

**SECTION 205 - ROCK FILL**

~~##This section cross-references Sections 173, 204 and 210. If any of the above sections are relevant, they should be included in the specification. If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent.~~

**205.01 DESCRIPTION**

This section covers the requirements for the use of rock fill in embankment construction. This section should be used taking into account the requirements of Section 204.

**205.02 DEFINITIONS**

**Fill:**

The compacted embankment placed above natural surface level after removal of topsoil.

**Rock Fill:**

A material comprised of larger fragments of hard, sound durable rock containing only a small amount of fine particles, which when placed and compacted produces an embankment deriving its stability from the mechanical interlock of the coarser rock particles and not from the compaction of finer material.

**205.03 MATERIALS**

(a) Rock Fill Material

Material for rock fill embankment construction shall be obtained from excavations within the works.

Rock fill shall be comprised of sound rock fragments having not less than two broken or angular faces. Not less than 10 individual, randomly selected, rock samples, with dimensions greater than 100 mm, shall be tested for each nominated point load test. Not less than 90% of rock fragments with dimensions greater than 100 mm shall have a Point Load Strength ( $I_{S(50)}$ ) of 2.0 MPa or greater.

Prior to placement, rock fill material shall have no particle dimension exceeding 500 mm and minimal fine material.

After placement and compaction, rock fill material, including Rock Fill cover layer material, shall comply with post-compaction gradings in Table 205.031.

**Table 205.031 Post-Compaction Grading of Rock Fill Material**

Rock Fill Type	Limits of Grading (% passing by mass) Post Compaction AS Sieve Size (mm)				
	500	300	150	75	37.5
Maximum Particle Size 500 mm	100	10-25	0-10		
Maximum Particle Size 300 mm		100	10-25	0-10	
Maximum Particle Size 150 mm			100	10-25	0-10
Maximum Particle Size 75 mm				100	10-25
Maximum Particle Size 37.5 mm					100

(b) Geotextile Fabric

Geotextile fabric required for the construction of rock fills shall have a G robustness rating of greater than 3000 and shall be supplied, handled and placed in accordance with the requirements of Section 210.

## 205.04 SITE EXCAVATION

### (a) General

Site excavation of rock fill material shall be within the limits of batters, open and underground drainage and approved borrow areas from within the Site, and shall include the handling of excavated material to the point of disposal.

### (b) Material Category

**Prior to the use of excavated rock material as rock fill, ~~the Superintendent Council~~ and the Contractor shall inspect the material encountered and subject to verification by appropriate testing, agree on the suitability of the material for rock fill as described in Clause 205.03.**

### (c) Excavation Operations

If excavated rock is to be used in the construction of rock fill embankment, the working methods employed in the excavation of cuttings must be adjusted so as to produce rock fill material of the size and grading and rock strength specified in Clause 205.03. Such working methods generally must include screening and, if necessary, secondary processing.

### (d) Oversize Rock

Oversize rock produced as a consequence of rock fill production shall be used or disposed of only in areas specified or shown in the drawings or approved by ~~the Superintendent Council~~.

**HP ~~The Superintendent Council's approval shall be obtained to the use or disposal of oversize rock with a maximum particle dimension greater than the requirements for Type B fill material in Type C fill areas in accordance with Section 204.~~**

## 205.05 ROCK FILL EMBANKMENT CONSTRUCTION

### (a) Areas Upon Which Rock Fills are to be Constructed

Areas upon which fills are to be constructed shall be prepared in accordance with the requirements of Section 204. Topsoil and material classified as silt shall be removed prior to construction of any rock fills.

Where a rock fill is to be constructed on steep sideling ground or against an existing embankment with side slope steeper than 4 horizontally to 1 vertically, benches shall be progressively cut over the full area to be covered by new fill. The width of each bench shall be such as to permit safe and effective operation of plant but shall be not less than 1 m.

Material excavated during benching may be used in construction of earthworks in accordance with Section 204.

Foundations under rock fills must be shaped to ensure that drainage is maintained and treated to ensure that erosion of the foundation will not occur.

### (b) Placement and Compaction of Rock Fill

Prior to placement of the first layer of rock fill, a geotextile fabric shall be placed as a separation layer.

The rock fill material shall be placed and compacted in layers in accordance with the accepted placement and compaction procedure and Table 205.051.

Rock fill shall be placed and compacted to ensure rock particle to particle contact between coarser rock particles is maintained and to achieve stability of the layer.

Interlock between successive rock fill layers shall be ensured by limiting the placement of finer particles over the surface of the rock fill layer to that necessary to achieve interlock between the courser rock particles.

Where earthworks fill material is to be placed over or adjacent to a rock fill, cover layers of rock fill material shall first be placed in accordance with Table 205.051. A geotextile separation fabric with a G robustness rating of greater than 3000 shall then be placed over the top of the rock fill layers, and extended to cover the longitudinal edge of the top layer. A minimum layer of 200 mm of Type B fill material with a maximum particle dimension of 75 mm shall then be placed on top of the geotextile fabric, above which the earthworks fill layer can then be constructed.

**Table 205.051 Thickness of Rock Fill Material Layers**

Rock Fill Type	Maximum Thickness of each Compacted Layer	Minimum Distance Below Subgrade Level	Thickness of Rock Fill Cover Layers			
			Bottom Layer Maximum Particle Size 150 mm	Middle Layer Maximum Particle Size 75 mm	Top Layer Maximum Particle Size 37.5 mm	Total Thickness of Rock Fill Cover Layers
Maximum Particle Size 500 mm	600 mm	2.0 m	300 mm	200 mm	100 mm	600 mm
Maximum Particle Size 300 mm	400 mm	1.2 m	Not Required	200 mm	100 mm	300 mm
Maximum Particle Size 150 mm	300 mm	800 mm	Not Required	Not Required	100 mm	100 mm
Maximum Particle Size 75 mm	200 mm	400 mm	Not Required	Not Required	100 mm	100 mm

(c) Rock Fill around Structures

At structures, including abutments, retaining walls, wingwalls and culverts, rock fill and rock fill cover material shall not be placed within any specified Type A fill zone or within 2 m of any structure.

(d) Level Control

Each layer of rock fill including cover layers shall be surveyed to confirm that placement is in accordance with the following tolerances:

Intermediate layers of rock fill shall be placed to a tolerance of +/- 100 mm.

The surface level tolerance of the top of final layer of rock fill or zone shall be finished to a tolerance of:

+0 mm / -100 mm.

**205.06 ACCEPTANCE OF PLACEMENT AND COMPACTION**

**The first lot shall be placed as a trial section for review by the Superintendent Council. The Contractor shall then develop a material grading, mixing, watering and rolling routine based on the construction and testing of trial section for review by the Superintendent Council.**

As a minimum, trial sections shall be carried out both for the initial layer of rock fill over in situ material and then for the subsequent (second) layer of rock fill and each trial section shall:

- have an area of not less than 1000 m<sup>2</sup>
- be thoroughly watered prior to applying roller passes
- be compacted by the application of not less than 15 roller passes or more, if consolidation is still occurring
- be surveyed for level changes in surface levels after each roller pass at not less than 20 pre-determined monitoring points
- be assessed to determine the point at which effective refusal occurs
- be inspected and tested for compliance with this Section 205.

Where any monitoring point has been, in the opinion of ~~the Superintendent~~ Council, destroyed or significantly damaged by crushing or rock break down, the survey level result for that point shall be disregarded for that roller pass and a replacement monitoring point established for monitoring of subsequent roller passes.

The accepted compaction routine shall provide not less than three additional passes of the compaction plant above the number of passes identified from the compaction trials as having no further consolidation of rock particles and the compactive effort shall be not less than the equivalent of 6 passes of a vibrating pad foot roller which can transmit a minimum force to the ground through the surface of the drum of 50 kN per metre of drum length, when operated at the maximum frequency of vibration. The frequency of vibration of the roller shall be between 16 and 25 Hz, and the travel speed shall not exceed 1 m for every three seconds.

~~The Superintendent~~ Council may require that further trial sections be constructed to verify that the proposed placement and compaction routine is acceptable where there is a change in the type or quality of the material being placed.

Assessment of placement and compaction will include visual inspection of inspection trenches excavated to the full depth of the rock fill layer and test rolling carried out in accordance with Clause 205.07.

Assessment of placement and compaction shall also include monitoring the level of rock particles at the surface of the layer to identify the point at which no further consolidation of the rock particles occurs when subject to three additional passes of the compaction plant. The number and location of monitoring sites shall be to the satisfaction of ~~the Superintendent~~ Council but shall not be less than 12 locations for each lot monitored.

Acceptance of work for compaction will be based on compliance with the accepted placement and compaction procedure, testing and inspection as specified and the confirmation by survey level monitoring that effective refusal has been achieved for the rock fill layer. For the purpose of this clause, effective refusal is where the average cumulative deflection over the last three roller passes is no greater than 5 mm.

#### **205.07 TEST ROLLING**

All layers of rock fill shall be test rolled in accordance with Section 173.

Prior to any layer being covered by a successive layer, ~~the Superintendent~~ Council may require further test rolling to confirm that the layer is stable.

Any unstable areas detected by test rolling shall be rectified.

**205.08 MINIMUM FREQUENCY OF TESTING**

(a) Material Properties

Materials shall be tested to demonstrate compliance with the material property requirements specified in Clause 205.03. Testing shall be undertaken at the frequency specified in Table 205.081.

**Table 205.081 Minimum Frequency of Testing for Material Properties**

Material Properties	Minimum Frequency of Testing
Rock Strength – Point Load Index – $I_{S(50)}$	Each source prior to the commencement of work and every 500 m <sup>3</sup> of production.
Grading Prior to Compaction	Prior to the commencement of work and at other times when in the opinion of the Contractor or <del>the Superintendent</del> Council, the nature and/or physical properties of the material have changed.
After Compaction Grading	For each trial section and for every third lot, and at other times when in the opinion of the Contractor or the <del>Superintendent</del> Council, the nature and/or physical properties of the material have changed.
Consolidation Measurement of Rock Fill Layers	Survey monitoring for all trial sections and each layer of rock fill including cover layers.
Test Rolling	All layers of rock fill including cover layers.

(b) Compaction

The Contractor shall initially test each trial section to verify the adequacy of placement and the compaction procedure to the satisfaction of ~~the Superintendent~~ Council.

Once a placement and compaction routine is established, each lot shall be placed in accordance with this procedure.

Every layer shall be tested for stability by test rolling and every third lot shall be monitored to verify that no further consolidation is occurring. Should the rock fill in any layer be found to be continuing to consolidate within the past three roller passes, the placement and compaction procedure shall be reviewed to the satisfaction of ~~the Superintendent~~ Council.

**205.09 AS-CONSTRUCTED RECORDS**

The location and extent of all rock fill zones and cover layers constructed shall be surveyed and shown in As-Constructed Drawings.