SPECIFICATION 1172

SUBSOIL AND FOUNDATION DRAINS

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# SPECIFICATION 1172 – SUBSOIL AND FOUNDATION DRAINS

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1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide subsoil and foundation drains as documented.

Performance
Quality: Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies to conform with 0161 Quality (Construction).

1.2 CROSS REFERENCES

Worksections
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards
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.
AS 1289.5.6.1-1998 Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material

Other publications
AUSTROADS
AP-C87-2010 Austroads Glossary of terms

1.4 INTERPRETATIONS

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
- CI: Cast Iron.
- HDPE: High Density Polyethylene.

Definitions
General: For the purposes of this worksection the following definitions apply:
- Foundation drains: For drainage of seepage, springs and wet areas within and adjacent to the foundations.
- Panel drain: Corrugated flat plastic pipe.
- Selected material zone: The top part of the Upper zone of formation in which material of a specified higher quality is required.
- Subsoil drains: For drainage of ground water and/or the pavement in cuttings.

1.5 SUBMISSIONS

Acceptance criteria
General: All submissions will be subject to the approval of the Superintendent.

Documents
Submit the following for approval:
- Filter materials: Refer to WITNESS POINTS.
- Calculations: Survey set out of works including quantity calculations.
Components: Submit technical details of:
- Geotextiles to 1171 Subsurface drainage.
- Pipes and fittings to 1171 Subsurface drainage.

Execution details: Refer to WITNESS POINTS.

1.6 INSPECTION

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

### Summary of HOLD POINTS

<table>
<thead>
<tr>
<th>Item/Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsoil / Foundation drains - Pipes</td>
<td>Submit bedding of compacted filter material laid to line and grade</td>
<td>3 working days before next activity</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Subsoil / Foundation drains - Excavation</td>
<td>Inspect excavation</td>
<td>1 working day prior to filling</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

### Summary of WITNESS POINTS – On-site activities

<table>
<thead>
<tr>
<th>Item/Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General - Filter material</td>
<td>Type of filter material</td>
<td>3 working days before ordering material</td>
</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General - Location</td>
<td>Mark location of drains consistent with drawings or directions</td>
<td>7 days prior to commencing works</td>
</tr>
<tr>
<td>Subsoil / Foundation drains - Pipes</td>
<td>Lay on compacted bed to documented line and level</td>
<td>1 working day before filling</td>
</tr>
<tr>
<td>Subsoil drains - Backfilling,</td>
<td>Backfilling to documented level and relative compaction</td>
<td>1 working days before covering with geotextile</td>
</tr>
<tr>
<td>Foundation drains - Backfilling</td>
<td>Backfilling to documented level and relative compaction</td>
<td>1 working days before covering with geotextile</td>
</tr>
<tr>
<td>Geotextile - Installation</td>
<td>Placement of fabric conformance</td>
<td>1 working day before filling</td>
</tr>
<tr>
<td>Geotextile - Installation</td>
<td>Ensure exposure periods are within the constraints</td>
<td>Progressive</td>
</tr>
<tr>
<td>Cleanouts – Field testing</td>
<td>Perform flushing test</td>
<td>3 working days from completion</td>
</tr>
</tbody>
</table>

2 PRE-CONSTRUCTION PLANNING

2.1 SCHEDULING

Programming the works
General: Program the works as follows:
- Plan sequence of activities.
- Address time and program sequence of HOLD POINTS and WITNESS POINTS.

3 MATERIALS

3.1 GENERAL

Filter material
Description: Type A or Type B filter material to 1171 Subsurface drainage capable of placing and compaction in the specific location and as shown on the drawings. This is a WITNESS POINT.
Geotextiles and pipes
Conform to: 1171 Subsurface drainage.

4 EXECUTION

4.1 ESTABLISHMENT

Location
Layout: As shown on the drawings or as directed by the Superintendent. This is a WITNESS POINT.

Existing underground services
Excavation: Do not excavate by machine within 1 m of existing underground services.
Location: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, of locating underground pipe and cables (possible within two working days). See www.dialbeforeyoudig.com.au.

4.2 PROVISION FOR TRAFFIC

General
Control of traffic: Conform to the following:
- Conform with worksection 1101 Control of traffic.
- Conform with Traffic Guidance Scheme in 1101 Control of traffic.

4.3 SUBSOIL DRAINS

Order of construction
Sequence: Construct subsoil drains as soon as possible after necessary earthworks are completed in the area of the drain.

Ground water: Where stabilisation of the subgrade is required, construct subsoil drains after completion of stabilisation except where excessive ground water is encountered, construct drain prior to stabilisation of the subgrade.

Excessive groundwater: Where a selected material zone is documented 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 prior to placement of select material in the selected material zone.
- Stage 2: Extend subsoil drain to top of the selected material zone after placement of selected material.

Excavation
Requirements: To 1171 Subsurface drainage.
Specified level: The bottom of the trench must not be more than 50 mm below the specified level of the invert of the pipe.
Smooth: Ensure the bottom and sides of the excavation are smooth with no protrusions that will damage the geotextile fabric.
Grade: Excavate the bottom of the trench to the same grade as the design pavement surface in the direction of the trench.
Minimum grade: If required increase the trench depth to provide a minimum grade of fall in the trench of 1.0%.
Prevent ponding: Excavate the bottom of the trench to prevent localised ponding of water occurs.
Over-excavation: If the trench is excavated below the documented level, backfill the trench to the documented level with non-porous subgrade material compacted to a relative compaction of at least 95% (Standard compaction) as determined by AS 1289.5.4.1.
Two stage construction: If a subsoil drain is constructed in two stages, carry out the excavation for Stage 2 after placement and compaction of the Selected Material Zone 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 to provide a clean, full contact with the filter material placed in Stage 1. Dispose of all excavated material to waste or incorporate into fills.
Inspection: To ensure the excavation conforms with the shape, grade line, filling and compaction and removal of any protrusions. This is a HOLD POINT.
Pipes
Bedding: 50 mm thick compacted filter material laid to the documented line and grade. This is a HOLD POINT.
Filter material type: As shown on the drawings or as directed by the Superintendent.
Pipe: Place centrally within the trench on the crushed aggregate the 100 mm diameter corrugated slotted plastic piping or corrugated flat plastic piping as shown on the drawings.
Filter Sock: The pipe shall be fitted with a filter sock if shown on the drawings or directed so by the Superintendent.
Tolerance: Deviation < 100 mm from the documented line. This is a WITNESS POINT.
Joints: Minimise joints in the pipeline.
Joint construction: Proprietary external joint coupling. Fit the inlet end of the pipe with a proprietary PVC cap.

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. Tamp around and over the pipe to avoid damage or disturbance to the pipe.
Upper section of the trench: Backfill above the level documented for filter material backfill, with selected free draining backfill material, conforming to the requirements of 1112 Earthworks (Roadways). Any Backfill material within 50mm of the finished surface which is to be revegetated shall consist of free draining topsoil.
Compaction: Compact cohesionless filter material to a Density Index of 70% determined by AS 1289.5.6.1 for the full depth of the backfill. This is a WITNESS POINT.

Two stage construction plug
Protection: Protect the filter material placed at the top of Stage 1 from scour and/or contamination by covering with a 50 mm thick plug of select fill material with a maximum particle size of 25 mm.
Compaction: Compact the select fill material to a relative compaction of 95% as determined by AS 1289.5.4.1.
Remove and replace: Remove this plug, any contaminated filter material and any select material covering, replace with filter material and compact to 95% relative compaction.

4.4 FOUNDATION DRAINS

Order of construction
Sequence: Construct foundation drains after completion of clearing and stripping operations, and before the commencement of embankment construction.

Excavation and laying pipes
Requirements: To 1171 Subsurface drainage and Subsoil drains.

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. Tamp around and over the pipe to avoid damage or disturbance to the pipe.
Upper section of the trench: Backfill above the level documented for filter material backfill with suitable free draining backfill material.
Compaction: Compact cohesionless filter material to a Density Index of 70% determined by AS 1289.5.6.1 for the full depth of the backfill. This is a WITNESS POINT.

4.5 GEOTEXTILE

Location
Extent: As shown on the drawings or as directed by the Superintendent.
Location: Completely encapsulate the filter material.

Installation
Placement: Cover the bottom, sides and overlay of the trench with sufficient free fabric to wrap around the whole of filter fabric. Conform to the shape of the trench with minimal wrinkles, folds or air voids between fabric and trench, but not stretched on the soil. This is a WITNESS POINT.
Joints: Provide laps of 500 mm at joints in the fabric.
Program: Ensure the period between initial laying out and final cover of the geotextile with drainage backfill layer does not exceed 14 days. Where possible place geotextiles just ahead of construction works and cover with materials within 48 hours. This is a WITNESS POINT.
Damage: Take all reasonable care to ensure that the geotextile is not damaged during installation and backfilling operations.
Remove and replace: Any geotextile fabric exposed for longer than 14 days must be removed and replaced at no extra cost.

4.6 OUTLET STRUCTURES

Discharge and salinity prevention
Subsurface drainage pipes: Connect discharge into gully pits or to outlet structures as shown on the drawings or as directed.
Salinity prevention: Discharge on the downhill side of the embankment or in the cut area so as to reduce the risk of recharge to the subsurface water table. This is a WITNESS POINT.

Outlets
Location intervals: 150 m maximum.

Rodent proofing
Method: Secure outlets, including those discharging into gully pits, with galvanised wire netting to conform with the drawings.

Erosion control
Method: Locate the outlet so that erosion of the adjacent areas does not occur and/or protect the outlet by the placement of selected stone or approved similar treatment.
Locations: Provide marker posts to indicate the location and assist maintenance.

Outlet pipe
Type: Provide unslotted outlet pipes from curtain drains.
Levels: Ensure no point in an outlet pipe is higher than the pipe at the end of the curtain drain.

Concrete
Specification for outlet structures: Concrete to 0319 Minor concrete works.

4.7 CLEANOUTS

Location
Details: As shown on the drawings. Do not locate pits in unsealed shoulders, drain inverts or on batter faces.
Location: At the commencement of each run of subsoil drain line and at intervals of approximately 100 - 140 m to conform with AGPT10-09.

Type
Clean out: Supply the standard CI caps as shown on the drawings.

Field testing
Method: After completion of backfilling, pump clean water into the cleanout at the commencement of each run until only clean water discharges at the outlet.
Flushing: The minimum rate of flow of flushing water at the inlet must be 100 l/min. This is a WITNESS POINT.

4.8 MARKING OF DRAINS

Completion
Records: Keep a detailed record of all trench drain installations. Mark 'Work-as-Executed' drawings of the completed drainage system. Submit within 28 days of completion of the works.
Mark: Markings location and type to conform with the relevant State Road Authority and AGPT10-09.
Pegs: Treated or painted timber 75 mm diameter with 600 mm of post above ground level. Do not use the colour white.
ID plate: Attach an identification plate to the marker post or pit lid.
4.9 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

**Summary of limits and tolerances table**

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<th>Limits/Tolerances</th>
<th>Worksection</th>
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<td></td>
<td>Clause/ subclause</td>
</tr>
<tr>
<td><strong>Excavation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Trench Grade</td>
<td>≥ 1.0%</td>
<td>Subsoil drains</td>
</tr>
<tr>
<td>- Compaction</td>
<td>&gt; 95% (Standard compaction)</td>
<td>Subsoil drains</td>
</tr>
<tr>
<td><strong>Laying of pipe</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment</td>
<td>Deviation &lt; 100 mm from the documented line at any point</td>
<td>Subsoil drains</td>
</tr>
<tr>
<td><strong>Subsoil drain backfill</strong></td>
<td>actors with completing the work detailed in this worksection and shown on the drawings, in accordance with provisions made in Contract Document.</td>
<td></td>
</tr>
<tr>
<td>- Layer thickness</td>
<td>300 mm max</td>
<td>Subsoil drains</td>
</tr>
<tr>
<td>- Compaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Filter material</td>
<td>70% Density Index for cohesionless material.</td>
<td></td>
</tr>
<tr>
<td>- Backfill material</td>
<td>100% (Standard compaction)</td>
<td>Subsoil drains</td>
</tr>
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<td><strong>Outlet spacing</strong></td>
<td>150 m max</td>
<td>Outlets</td>
</tr>
<tr>
<td><strong>Cleanout spacing</strong></td>
<td>100 - 140 m approx</td>
<td>Cleanouts</td>
</tr>
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<td><strong>Foundation drain backfill</strong></td>
<td>actors with completing the work detailed in this worksection and shown on the drawings, in accordance with provisions made in Contract Document.</td>
<td></td>
</tr>
<tr>
<td>- Backfilling</td>
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<td></td>
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<tr>
<td>- Layer thickness</td>
<td>300 mm max</td>
<td>Foundation drains</td>
</tr>
<tr>
<td>- Compaction</td>
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</tr>
<tr>
<td>- Filter material</td>
<td>70% Density Index for cohesionless material.</td>
<td>Subsoil drains</td>
</tr>
<tr>
<td>- Backfill material</td>
<td>&gt; 95% (Standard compaction)</td>
<td>Foundation drains</td>
</tr>
</tbody>
</table>

5 MEASUREMENT AND PAYMENT

5.1 GENERAL

*Payment shall be made for all the activities associated with completing the work detailed in this worksection and shown on the drawings, in accordance with provisions made in Contract Document.*