make the outlet easy to find. Provide a marker post and a smooth bore unslotted pipe of sufficient crush strength to bear maintenance plant.

## 3.4 Intra-pavement drains

### 3.4.1 Excavation

Trench dimensions: Cut a 'V' shaped trench 75 mm deep to the documented line in the pavement layer immediately below the crushed rock macadam subbase pavement layer to AGPT 10 Figure 3.2.

Discharge pipe: If the pipe is to discharge through the fill batter, construct a trench on a grade suitable for the pipe to discharge its contents without scour. After laying the pipe, backfill the trench with fill material and compact for the full depth to a relative compaction of not less than 95% (Standard compaction).

### 3.4.2 Laying of pipe

Subbase: Conform to either of the following:

- Crushed rock subbases: Less than 10% of material passing the 9.5 mm AS sieve and with a layer thickness between 150 mm and 200 mm. Or
- Open graded asphalt subbases having layer thicknesses between 80 mm and 100 mm. Or
- No fines concrete: Lay the pipe on a bed of no fines concrete to the line and level, as documented. Where using pipes in concrete, the pipes will need pegging and tied down to prevent floating when the concrete is liquid and newly poured.

Suitability for subbases: If the subbase requires pavement drains, make sure that the proposed type of pavement drain has adequate crushing strength to cope with compaction equipment in the following locations:

- Pervious crushed rock subbase depth: 200 mm minimum.
- Open graded asphalt subbase depth: 100 mm minimum.

Outlet length: Install an unslotted outlet pipe from the outside edge of the free-draining subbase to an outlet structure in the embankment batter and seal the pipe joints in this length of pipe with suitable couplings or mastic.

Level and alignment: Lay the pipe to the documented line and level.

Joints: Minimise joints in the pipeline.

Pipe anchorage: Anchor the pipes by securing all pipes held to the layer under the free-draining subbase to prevent movement of the pipes during placement and compaction of the free-draining subbase.

Anchorage alternatives: Submit details of the proposed method of securing the pipes to the layer under the free-draining subbase.

Alternative securing method: If the approved method of securing the pipes to the layer under the free draining subbase allows movement of the pipes, discontinue the method and submit an alternative securing method for approval.

Additional costs: Any additional cost resulting from the use of alternative method of securing the pipes shall be borne by the contractor.

### 3.4.3 Backfilling

Subbase: Spread subbase material, compact and trim, where appropriate, as follows:

- For crushed rock macadam subbase: To the SPREADING and TRIMMING, COMPACTION AND CURING in *C08 Flexible pavement base and subbase*.
- For open graded asphalt subbase: To *C10 Asphalt (Roadways)*.

Prevent damage to pipes: Place, spread and compact the subbase without damage to the intra-pavement drain pipes.

Remove and replace: If any pipes are damaged remove and replace the damaged pipes. The cost of removal and replacement of such damaged pipes shall be borne by the contractor

Compaction: Place and compact the filter material in layers with a maximum compacted thickness of 300 mm. Tamp around and over the pipe to avoid damage or disturbance to the pipe.

No fines concrete: Backfill with no fines concrete, as documented.

## **3.5 Edge drains**

### **3.5.1 Excavation**

Trench dimensions: Trim the verge material to subgrade level and to the minimum width, as documented.

Discharge pipe: If the pipe is to discharge through the fill batter, excavate a suitable trench to the documented grade.

Strip filters: Do not use strip filters.

### **3.5.2 Laying of pipe**

Pipe: If any part of a shoulder consists of material other than concrete, install slotted thick walled PVC-U pressure pipe.

Securely hold in place: Secure all pipes held against the vertical face of the rigid pavement.

Bedding and alignment: Lay the pipe on a prepared bed of filter material or no fines concrete to the documented line and level.

Joints: Minimise joints in the pipeline.

Outlet: The outlet section of a pipe from the vertical face of the rigid pavement to an outlet in the embankment batter shall be unslotted and the pipe joints in this length of pipe shall be sealed with mastic.

### **3.5.3 Backfilling**

Soaking of filter material: Mechanical compaction of this filter material is not required. After placement of the filter material, soak with water and add additional filter material, if required.

Material: Backfill filter material to **FILTER MATERIAL** in the *C14 Subsurface drainage* worksection or no fines concrete to **NO FINES CONCRETE**, in the *C14 Subsurface drainage* worksection and as required for verges.

Compaction: Relative compaction of not less than 95% (Standard compaction).

## **3.6 Outlets structures**

### **3.6.1 General**

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

Location: Provide marker posts to indicate the location and assist maintenance. Outlets are to be as shown on the Drawings or at maximum intervals of 150m. Comply to specification for C14 Subsurface drainage

Erosion control: The outlet shall be located so that erosion of the adjacent area does not occur, or shall be protected by the placement of selected stone in the splash zone of the outlet. Comply to specification for *C14 Subsurface drainage*.

Intra-pavement drain discharge: If discharge must be constructed, extend each pipe using a 60° bend. Unslotted pipe to discharge through the fill batter and construct an outlet structure on the discharge end, as documented.

Edge drain: If discharge must be constructed, install unslotted pipe with mastic sealed joint from the outlet section of a pipe at the vertical face of the rigid pavement to an outlet in the embankment batter.

Sub-pavement drainage discharge: Provide unslotted plastic pipe of the same diameter as the main run to discharge below the edge of the road shoulder. An outlet structure shall be constructed at the discharge end.

Rodent proofing

Method: Secure outlets, including those discharging into gully pits, with galvanised wire netting to conform with the drawings. Comply to specification for *C14 Subsurface drainage*.

### 3.7 Clean-outs

#### 3.7.1 General

Outlet: Preformed riser fitting or pipe not less than 100 mm diameter.

Intervals: Maximum 120 m.

## 4 Annexures

### 4.1 Annexure - Summary of hold and witness points

Reference No:	Clause description and	Type*	Submission/Inspection details	Submission/Notice times	Process held
C16-HP01	INSPECTIONS, Notice  Laying of pipes	H	Compacted bedding, and placement of pipes	1 day before backfilling over pipes	Backfilling. For development inspections book through "MyInspect".
C16-HP02	SUBMISSIONS, Execution details  Intra-pavement drains	H	Submit details of securing pipes for holding down subsoil drains using no fines concrete.	7 days before laying of pipe.	Laying of subsoil pipe under pavement
C16-HP03	SUBMISSIONS, Execution details  Edge drains	H	Submit details of securing geocomposite drains	7 days before laying of edge drain.	Laying of subsoil geocomposite edge drain
C16-HP04	SUBMISSIONS, Work as Executed details and Road Asset Attribute Schedule	H	Submit details showing locations of any new subsoil drains	2 weeks following completion of works	Prior to Subdivision Certificate/Occupation Certificate
*H = Hold Point, W = Witness Point					



## 4.2 Annexure - Maximum lot sizes and minimum test frequencies

Activity	Key quality verification requirements	Test method
Backfilling	Pipe outlets: Relative compaction of fill material	AS 1289.5.4.1.
Backfilling of intrapavement drains with no fines concrete	Ability of no fines concrete to be porous under road	
	- Water absorption	AS C08.6.1
	- Permeability	RMS T376

## 4.3 Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS C08		Methods for sampling and testing aggregates
AS C08.6.1	2000	Particle density and water absorption of coarse aggregate - Weighing-in-water method
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
Austrroads AGPT		Guide to pavement technology
Austrroads AGPT10	2009	Subsurface drainage
RMS T376	2016	Moulding of no fines concrete specimens