

**Construction Specification
for Civil Works**

C232 – Pavement Drains

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GENERAL

C232.01 SCOPE

This Specification is for the installation of Sub-Pavement Drains, Intra-Pavement Drains and Edge Drains. **Scope**

Pavement drains shall be constructed where and as shown on the approved design drawings. **Location**

This Specification should be read in conjunction with *C230 - Subsurface Drainage*. **Associated Specification**

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in *CQC-Quality Control Requirements Sub-Annexure B3*. **Quality**

C232.02 TERMINOLOGY

Sub-Pavement Drains are intended for the drainage of the pavement layers where the subbase is not a macadam-crushed rock. **Sub-Pavement Drains**

Intra-Pavement Drains are intended for the drainage of the pavement layers of a flexible pavement where the subbase material is a macadam-crushed rock or open graded asphaltic concrete. **Intra-Pavement Drains**

Edge Drains are intended for the drainage of rigid pavements. **Edge Drains**

C232.03 DEFINITIONS

The Works – Defined as follows: **The Works**

- **Developer Infrastructure Works** - work includes subdivisions and any public infrastructure work associated with an approved Development in the ARC local government area requiring a construction certificate.
- **Contracted Works** – infrastructure work undertaken by a Principal Contractor or subcontractor formally appointed by ARC and supervised by ARC.
- **Internal Works** - infrastructure work undertaken by ARC's day labour workforce.

Constructor – Defined as the organisation responsible for construction of the Works and the Principal Contractor as defined in the *Work Health and Safety Act 2011*. **Constructor**

ARC Representative – Defined as follows: **ARC Representative**

- **Developer Infrastructure Works** – Nominated ARC officer(s) for the approved Development.
- **For Contracted Works** – the Superintendent.
- **For Internal Works** – ARC Asset Owner.

Constructor's Representative – Defined as follows: **Constructor's Representative**

- **Contracted Works** – the Principal Contractor's nominated representative as per the relevant contract.
- **Internal Works** – ARC officer responsible for delivery.

Developer's Representative– Defined as the person or organisation appointed by the Developer to administer the Constructor responsible for the delivery of Developer Infrastructure Works. **Developer's Representative**

C232.04 REFERENCE DOCUMENTS

Documents referenced in this Specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. **Documents Standards Test Methods**

Where not otherwise specified in the relevant Armidale Regional Council (ARC) Construction Specifications or the approved design drawings, the Constructor shall use the latest versions of the Reference documentation, including amendments and supplements, listed in the ARC Construction Specifications at the time of the Works approval.

Currency

(a) Armidale Regional Council (ARC) Specifications

- C213 - Earthworks.
- C230 - Subsurface Drainage.
- C242 - Flexible Pavements.
- C245 - Asphaltic Concrete.
- CQC - Quality Control Requirements.

ARC Specifications

(b) Australian Standards

References in this Specification or on the approved design drawings to Australian Standards are noted by their prefix AS or AS/NZS.

Australian Standards

- AS 1289.3.3.1 - Calculation of the plasticity index of a soil.
- AS 1289.5.4.1 - Compaction control test - dry density ratio, moisture variation and moisture ratio.
- AS 1477 - PVC pipes and fittings for pressure applications.

(c) ARC Standard Drawings Applicable to this Section

- 030-067 Standard Subsoil Drainage Details.

ARC Standard Drawings

ARC Standard Drawings shall take precedence over ALL other drawings related to the Works.

Where any ARC Standard Drawings conflicts with this Specification, the requirements of this Specification shall take precedence. Proposals to deviate from this Specification shall constitute a **HOLD POINT**.

HOLD POINT

Hold Point

All proposed deviations from the approved design drawings, ARC Standard Drawings, this Specification or the documents referenced within it, shall be submitted for approval to the ARC Representative with supporting evidence at least five (5) working days prior to the work being undertaken.

PROCESS HELD: The lot or element affected by the proposed deviation.

C232.05 ORDER OF CONSTRUCTION

(a) Sub-Pavement Drains

Sub-pavement drains shall be constructed as soon as possible after necessary earthworks are completed in the area of the drain. Where stabilisation of the subgrade is required, sub-pavement drain shall be constructed after completion of stabilisation except that where excessive ground water is encountered, sub-pavement drains may be constructed prior to stabilisation of the subgrade.

Timing of Construction

Where a Selected Material Zone (SMZ) is specified and excessive ground water is encountered, sub-pavement drains may be installed in two stages as follows:

Stage Construction

- Stage 1: Standard sub-pavement drains installed below the base of the cutting prior to placement of select material in the SMZ.
- Stage 2: Extension of sub-pavement drain to top of the SMZ after placement of selected material.

(b) Intra-Pavement Drains

Intra-Pavement Drains shall be constructed after the completion of the layer below the crushed rock Macadam or 40mm open graded asphaltic concrete subbase and preceding the construction of the subsequent layers.

Timing of Construction

(c) Edge Drains

Edge Drains shall be constructed after the construction of the rigid pavement and before the placement and compaction of verge material.

Timing of Construction

CONSTRUCTION

C232.06 SUB-PAVEMENT DRAINS

(a) Excavation

Trenches 300mm wide shall be trimmed to the required line and to a depth of 600mm below the bottom of the subbase or below the base of the cutting where two stage construction of the Sub-Pavement Drain is required unless stated otherwise in the approved design drawings.

Trench Dimensions

The bottom of the trench shall be to the same grade as the design pavement surface except where the grade of the roadway is less than 0.5%, in which case the depth of the trench shall be increased to provide a grade of 0.5% in the trench. The bottom of the trench shall be excavated so that no localised ponding of water occurs.

Trench Grade

Where two stage construction of the sub-pavement is required, excavation for Stage 2 shall be carried out after placement and compaction of the SMZ. The Stage 2 trench shall be to the same line and width as Stage 1 and to a depth sufficient to provide a clean, full contact with the previously placed filter material.

Two-Stage Construction

(b) Laying of Pipe

The 100mm diameter corrugated slotted plastic piping shall be laid on a bed of filter material 50mm in thickness and shall be laid to the specified line and grade. The pipe shall not deviate from the specified line by more than 10mm at any point.

Filter Bed

The type of filter materials shall be as shown on the approved design drawings

Type

Joints in the pipeline shall be kept to the minimum number and, where required, shall be made using a suitable external joint coupling. The pipe inlet shall be fitted with a cap.

Jointing

(c) Backfilling

The trench shall be backfilled with filter material to the level specified. The type of filter material shall be as shown on the approved design drawings. The filter material shall be placed and compacted in layers with a maximum compacted thickness not exceeding 300mm. Tamping around and over the pipe shall be done in such a manner as to avoid damage or disturbance of the pipe.

Filter Material

The filter material shall be compacted for its full depth to a relative compaction of not less than 100% (standard compaction) as determined by AS 1289 5.4.1.

Compaction

On the outlet section of pipes discharging through the fill batters, the trench shall be backfilled with the nominated filter material to a depth of 50mm above the pipe. The balance of trench shall be backfilled with earth backfill material of maximum particle size of 50mm and shall be compacted for the full depth to a relative compaction of 95% (standard compaction) as determined by AS 1289 5.4.1.

Pipe Outlet

In case of two stage construction of Sub-Pavement Drains when it is not practical to place the Pavement Layers or the SMZ immediately after the construction of Stage 1, the filter material placed to the top of Stage 1 shall be protected from scour and/or contamination by covering with a 50mm thick plug of compacted select fill material

Temporary Plug over Filter Material

having a maximum particle size of 25mm and Plasticity Index of not more than 12 as determined by AS 1289.3.3.1. For this plug, any contaminated filter material and any select material covering shall be removed and replaced with the nominated filter material and compacted immediately ahead of the placement of the pavement layer. All excavated material shall be disposed to waste or incorporated in fills.

(d) Cleanouts

Cleanouts are to be provided at the commencement of each run of Sub-Pavement Drain line and at intervals of approximately 60m or as shown on the approved design drawings.

Location

Details of required cleanouts are to be shown on the approved design drawings.

Details

(e) Outlets

Outlets are to be provided as shown on the approved design drawings or at maximum intervals of 150m. Sub-Pavement Drains shall discharge into gully pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the approved design drawings shall be constructed at the discharge end. The outlet shall be made rodent proof.

Location

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.

Erosion Control

C232.07 INTRA-PAVEMENT DRAINS

(a) Excavation

A 'V' shaped trench approximately 50mm deep shall be cut to the required line in the pavement layer immediately below the crushed rock Macadam layer. No excavation is required below a 40mm open graded asphaltic concrete subbase layer.

Type

The bottom of the trench is to be to the same grade as the roadway. The bottom of the trench shall be constructed so that localised ponding of water does not occur.

Grade

Where the pipe is to discharge through the fill batter a trench shall be constructed on a grade suitable for the pipe to discharge its contents without scour. After laying the pipe the trench shall be backfilled with fill material and compacted for the full depth to a relative compaction of not less than 95% (standard compaction) as determined by AS 1289 5.4.1.

Discharge Pipe

(b) Laying of Pipe

Thick walled unplasticised PVC pressure pipe, complying with AS 1477, and having a nominal diameter of 58mm, and a minimum pipe wall thickness of 6.5mm, shall be used with crushed rock subbases having not more than 10% of material passing the 9.5mm AS sieve and having layer thicknesses neither less than 150mm nor more than 200mm or open graded asphalt subbases having layer thicknesses neither less than 80mm nor greater than 100mm.

UPVC Pressure Pipe

Where crushed rock subbases require pavement drains and have a depth exceeding 200mm, the type of pavement drain will need to be certified to have adequate crushing strength. Approval is required from the ARC Representative for pavement drains in asphalt subbases greater than 100mm in depth.

Subbases >200mm Pipe Crushing Strength

Where spigot and socket type joints are used, the pipes shall be joined with the socket ends facing upstream.

Socket Joints

The pipe shall be laid to the specified line and level. The pipe shall not deviate from the specified line by more than 10mm at any point. The inlet ends of all pipes shall be fitted with caps.

Level

All pipes shall be securely held to the layer under the free-draining subbase to prevent movement of the pipes during placement and compaction of the free-draining subbase. If the resultant securing method allows movement of the pipes, the method shall be discontinued and the Constructor shall propose an alternative securing method.

Pipe Anchorage

Any additional costs resulting from the use of the alternative method of securing the pipes shall be borne by the Constructor. **Constructor's Costs**

The outlet length of pipe from the outside edge of the free-draining subbase to an outlet structure in the embankment batter shall be unslotted and the pipe joints in this length of pipe shall be sealed with suitable couplings or mastic. **Outlet Length**

(c) Backfilling

Subbase material shall be spread, compacted and trimmed, where appropriate, as follows: **Subbase**

- (a) For crushed rock Macadam subbase, in accordance with *C242 - Flexible Pavements*.
- (b) For open graded asphalt subbase, in accordance with *C245 - Asphaltic Concrete*.

Tipping, spreading and compaction of the subbase shall be undertaken in such a manner as not to damage the intra-pavement drain pipes. If any pipes are damaged as a result of the tipping, spreading and compaction of the subbase, the Constructor shall remove and replace the damaged pipes. **Damage to Pipes**

The cost of the removal and replacement of such damaged pipes shall be borne by the Constructor. **Constructor's Costs**

(d) Outlets

Outlets are to be provided as shown on the approved design drawings or at maximum intervals of 150m. Intra-pavement drains shall discharge into gully pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the approved design drawings shall be constructed at the discharge end. The outlet shall be made rodent proof. **Location**

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. **Erosion Control**

C232.08 EDGE DRAINS

(a) Excavation

The verge material shall be trimmed to subgrade level and to the minimum width shown on the approved design drawings. The bottom of the trench is to be constructed at the same grade as the roadway and in such a manner that localised ponding of water does not occur. **Width and Level**

Where the grade of the roadway is less than 0.5% the trench shall be excavated to provide a minimum grade of 0.5%. **Grade**

When the pipe is to discharge through the fill batter a suitable trench shall be excavated to provide the required grade. **Discharge Pipe**

(b) Laying of Pipe

Generally, 65mm diameter slotted corrugated plastic pipe enclosed in seamless tubular filter fabric, complying with *C230 - Subsurface Drainage*, shall be used for edge drains. **Slotted Plastic Pipe**

Where any part of a shoulder consists of material other than concrete, slotted thick walled unplasticised PVC pressure pipe, complying with *AS 1477*, shall be used. Spigot and socket type pipes shall be joined with the socket ends facing upstream and the ends of each pipe shall be securely held against the vertical face of the rigid pavement. **Slotted UPVC Cement Pipe**

The pipe shall be laid on a prepared bed to the specified line and level. The pipe shall not deviate from the specified line by more than 10mm at any point. **Prepared Bed**

Joints in the pipe shall be kept to a minimum number and shall be made using an external joint coupling. **Jointing**

The inlet end of the pipe shall be fitted with a cap.

Inlet Cap

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.

Outlet Pipe

(c) Backfilling

The pipe shall be covered with Type B filter material as specified in *C230 – Subsurface Drainage* to the dimensions shown on the approved design drawings.

Filter Material

Mechanical compaction of this filter material is not required, however after placement of the filter material it shall be soaked with water. Where necessary additional filter material shall be added and soaked to provide the final dimensions shown on the approved design drawings.

Soaking of Filter Material

Backfilling over the edge drain shall be done in such a manner as to avoid damage or disturbance of the pipe. Backfill material shall be selected material as required for verges and in accordance with the requirements of *C213 - Earthworks*. Backfilling shall be compacted to a relative compaction of not less than 100% (standard compaction) as determined by *AS 1289 5.4.1*.

Procedure and Compaction

(d) Cleanouts

Cleanouts are to be provided at the commencement of each run of edge drain line and at intervals of approximately 60m or as shown on the approved design drawings.

Location

Details of the required cleanout construction are shown on the approved design drawings. The standard cleanout caps as shown on the approved design drawings shall be supplied by the Constructor.

Construction Detail

(e) Outlets

Outlets are to be provided as shown on the approved design drawings or at maximum intervals of 150m. Edge drains shall discharge into gully pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the design plans shall be constructed at the discharge end.

Location

The outlet shall be made rodent proof in accordance with the requirements of *C230 - Subsurface Drainage*.

Rodent Proof

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.

Erosion Control

LIMITS AND TOLERANCES

C232.09 SUMMARY OF LIMITS AND TOLERANCES

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C232.1 below.

Item	Activity	Limits/Tolerances	Spec / Clause
1	Excavation		
	Trench Grade	≥ 0.5%	C232.06 C232.08
2	Sub-Pavement Drain		
	Laying of Pipe		
	Alignment	Deviation <10mm from specified line at any point.	C232.06
	Backfill		
	(a) Layer thickness	300mm (max).	C232.06
	(b) Compaction		
	Filter material	100% (Standard).	C232.06
	Backfill material	> 95% (Standard).	C232.06
3	Cleanout Spacing		
	Cleanout Spacing	60m (max).	C232.06 C232.08
4	Outlet Spacing		
	Outlet Spacing	150m (max).	C232.06 C232.07 C232.08
5	Intra-Pavement Drain		
	(a) Alignment	Deviation < 10mm from specified line at any point.	C232.07
6	Edge Drains		
	(a) Alignment	Deviation < 10mm from specified line at any point.	C232.08
	(b) Compaction (Relative) Backfill material	100% (Standard).	C232.08

Table C232.1 - Summary of Limits and Tolerances

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