COFFS HARBOUR CITY COUNCIL

DEVELOPMENT SPECIFICATION
DESIGN

1173 Pavement drains

Version 1 ***01 January 2009***

1173 PAVEMENT DRAINS

1 SCOPE AND GENERAL

1.1 SCOPE

This worksection covers the installation of Sub-Pavement Drains, Intra-Pavement Drains and Edge Drains.

This worksection should be read in conjunction with 1171 *Subsurface drainage*.

1.2 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality (Construction)*.

1.3 REFERENCED DOCUMENTS

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

Worksection

0165 Quality (Construction)

1101 Control of traffic

1112 Earthworks (Roadways)

1141 Flexible pavements

1144 Asphaltic concrete (Roadways)

1171 Subsurface drainage

Standard

AS 1289	Methods of testing soils for engineering purposes
AS 1289.3.3.1	Soil classification tests—Calculation of the plasticity index of a soil
AS 1289.5.4.1	Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio

1.4 TERMINOLOGY

Sub-pavement drains

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

Intra-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.

Edge drains

Edge drains are intended for the drainage of rigid pavements.

1.5 ORDER OF CONSTRUCTION

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.

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

- Stage 1: Standard sub-pavement drains installed below the base of the cutting prior to placement of select material in the Selected Material Zone.

- Stage 2: Extension of sub-pavement drain to top of the Selected Material Zone after placement of selected material.

Intra-pavement drains

Intra-Pavement Drains shall be constructed after the completion of the layer below the crushed rock

Macadam or 40 mm open graded asphaltic concrete subbase and preceding the construction of the subsequent layers.

Edge drains

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

2 CONSTRUCTION

2.1 SUB-PAVEMENT DRAINS

Excavation

Trench dimensions:

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

Trench grade: 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.

Two-stage construction: Where two stage construction of the sub-pavement is required, excavation for Stage 2 shall be carried out after placement and compaction of the Selected Material Zone. 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. All excavated material shall be disposed to waste or incorporated into fills.

Laying of pipe

Filter bed approval: A bed of filter material 50 mm in compacted thickness and shall be laid to the required line and grade.

This action constitutes a HOLD POINT.

The Superintendent's approval to the compacted bedding is required prior to the release of the hold point.

Filter material: The type of filter materials shall be as shown on the Drawings or as directed by the Superintendent.

Filter bed: The 100 mm diameter corrugated slotted plastic piping, complying with 1171 *Subsurface drainage*, shall be laid on the compacted bed to the specified line and level.

The pipe shall not deviate from the specified line by more than 100 mm at any point.

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

Backfilling

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

Compaction: 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.

Pipe outlets: 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 50 mm above the pipe. The balance of trench shall be backfilled with earth backfill material of maximum particle size of 50 mm and shall be compacted for the full depth to a relative compaction of 95% (Standard compaction) as determined by AS 1289.5.4.1.

Temporary plug over filter material: In the case of sub-pavement drains of two stage construction, when it is not practical to place the Pavement Layers or the Selected Material Zone 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 50 mm thick plug of compacted select fill material having a maximum particle size of 25 mm and Plasticity Index of not more than 12 as determined by AS 1289.3.3.1. 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.

Cleanouts

Cleanouts are to be provided at the commencement of each run of sub-pavement drain line and at intervals of approximately 60 m or as shown on the Drawings. Details of the required cleanout construction are shown on the Drawings.

Outlets

Location: Outlets are to be provided as shown on the Drawings or at maximum intervals of 150 m. 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 Drawings shall be constructed at the discharge end.

Rodent proof: The outlet shall be made rodent proof in accordance with 1171 *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.

2.2 INTRA-PAVEMENT DRAINS

Excavation

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

Trench grade: 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.

Discharge pipe: 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.

Laying of pipe

UPVC pressure pipe: Thick walled unplasticised PVC pressure pipe, complying with 1171 *Subsurface drainage*, shall be used with:

- Crushed rock subbases having not more than 10% of material passing the 9.5 mm AS sieve and having layer thicknesses neither less than 150 mm nor more than 200 mm.
- Open graded asphalt subbases having layer thicknesses neither less than 80 mm nor greater than 100 mm.

Subbases with depth exceeding 200 mm: Where crushed rock subbases require pavement drains and have a depth exceeding 200 mm, the type of pavement drain will need to be certified to have adequate crushing strength and written approval of the Superintendent to the proposed pavement drain type and specification will be required. Similar proposal and Superintendent’s approval is required for pavement drain in asphalt subbases greater than 100 mm in depth.

Inlet cap: The inlet end of the pipe shall be fitted with a cap complying with 1171 *Subsurface drainage*.

Outlet length: 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.

Level and alignment: The pipe shall be laid to the specified line and level. The pipe shall not deviate from the specified line by more than 100 mm at any point

Pipe anchorage: 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.

At least seven days before commencement of pipe laying, the Contractor shall submit details of the proposed method of securing the pipes to the layer under the free-draining subbase for the approval of the Superintendent.

This action constitutes a HOLD POINT.

The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Alternative securing method: Notwithstanding the Superintendent's approval to the use of a method of securing the pipes to the layer under the free draining subbase, if such securing method allows movement of the pipes, the method shall be discontinued and the Contractor shall propose an alternative securing method for approval by the Superintendent. Any additional costs resulting from the use of the alternative method of securing the pipes shall be borne by the Contractor.

Backfilling

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

- For crushed rock Macadam subbase, in accordance with 1141 *Flexible pavements*.
- For open graded asphalt subbase, in accordance with 1144 *Asphaltic concrete (Roadways)*.
- Prevent damage to pipes: 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 Contractor shall remove and replace the damaged pipes. The cost of the removal and replacement of such damaged pipes shall be borne by the Contractor.

Subbase layer thickness: The thickness of the layer of subbase material enclosing the pipe shall be within the limits specified in **Intra-pavement drains** for the type of pipe used in the intra-pavement drain.

Outlets

Location: Outlets are to be provided as shown on the Drawings or at maximum intervals of 150 m. Intra-pavement drains shall discharge into gully pits and other stormwater drainage structures.

Construction: 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 Drawings shall be constructed at the discharge end.

Rodent proof: The outlet shall be made rodent proof in accordance with 1171 *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.

2.3 EDGE DRAINS

Excavation

Width and level: The verge material shall be trimmed to subgrade level and to the minimum width shown on the 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.

Trench grade: Where the grade of the roadway is less than 0.5 per cent the trench shall be excavated to provide a minimum grade of 0.5%.

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

Laying of pipe

Slotted corrugated plastic pipe: Generally, 65 mm diameter slotted corrugated plastic pipe enclosed in seamless tubular filter fabric, complying with 1171 *Subsurface drainage*, shall be used for edge drains unless shown otherwise on the Drawings or as directed by the Superintendent.

Slotted PVC pressure pipe: Where any part of a shoulder consists of material other than concrete, slotted thick walled PVC pressure pipe, complying with 1171 *Subsurface drainage*, shall be used.

Securely hold in place: All pipes shall be securely held against the vertical face of the rigid pavement.

Approval securing method: At least seven days before commencement of pipe laying, the Contractor shall submit details of the proposed method of securing the pipes against the rigid pavement for the approval of the Superintendent.

This action constitutes a HOLD POINT.

The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Bedding and alignment: 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 100 mm at any point.

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

Inlet cap: The inlet end of the pipe shall be fitted with a cap complying with 1171 *Subsurface drainage*.

Outlet pipe: 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.

Backfilling

Filter material: The pipe shall be covered with Type B filter material, complying with 1171 *Subsurface drainage*, to the dimensions shown on the Drawings.

Soaking of 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 Drawings.

Procedure and compaction: 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 1112 *Earthworks (Roadways)*. Backfilling shall be compacted to a relative compaction of not less than 100% (Standard compaction) as determined by AS 1289.5.4.1.

Cleanouts

Location: Cleanouts shall be provided at the commencement of each run of edge drain line and at intervals of approximately 60 m or as shown on the Drawings.

Construction Details: Details of the required cleanout construction are shown on the Drawings. The standard CI caps as shown on the Drawings shall be supplied by the Contractor.

Outlets

Location: Outlets are to be provided as shown on the Drawings or at maximum intervals of 150 m. 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 Drawings shall be constructed at the discharge end.

Rodent proof: The outlet shall be made rodent proof in accordance with 1171 *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.

3 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in Table 3.1.

Table 3.1 Summary of limits and tolerances

Activity	**Limits/Tolerances**	**Worksection Clause Reference**
Excavation Trench Grade	≥0.5%	**Sub-pavement drains** **Edge drains**
Sub-pavement drain		
Laying of pipe		
Alignment	Deviation <100 mm from specified line at any point.	**Sub-pavement drains**
Backfill		
- Layer thickness	300 mm max	**Sub-pavement drains**
- Compaction (Relative) Filter material Backfill material	 100% (Standard compaction) >95% (Standard compaction)	 **Sub-pavement drains** **Sub-pavement**

Activity	Limits/Tolerances	Worksection Clause Reference
		drains
Cleanout spacing	60 m approx	**Sub-pavement drains** **Edge drains**
Outlet spacing	150 m max	**Sub-pavement drains** **Intra-pavement drains** **Edge drains**
Intra-pavement drain		
- Backfill	>95% (Standard compaction)	**Intra-pavement drains**
- Alignment	Deviation <100 mm from specified line at any point.	**Intra-pavement drains**
Edge drains		
- Alignment	Deviation <100 mm from specified line at any point.	**Edge drains**
- Compaction (relative) backfill material	100% (Standard compaction)	**Edge drains**

4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

Pay Items shall be made for all the activities associated with completing the work detailed under this worksection on a schedule of rates basis in accordance with Pay Items 1173.1 to 1173.3 inclusive.

A Lump Sum price for any of these items will not be accepted.

If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Filter material and outlet structures are measured and paid in accordance with 1171 *Subsurface drainage*.

Subbase material, including spreading, compacting and trimming, is measured and paid in accordance with either 1141 *Flexible pavements* or 1144 *Asphaltic concrete (Roadways)*, as appropriate.

Selected material backfill to edge drains is measured and paid in accordance with 1112 *Earthworks (Roadways)*.

4.2 PAY ITEMS

1173.1 Excavation

The unit of measurement shall be the cubic metre measured as bank volume of excavation.

The width of trench shall be as shown on the Drawings or as directed by the Superintendent.

The depth and length of excavation shall be based on the Superintendent's instructions and shall be determined at the time of excavation.

The schedule rate shall cover all types of material and separate rates shall not be included for earth or rock.

The rate is deemed to include:

- setting out and associated survey work;
- replacement for overexcavation for any reason;
- control of stormwater run-off, temporary drainage and erosion and sedimentation control.

The disposal of material from drain excavation shall be included in the schedule rate for excavation.

The schedule quantity is a provisional quantity.

1173.2 Subsoil drain pipe

- 1173.2(1) 100 mm dia slotted corrugated plastic pipe.
- 1173.2(2) 58 mm dia thick walled unplasticised PVC pressure pipe.
- 1173.2(3) 65 mm dia slotted corrugated plastic pipe.

The unit of measurement for Pay Items 1173.2(1), 1173.2(2) and 1173.2(3) shall be the linear metre measured along the length of the pipe. Any unslotted pipe required for outlets shall be included in the length.

The schedule rate shall cover the supply, laying and securing of the subsoil pipe.

The rate shall include connections, fittings and seamless tubular filter fabric where specified.

The schedule quantity is a provisional quantity.

1173.3 Cleanout structures

The unit of measurement shall be 'each' cleanout structure constructed in accordance with the Drawings.

The schedule rate shall include the supply and installation of lids and the recording of cleanout locations in accordance with 1171 *Subsurface drainage*.

The schedule quantity is a provisional quantity.