DEVELOPMENT CONSTRUCTION SPECIFICATION

C230

SUBSURFACE DRAINAGE GENERAL

SPECIFICATION C230 - SUBSURFACE DRAINAGE-GENERAL

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SPECIFICATION C230 : SUBSURFACE DRAINAGE - GENERAL

GENERAL

C230.01 INTRODUCTION

1. This is the general specification common and applicable to all types of subsurface drainage and shall be read in conjunction with subsurface drainage specifications: ***Purpose***

C231	-	Subsoil and Foundation Drains
C232	-	Pavement Drains
C233	-	Drainage Mats

as applicable to particular contracts.

C230.02 SCOPE

1. The work to be executed under this Specification consists of:

(a) Preparation for subsurface drainage construction;

(b) Siting of subsurface drainage facilities;

(c) The supply of all materials associated with the provision of the subsurface drainage system;

(d) All activities and quality requirements associated with the supply, placement and compaction of filter material;

(e) The provision of a detailed record of all subsurface drain installations;

(f) The marking on the ground of the location of all subsurface drains.

C230.03 EXTENT OF WORK

1. Details of the work are as shown on the Drawings, or as directed by the Council's Development Engineer and Geotechnical Engineer.

C230.04 REFERENCE DOCUMENTS

Documents Standards Test Methods

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

(a) Council Specifications

C211	-	Control of Erosion and Sedimentation
C213	-	Earthworks
C271	-	Minor Concrete Works

(b) Australian Standards

AS 1141.11	-	Particle size distribution by dry sieving.
AS 1141.22	-	Wet/dry strength variation.
AS 1289.E5.1	-	Determination of minimum and maximum dry density of a cohesionless material.
AS 1477	-	Unplasticised PVC (UPVC) pipes and fittings for pressure applications
AS 2439.1	-	Perforated drainage pipe and associated fittings
AS 2758.1	-	Aggregates and rock for engineering purposes - Concrete aggregates
ASTM-D2434-68		Test method for permeability of granular soils (constant head)

(c) RTA Specifications

MR1160	-	Supply and Delivery of Seamless Tubular Filter Fabric

(d) RTA Test Methods

T102	-	Pretreatment of Samples of Road Materials by Compaction
T103	-	Pretreatment of Road Materials by Artificial Weathering

(e) Legislation

Occupational Health and Safety Act, 2000

C230.05 TEMPORARY DRAINAGE DURING CONSTRUCTION

1. All drainage works carried out shall comply with Specification C211 - CONTROL OF EROSION AND SEDIMENTATION. *Erosion Control*

2. Adequate provision shall be made for runoff flows at subsurface drainage works under construction to avoid damage or nuisance due to scour, sedimentation, soil erosion, flooding, diversion of flow, damming, undermining, seepage, slumping or other adverse effects to the Works or surrounding areas and structures as a result of the construction activities. *Responsibility*

3. Material and equipment shall be located clear of watercourses or secured so that they will not cause danger or damage in the event of large runoff flows. *Location of Equipment*

C230.06 SITING OF WORK

1. Before commencing construction of any subsurface drainage activity, the position of *Set-out*

the work shall be set out to the location and levels shown on the Drawings.

2. The Council's Development Engineer may amend the locations or designed levels or the lengths to suit actual site conditions. ***Amendments to Planned Work***

3. Changes to the location, length, designed levels, conditions of installation or cover to suit the construction procedures shall be submitted for consideration by the Council's Development Engineer. No changes shall be made unless the prior written approval of the Council's Development Engineer is obtained. ***Proposed Changes by Contractor***

C230.07 EXCAVATION

1. Excavation shall be undertaken in compliance with statutory requirements. All shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements shall be provided. ***Safety***

2. Where public utilities exist in the vicinity of drainage works, the approval of the relevant authority to the method of excavation before commencing excavation is required. ***Approval by Public Utility Authorities***

3. Excavation by blasting, if permitted, shall be carried out to ensure that the peak particle velocity measured on the ground adjacent to any previously installed drainage structure does not exceed 25 millimetres per second. Blasting activities shall comply with other requirements concerning blasting operations in Specification C213 – EARTHWORKS. ***Blasting Operation***

4. Trenches shall be excavated to the line, grade, width and depth shown on the Drawings or as directed by the Council's Development Engineer. The bottom of the trench shall be constructed so that no localised ponding can occur. All loose material shall be removed. ***Excavation Level***

5. Any material at the bottom of the trench or at foundation level which the Council's Development Engineer deems to be unsuitable shall be removed and disposed in accordance with Specification C213 - EARTHWORKS and replaced with backfill material in accordance with the requirements of this Specification. The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be parallel with the specified level or grade of the pipe. ***Unsuitable Material***

C230.08 BACKFILLING

1. Backfilling shall be carried out in accordance with the requirements of the relevant subsurface drainage structures Specifications. ***Detail***

C230.09 OUTLET STRUCTURES FOR SUBSURFACE DRAINAGE

1. Subsurface drainage pipes shall be connected to discharge into gully pits or to outlet structures as shown on the Drawings or as directed by the Council's Development Engineer. ***Discharge***

2. Outlets shall be spaced at a maximum interval of 80m. ***Spacing***

3. Outlets, including those discharging into gully pits, shall be made rodent proof using galvanised wire netting. ***Rodent Proof***

4. The outlet shall be located so that erosion of the adjacent areas does not occur or shall be protected by the placement of selected stone or similar treatment. ***Erosion Control***

5. Outlet pipes from curtain drains shall be unslotted. At no point shall an outlet pipe be higher than the pipe at the end of the curtain drain. ***Outlet Pipe***

6. All concrete used in the construction of outlet structures shall conform to the ***Concrete***

requirements of Specification C271 - MINOR CONCRETE WORKS. *Specification*

MATERIALS

C230.10 CORRUGATED PLASTIC PIPE

1. Corrugated plastic pipe shall be Class 1000 complying with AS2439.1 of 65mm or 100mm diameter unless otherwise indicated on the Drawings. All pipe shall be slotted except where shown on the Drawings. *Specification*

2. Joints, couplings, elbows, tees and caps shall also comply with AS2439.1 and only the manufacturer's recommended fittings shall be used. *Fittings*

3. The Contractor shall obtain from the Manufacturer a Test Certificate demonstrating compliance with AS2439.1. *Compliance*

C230.11 OTHER TYPES OF SUBSURFACE DRAINAGE

1. Where a subsurface drainage pipe other than corrugated plastic pipe is selected for use, full details of the type of pipe, certification from the manufacturer of its suitability and quality are to be submitted for written acceptance by the Council for its use in each particular application. Certification of the suitability of any pipe will address the crushing strength, flexural strength, jointing system and slotting details. *Submit for Approval*

C230.12 FILTER MATERIAL

(a) General

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

   (a) Type A filter material for use in most applications

   (b) Type B filter material for use in trench drains and Type B drainage mats

2. All filter material shall consist of clean, hard, tough, durable particles.

(b) Type A Filter Material

1. Type A filter material shall be crushed rock complying with the following requirements: *Grading*

TEST METHOD	PROPERTY	REQUIREMENT
AS 1141.11	Material passing AS sieve	Per cent by mass
	6.7mm	100
	4.75mm	85 to 100
	2.36mm	0 to 40
	1.18mm	0 to 5
	425um	0 to 2

Table C230.1 - Type A Filter Material

(c) Type B Filter Material

1. Type B filter material shall be granular material complying with the following grading requirements: ***Grading***

TEST METHOD	PROPERTY	REQUIREMENT
AS 1141.11	Material passing AS sieve	Per cent by mass
	4.75mm	100
	2.36mm	95 to 100
	425um	20 to 80
	300um	0 to 30
	150um	0 to 2
	75um	0 to 0.1

Table C230.2 - Type B Filter Material

2. In addition to the above grading requirements, Type B filter material shall have a coefficient of saturated permeability, when compacted to its maximum dry density as determined by AS 1289.E5.1 and then tested in accordance with Test Method ASTM-D2434-68, of at least 8 metres per day after three hours of flow. ***Coefficient of Saturated Permeability***

3. After treatment in accordance with Test Method T103 and five cycles of compaction in accordance with Test Method T102, Type B filter material shall not vary from its original grading before such treatment by more than the following amounts: ***Grading Variation***

AS Sieve	Variation From Grading Before Treatment (per cent of mass)
2.36mm	± 3
1.18mm	± 1
425um	± 1
300um	± 1
150um	± 0.5
75um	± 0.1

Table C230.3 - Type B Filter Material Variation

C230.13 GEOTEXTILE

(a) General

1. The geotextile, other than seamless tubular filter fabric, shall consist of a needle-punched felt, which shall be manufactured from synthetic materials other than polyamide. It shall be bio-stable and resistant to attack by alkalis, acids, dry heat, steam, moisture, brine, mineral oil, petrol, diesel and detergents. ***Properties***

2. The geotextile shall be resistant to ultra-violet light. No geotextile shall be left exposed to sunlight during storage and construction for a period longer than a total of twenty-one days. If exposure in excess of twenty-one days does occur, the geotextile shall be tested and if its characteristics have deteriorated to or below 90 per cent of the characteristics claimed by the manufacturer or the characteristics determined on unexposed geotextile, whichever is the better, it shall be removed and replaced with a geotextile complying with this Specification. ***Ultra Violet Light Resistant***

3. The geotextile shall be capable of retaining particles of particle size greater than 100 microns. ***Particle Retention***

4. The minimum mass of geotextiles for different types of subsurface drainage shall be as follows: ***Mass***

TYPE OF SUBSURFACE DRAINAGE	MINIMUM MASS OF GEOTEXTILE (Grams per square metre)
Trench Drains and Drainage Mats	250
Curtain Drains	500

Table C230.6 - Geotextile Mass

5. In addition to the above requirements, geotextiles for curtain drains shall consist of polyester, polypropylene or polyethylene. Geotextiles for curtain drains shall have a rate of water transmission not less than 20 litres per hour per metre width of fabric through a 300 mm length of the fabric when subjected to a pressure of 200 kPa applied at right angles to the plane of the fabric, and to a constant head of water no greater than 50 mm applied to the top edge of the fabric. ***Water Transmission Rate***

(b) Seamless Tubular Filter Fabric ***Specification***

1. Seamless tubular filter fabric shall be used to enclose all slotted pipes and shall comply with MR Form 1160.

2. Fitting of the seamless tubular filter fabric shall be in accordance with the requirements of Annexure C230A. Filter fabric that is excessively stretched, torn or otherwise damaged during fitting of the fabric, storage, transportation or pipe laying will be removed and replaced so as to eliminate any damaged lengths. ***Fitting***

RECORDING OF DRAINAGE

C230.14 RECORDING OF SUBSURFACE DRAINAGE INFORMATION

1. The Developer shall keep a detailed record of all subsurface drainage pipes and the completed subsurface drainage systems shall be shown on the work-as-executed plans. ***Work As Executed Plans***

2. The information to be included in the Works-as-Executed plans shall include: ***Detail***

   a. Drain Number

   b. Type of Drain,

   c. Pipe Size,

   d. Depth below Finished Surface Level,

   e. Locations of Cleanouts, and

   f. Locations of Outlets

ANNEXURE C230A

SLOTTED PIPES FITTED WITH SEAMLESS TUBULAR FILTER FABRIC

1. PROCEDURE FOR FITTING SEAMLESS TUBULAR FILTER FABRIC TO SLOTTED PIPE

Seamless tubular filter fabric shall be fitted to slotted pipe immediately before the slotted pipe is to be laid in its final position in the work.

The filter fabric shall be initially pulled over and onto a short length of smooth pipe of internal diameter between 20mm and 30mm greater than the external diameter of the slotted pipe to be enclosed by filter fabric. The short, larger diameter pipe shall be referred to as the 'mandrel'.

The pipe to be enclosed by the filter fabric shall be passed through the mandrel. The filter fabric shall be slipped on to the pipe as the pipe emerges from the mandrel leaving enough overhang of the filter fabric to make a suitable joint with the filter fabric on the adjacent pipe. The filter fabric shall be firmly held to the forward end of the pipe so that it cannot slip back along the pipe.

The pipe shall be pulled right through the mandrel allowing the filter fabric to progressively slip over the pipe. The filter fabric shall be restrained from easily slipping off the mandrel thus ensuring the filter fabric is stretch fitted onto the pipe.

When the end of the pipe emerges from the mandrel, the filter fabric shall be clamped to that end of the pipe so that the filter fabric cannot slip down the pipe. The filter fabric shall remain clamped to each end of the pipe to ensure the filter fabric remains stretch fitted onto the pipe when the pipe is placed in its final position in the drain. The filter fabric shall be cut cleanly leaving enough overhang over the end of the pipe to make a fully covered join with the filter fabric on the adjacent pipe when the pipes are installed in the drain.

2. PRECAUTIONS TO BE TAKEN WHEN USING SLOTTED PIPE FITTED WITH SEAMLESS TUBULAR FILTER FABRIC

Slotted pipe fitted with seamless tubular filter fabric shall not be dragged over the ground. If carried, the pipe shall be lifted clear of the ground and the filter fabric shall be protected from damage at all times.

Seamless tubular filter fabric, which has been so damaged as to affect its filtering properties, shall be removed from the pipe and replaced with undamaged filter fabric.

If at any time during the installation of a slotted pipe it is found that the enclosed filter fabric has become loose on the pipe it shall be restretched to its correct position. If restretching causes any damage to the filter fabric, the damaged filter fabric shall be removed from the pipe and replaced with undamaged filter fabric.