

ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION R44

EARTHWORKS

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REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 0		General Revision	GM, RNIC	21.10.03
Ed 3/Rev 1	1.4, 2.4, 3.2, 4.2, 5.1(c) All Figures 1.6 3.4 4.2 5.4.1 5.4.3 6.1.1 7.2.3 7.4.2 Annx R4/A Annx R4/A5 Annx R4/M	Minor editorial changes. Revised and details transferred to Annexure R44/A1 Revised to follow work sequence Refers to Annexure R44/A3. Reinforced soil excluded, Reference to Clause 2.8 and Table B30.1 added. Heading changed. Minor changes, AS 3725 replaced by clause 5.4.1 Hold Point applies to all material Details replaced by RTA T166. Formula transferred to Annexure R44/A6 Default requirements shown Source and location added RTA B30, R58 and T131 added	GM, RNIC	21.11.03
Ed 3/Rev 2	Various 1.6.2 2.5.2, 3.2, 3.4, 4.5.1 2.7.3 Annexure R44/A	Minor editorial changes Requirements further clarified MOSS software changed to MX Text revised New Hold Point Additional information shown	GN, RNIC	18.12.03

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 2 (cont'd)	Annexure R44/A4.2	New annexure		
Ed 3/Rev 3	Various 3.2, 3.4 Annx R44/M	Minor editorial changes Defined terms shown with capitals Minor changes to Hold Points Other References added	GM, RNIC	22.01.04
Ed 3/Rev 4	Various Foreword 2.7.1, A3 3.2.5, 3.4.2, 5,1,2,2, 5.3, A4.2 3.4.1, 6.1.2, 7.4.1, M 7.4.1 8 A1 A4.2 A6 R44/B	Minor editorial changes Survey references changed to G71 New clause after the Table of Contents New methods of placing topsoil Additional property criteria Changes to test method references Performance criteria added Revised with additional details Guide note added CBR for top 150 mm added Changes to CBR test conditions Pretreatment specified Lime modification may be required Test deflection under each lane Changes to R44P1, P5 and P6.2	GM, RNIC	09.02.05
Ed 3/Rev 5	Pay Item R44P2	Exclusion of unsuitable material from measurement emphasised	GM, RNIC	15.07.05
Ed 3/Rev 6	Various 2.8.2, 6.2	References to EPA changed to DEC Minor editorial changes Format changed	GM, RNIC	31.10.05
Ed 3/Rev 7	Global 2.8.1 2.8.2.2, 2.8.4.2 3.5	Clauses re-worded to improve clarity. Document reformatted. “selected material” changed to “Upper Zone Material”. Clause added to clarify that grading requirement for Upper Zone of Formation material and Verge material in cases where safety barriers, etc are to be installed apply to both Site Won Material as well as Imported Material Superfluous clause removed.	GM, IC	27.08.08

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 7 (cont'd)	Annex B	Pay Item description for P5.1 to P5.4 changed to include the words "Limit of Works"		
Ed 3/Rev 8	"Notice" 1.4 2.8.2.1 2.8.3.1 2.8.4.1 2.8.4.1, 2.8.4.2 Figure R44.7 Annex A/A4.2	RTA PO Box and Fax numbers updated. Figures R44.2 and R44.3 revised. Requirement for ≤ 10% site won material passing 1.18mm sieve deleted. Requirement for ≤ 10% site won selected material passing 1.18mm sieve deleted. Requirement for ≤ 10% site won verge material passing 1.18mm sieve deleted. Plasticity Index requirement reworded to conform to that in Annexure R44/A4.2. Figure number "R44.7" changed to "R44.6", following the number sequence. Changes to CBR values, pre-treatment test methods and CBR test conditions	GM, IC	04.06.09
Ed 3/Rev 9	5.1 (b) 5.1.1.1 7.2.1 Table 4 8 Table 6 Annex A Annex M	Scope extended to fill for embankments at "spill-through" bridge abutments. New clause on fill for embankments at "spill-through" bridge abutments added. Relative compaction requirement for materials placed in "spill-through" embankment added in table. Test Method, Min Freq & Accept Criteria details added under item 10.3 for materials placed in "spill-through" embankment. Spec R67 added for items 7.6 & 9.7 "Use of Geotextile or Geogrid". Test Method "T117a" deleted from Table in A4.2. Referenced Test Methods updated.	GM, IC (Mark Andrew)	16.09.09
Ed 3/Rev 10	Global 1.3.3 1.3.5	Clauses reworded to improve clarity. Text revised to direct imperatives style. References to G34 removed. Tables renumbered, and corresponding Table references in text updated. Reference to Spec Q for definitions of Hold Points and Witness Points added. Table reference number corrected.	GM, IC	17.05.2010

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 10 (cont'd)	1.4	<p>“DECC” changed to “DECCW”.</p> <p>Circumstances of when contaminated material is deemed to be unsuitable material clarified.</p> <p>Definitions of “you” and “your” added.</p> <p>Additional note on details of Foundation Treatment Types added to Figures R44.2 and R44.3.</p>		
	1.5 (b)	<p>Subclause expanded to specifically exclude ponding and consequent wetting up of pavement materials.</p>		
	1.7	<p>Details of EARTHWORKS PLAN expanded to include management of surplus excavated materials resulting from other works, and methods to ensure that materials placed conform to maximum rock size.</p>		
	2.1	<p>Clause added that surplus excavated material arising from other works must comply with Spec R44 if used in embankment construction.</p>		
	2.5.1	<p>Disposal of non-contaminated materials clarified.</p> <p>Pay Item reference for disposal of non-contaminated spoil outside the limits of the Works changed.</p>		
	2.5.2	<p>Pay Item reference for handling and disposal of contaminated spoil changed.</p>		
	2.6.3, 4.5.1	<p>Names of Government Authorities updated.</p>		
	2.7.1 (b)	<p>Embankments – part of clause unrelated to topsoil deleted.</p>		
	2.8.1	<p>Clause expanded to cover imported materials from sources that are not specified.</p> <p>Additional clause to verify response of material to pre-treatment.</p>		
	3.2.4, 3.4.5	<p>References to Spec R67 and Pay Item R67P1 added added.</p>		
	3.2.5	<p>Requirement added to adjust grading of drainage blanket to ensure its adequacy as a stable foundation.</p>		
	3.3	<p>Requirement added to inspect floor of terrace for unsuitable material.</p>		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 10 (cont'd)	6.1.2	Requirement added that materials placed in upper and lower layers must be similar. Table R44.4 on sampling frequency for Selected Material Zone (SMZ) lots added. Hold Point for placement of each SMZ lot added.		
	7.2.2	Requirement that placement methods must ensure conformity.		
	7.2.2	Method of repairing test holes added.		
	7.4.2	Benkelman Beam test - "Coefficient of Variation" changed to "Standard Deviation". Locations for undertaking Benkelman Beam test specified.		
	Annex A4.2	Clause 2.8.3 – CBR _{4 day} value to be "characteristic value (Q)". Test T108 deleted. Clause 3.4(b) – Test T102/T103 added against Plasticity Index. Note 2 expanded to cover suitability of binders.		
	Annex A6	Clause 7.4.2 – locations for undertaking Benkelman Beam test deleted.		
	Pay Item R44P1.1	Pay Item description changed and reworded to clarify intent.		
	Pay Item R44P1.2	Pay Item description changed and reworded to clarify intent. Clause reference and reference to Pay Items updated.		
	Pay Item R44P2	Pay Item scope revised to cover double handling of materials and to exclude incorporation of surplus material from other Works under Contract into embankments. Reference to relevant Pay Items updated.		
	Pay Item R44P3	Expanded to improve clarity.		
	Pay Item R44P4	Amended to accord with revised Clause 2.5 and revisions to other Pay Items.		
Pay Item R44P6	Rewritten.			
Pay Item R44P8	New Pay Item.			
Annex M	Referenced documents updated.			

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 11	5.4.1 Pay Item R44P3 Annex M	Reference to R59 added. Pay Item scope revised to exclude payment for imported or borrowed material for fill above and behind reinforced soil block. Referenced documents updated.	GM, IC (Bernie Chellingw' th)	08.07.2010
Ed 3/Rev 12	2.7.1 Annex A3 Annex B	Topsoil removal options corrected. "Place topsoil" options corrected. Pay Item R44P1.2 – references to clause 2.7.1 corrected.	GM, IC	16.08.10
Ed 3/Rev 13	3.2 3.3 Annex A4.2	Annexure reference to Shallow Embankments corrected. Reworded to improve clarity. Terrace depth locations clarified. Clause reference to site won Selected Material corrected.	GM, IC	01.11.10
Ed 3/Rev 14	1.4, 4.5.1 3.2.2 4.4 5.1.1.1 5.1.3 6.1.2, Annex A4.1 7.4.2	"DECCW" updated to "OEH" Bridging layer – minimum depth and maximum thickness specified; types of acceptable material for use specified Requirement for drainage at benches clarified. Grading and other properties of fill material for "spill-through" bridge abutments clarified. Clarifying note to Fig 7 added re batter orientation. Depth of excavation for Shallow Embankment adjoining cut/fill transition requirement clarified. Provision for Principal to exempt CBR and PI tests for embankment foundation inserted. Material in SMZ to be from same source only if specified in Annex A4.1. "Yes/No" option for above, and clarifying Note, inserted in Annex A4.1. Benkelman Beam limits for conformity clarified.	GM, IC	15.06.11

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
	Annex A3	UZF thickness requirements for cut/fill transitions and shallow embankments specified.		
Ed 3/Rev 14 (cont'd)	Annex A4.2	CBR limits for site won Selected Material clarified. CBR for fill at “spill-through” bridge abutment zone clarified to be characteristic value.		
	Annex A4.2	Note 2 added on requirement to select appropriate pre-treatment regime (T102 or T103). Subsequent Note renumbered. Note 4 added on rounding calculated CBR characteristic value to nearest 1%.		
	Annex A5	Note added to clarify how Moisture Range is expressed.		
	Annex A6	Shallow Embankment depth specified.		
	Annex A7	Minimum depth to bridging layer, and maximum thickness of bridging layer specified.		
	Annex M	Referenced documents updated.		
Ed 3/Rev 15	1.4	Definitions of “Contaminated material”, “Stripped Surface Level”, and “Unsuitable Material” revised.	GM, IC (M Andrew)	17.10.11
	2.5.2	Scope of work covered by Pay Item R44P8 clarified to include “classification in accordance with OEH Waste Classification Guidelines”.		
	2.7.1	Clause on removal of topsoil to nominal depths or as directed by the Principal deleted.		
	Table R44.7	Item 6.1 “Removal of Topsoil” – reference to Annex A3 in “Acceptance Criteria” column deleted.		
	Annex A3	Clause 2.7.1 – nominal depths for removal of topsoil deleted.		
	Pay Item R44P1.2	Measurement of topsoil volume based on nominal depth deleted.		
	Pay Item R44P8	Notes to Tender Documenter added. Scope of work under Pay Item clarified to include waste classification and haulage of contaminated material. Pay Item split into two sub-items: Pay Item R44P8.1 for Identified Contaminated Material, and Pay Item R44P8.2, as a Provisional Sum item, for other unknown contaminated material.		



EARTHWORKS

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from RMS Specification R44 Edition 3 Revision 14.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

RMS QA SPECIFICATION R44

EARTHWORKS

1 GENERAL

1.1 INTRODUCTION

The purpose of earthworks is to create a stable formation suitable for the pavement to be constructed so that it meets its intended life. Earthworks is undertaken using materials from within the site, or if suitable materials are not available from within the site, using suitable materials from offsite. Earthworks must be executed in conjunction with other processes including, but not limited to, surface and subsurface drainage works and environmental control measures.

The earthwork formation comprises a series of earth or rock structures, which must be constructed by the controlled excavation and placement of materials, and the use of associated Structural Treatments.

The material in the Upper Zone of Formation must be selected, placed and controlled to achieve the best possible support for the road pavement.

The execution of earthworks involves safety and environmental risks and attention is drawn to the requirements of the relevant RMS Specifications.

1.2 SCOPE

The work to be executed under this Specification is summarised in Table R44.1.

Table R44.1 – Summary of Earthworks Process

Task	Reference
General – Prepare and submit for consideration an Earthworks Plan and Project Quality Plan. Protect the earthworks and the environment by installing and maintaining effective drainage, and control measures for erosion and sedimentation. Set out the earthworks by survey, and carry out surveys for process control and determining quantities.	Clause 1
Materials – Manage the use of materials from within the site, stockpile sites, remove and stockpile topsoil, remove, replace or treat any unsuitable material, spoil or borrow, and import materials as necessary.	Clause 2
Foundations – Prepare and compact the floors of cuttings, cut/fill transitions and foundations for embankments, including subsurface drainage, and the use of drainage blankets, bridging layers, stabilisation, and geotextiles/geogrids.	Clause 3
Cuttings – Excavate cuttings with specified benches, drainage and batter tolerances. Blasting of rock may be required.	Clause 4
Embankments – Place and compact suitable material to the specified dimensions and batter tolerances, including subsurface drainage and the use of rock facing, selected backfill to structures, stabilisation, and geotextiles/geogrids. Control the quality of material for the Upper Zone of Formation.	Clause 5
Structural Treatments – Where shown on the Drawings, supply, place and compact Upper Zone Material and verge material to the specified quality over the full length of the earthworks, or provide other geotechnical treatments as required.	Clause 6
Additional Conformity Requirements – Complete the earthworks to the specified quality and tolerances. Undertake all inspection and testing necessary to demonstrate that the quality requirements of this Specification are achieved.	Clause 7

The earthworks process outline by activity sequence is given in Figure R44.1

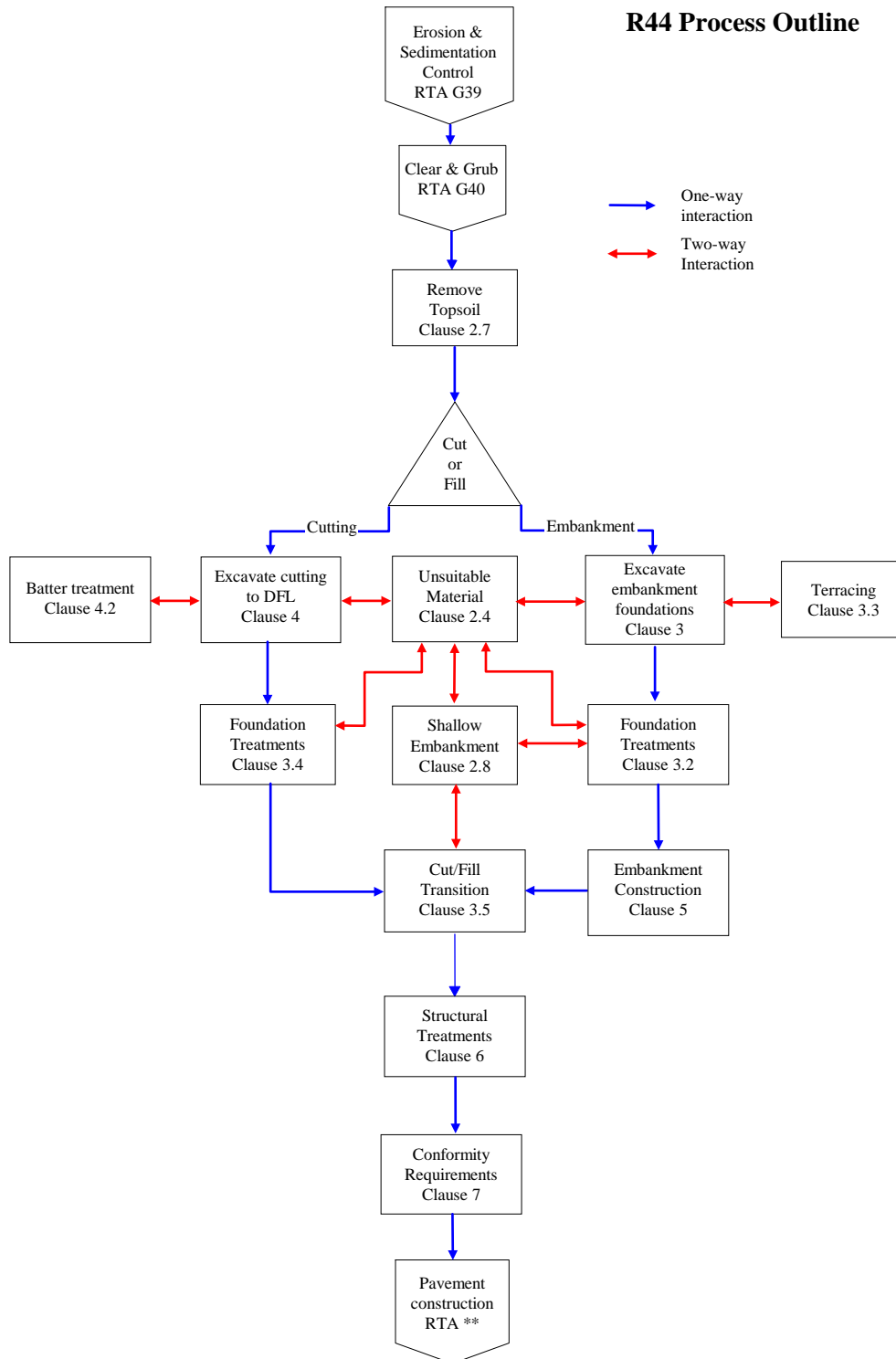


Figure R44.1 – Earthworks Process Outline By Activity Sequence

Notes:

- (a) Notwithstanding that some clearing and grubbing may be necessary before erosion and sedimentation control can commence, staged construction of drainage works including sedimentation control, culverts, catch drains and ancillary activities must generally precede clearing and grubbing activities.
- (b) Pavement construction is to be carried out to the appropriate RMS specifications (shown as “RMS ** ” above) included within the Contract.

1.3 STRUCTURE OF SPECIFICATION

This Specification includes a series of Annexures that detail additional requirements.

1.3.1 Project Specific Information

Details of work specific to this Contract are shown in Annexure R44/A.

1.3.2 Measurement and Payment

The method of measurement and payment is detailed in Annexure R44/B.

1.3.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure R44/C list the HOLD POINTS and WITNESS POINTS that must be observed. Refer to Specification RMS Q for the definitions of HOLD POINTS and WITNESS POINTS.

The records listed in Annexure R44/C are Identified Records for the purposes of RMS Q Annexure Q/E.

1.3.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements shown in Clause 1.7 and must be implemented.

If the Contract does not require you to implement a PROJECT QUALITY PLAN, the documents shown in Clause 1.7 must be submitted to the Principal for consideration at least 5 working days prior to work commencing and must be implemented.

1.3.5 Minimum Frequency of Testing

The Inspection and Test Plan must nominate the proposed testing frequency to verify conformity of the item, which must not be less than the frequency specified in Table R44.7. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of RMS Q.

1.3.6 Referenced Documents

Unless otherwise specified or is specifically supplied by the Principal, the applicable issue of a referenced document is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure R44/M.

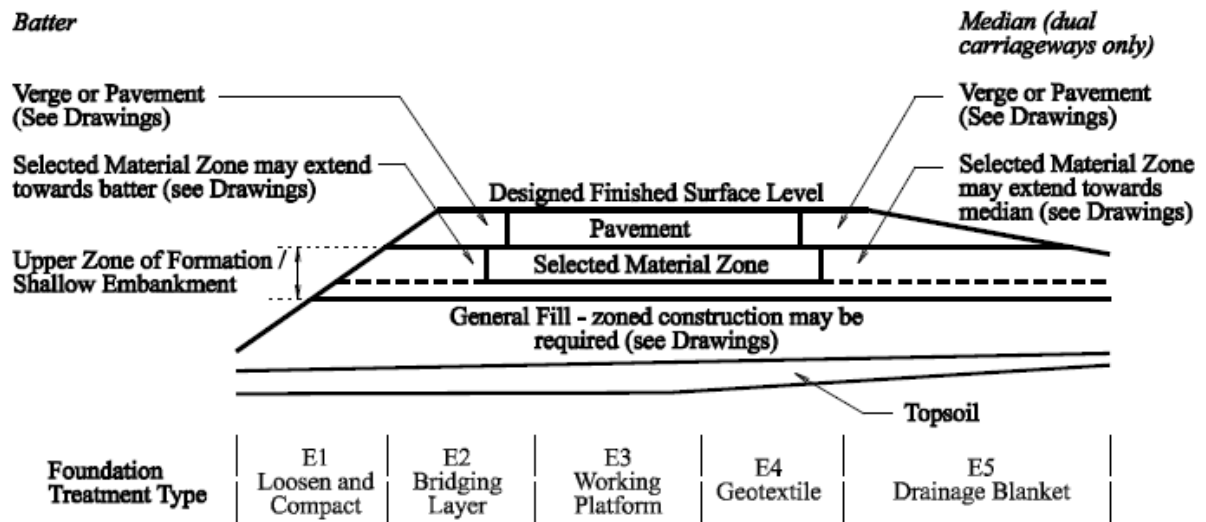
1.4 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

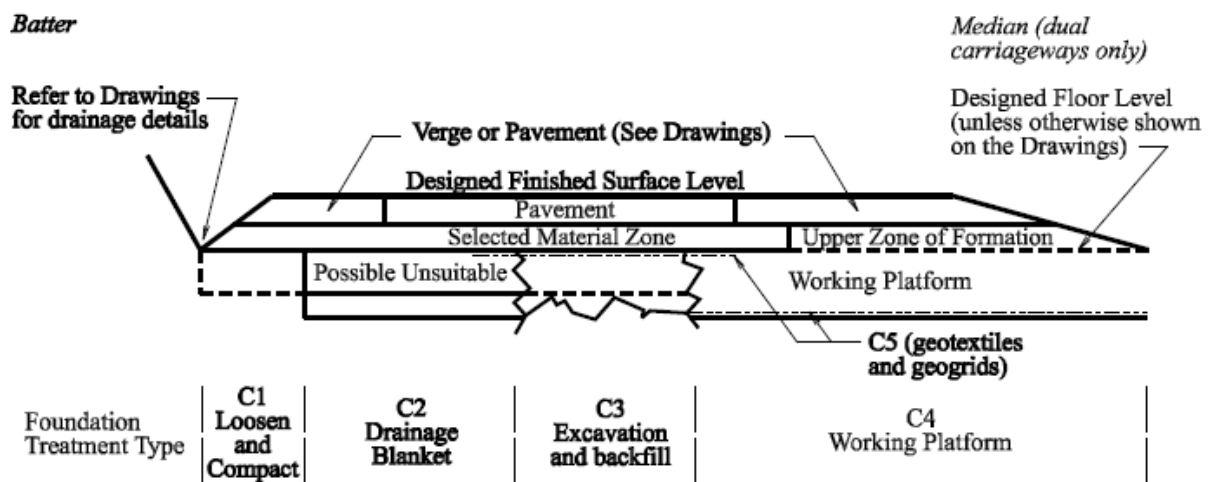
Borrow Site	An area (either within or outside the Site), other than the cuttings and specified excavations, from which material may be excavated for placing in embankments.
Contaminated material	Material classified as Restricted, Hazardous or Special Waste in accordance with OEH Waste Classification Guidelines.
Cutting	An earth or rock excavation within the Works site that is made below an existing surface to create the road formation.
Designed Floor Level	The level of excavation below the underside of the pavement less the thicknesses of the Selected Material Zone and any designed Foundation Treatment (other than those included in this Specification).
Earthworks	The activities covered by this Specification.
Earth fill	See Clause 5.1.1. Material consisting of fine material and coarse particles distributed throughout the layer filling voids so that when compacted produces a dense stable embankment.
Embankment	An earth or rock fill structure above an existing and/or excavated surface to create the road formation.
Formation	The earthworks structure including all Foundation and Structural Treatments on which the road pavement will be constructed.
Foundation Level	The level from which the formation is constructed. This is the level achieved after excavation is undertaken for foundation treatments and the removal of unsuitable material.
Foundation treatment	A special layer or treatment zone at the base of a formation for the purpose of reinforcing, strengthening or drainage.
General fill	Embankment material other than the Upper Zone of Formation, and Foundation Treatments.
Imported material	Material incorporated into the earthworks from sources other than that generated by the construction of cuttings and specified excavations.
Joint survey	See Specification RMS G71. A survey carried out in the presence of, or in conjunction with, the Principal's surveyor.
Limit of Works	A boundary within which the contracted works are undertaken. This is either indicated in Specification RMS G1 or shown on the Drawings.
Road Formation	Same as Formation.
Rock fill	See Clause 5.1.2. Material composed of hard, sound, durable rock with 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 particles and not from the compaction of finer material.

Roller pass	Compactive effort of a single movement of the roller over all segments of the lot nominated in the Project Quality Plan.
Selected Material	Material of specified quality used in the Selected Material Zone as specified in Clause 2.8.3 and Annexure R44/A4.2.
Selected Material Zone	The top part of the Upper Zone of Formation in which material of a specified higher quality is required.
Shallow Embankment	A part of an embankment where the depth from the top of formation to the Stripped Surface Level is less than the depth specified in Annexure R44/A6.
Spoil	Spoil is surplus material and/or contaminated material from excavations under the Contract which is not required to complete the Works as specified, or material from excavations under the Contract whose quality renders it unacceptable for incorporation in the Works.
Stripped Surface Level	Level of the surface after stripping of topsoil.
Structural treatment	A special layer or zone within a formation for the purpose of reinforcing or strengthening. It also includes other treatments where shown on the Drawings or directed by the Principal.
Topsoil	Topsoil is natural surface soil that may contain organic matter.
Transition Zone	The area of special formation treatment where the road formation transitions from a cutting to an embankment as shown in Figure R44.6 and described in Clause 3.5.
Unsuitable Material	<p>Unsuitable material is that occurring below the Designed Floor Level of excavations and below the Stripped Surface Level beneath embankments, which the Principal deems to be unsuitable for embankment or pavement support in its present position in accordance with Clause 2.4.</p> <p>It excludes materials excavated for Foundation Treatment Types C1 to C5 inclusive.</p> <p>The Principal will deem any contaminated material occurring below the Designed Floor Level of excavations and below the Stripped Surface Level beneath embankments to be unsuitable material if it cannot remain in its existing position.</p>
Upper Zone of Formation	The Upper Zone of Formation includes the Selected Material Zone and is at the top of the formation. The depth and quality of the material is specified in Annexure R44/A3 and R44/A4.2.
Upper Zone Material	Material of specified quality used in the Upper Zone of Formation.
Working platform	See Foundation and Structural Treatment. A construction expedient (even if directed).



[See Figures R44.4(a) to (e) for Details of Foundation Treatments Types for Embankments]

Figure R44.2 – Embankment Nomenclature



[See Figures R44.5(a) to (d) for Details of Foundation Treatments Types for Cuttings]

Figure R44.3 – Cutting Nomenclature

1.5 PROTECTION OF EARTHWORKS

Your responsibility for care of the Works includes the protection of earthworks. Specifically:

- Install and maintain effective erosion and sedimentation control measures in accordance with Specifications RMS G35 or RMS G36, and Specifications RMS G38 or RMS G39.
- Maintain drainage of all working areas at all times to ensure run-off of water without scour, except where ponding is off the formation and forms part of a planned erosion and sedimentation control system. Do not allow water to pond in the working areas resulting in wetting up of the existing pavement or formation or foundation material.

- (c) When rain is likely or when work is not proposed to continue in a working area on the following day, take precautions to minimise ingress of water into earthworks material. Seal off ripped material remaining in cuttings and material placed on embankments with a smooth drum roller.
- (d) Should earthworks material become over-wet (above the specified moisture content for compaction), you are responsible for replacing and/or drying out the material, and for any consequent costs. Refer also to Clauses 2.4 and 7.2.
- (e) Do not allow the earthworks material to dry out to the point where t excessive shrinkage occurs in the embankment, and the surface is pulverised by traffic generating excessive dust.

1.6 SURVEYING

1.6.1 Setting Out of Earthworks

The position and extent of all cuttings and embankments shown on the Drawings and transitions from cuttings to embankments must be marked, using pegs and batter profiles or equivalent, prior to commencement of construction. Setting out must take into account any formation widening necessary to accommodate the design requirements.

Where the Specification refers to dimensions or setting out relevant to the underside of the Selected Material Zone, and the Drawings do not provide for a Selected Material Zone, adopt the dimensions for setting out relevant to the underside of the pavement.

1.6.2 Joint Survey

Where specified in Annexure R44/A1 or where directed by the Principal, carry out a joint survey in accordance with RMS G71. The Survey Report, where specified, must include a computer file to produce an accurate digital model of the surface using MX software.

1.6.3 Specified Surveys

To determine quantities for payment or for process control, carry out the surveys specified in Annexure R44/A1.

1.7 EARTHWORKS PLAN

The EARTHWORKS PLAN must address all requirements and constraints imposed by the Specification, the physical conditions at the site and your proposed work methods. The EARTHWORKS PLAN must include details of:

- (a) excavation sequence and proposals for the management of all materials in the earthworks, including the use of topsoil and surplus excavated material resulting from other works under the Contract (such as trenching for drainage pipes or utility conduits), procurement and control of imported materials, materials from borrow sites, and spoil (Clauses 1.6, 2, and 4) including details for each construction stage;
- (b) preliminary identification of zones of potentially unsuitable materials, and management of the disposal and replacement of the unsuitable materials (Clause 2.4);

- (c) methods to be employed to ensure that materials of the specified or higher quality are identified, made available and incorporated into the Works at the locations where the quality of the material has been specified. The details will include any sorting, isolating, processing, and placement of the materials proposed for such use. Processing may include screening, crushing, blending, and modification of materials (Clauses 2.8 and 6);
- (d) methods to be employed to ensure that all materials placed within the Works conform to maximum stone (or rock) size and other dimensional requirements, where specified (Clauses 2.8, 3, and 5);
- (e) sources of materials and testing proposed for Structural Treatments (Clause 2.8);
- (f) procedures proposed for procuring and managing materials from borrow sites where applicable (Clause 2.6);
- (g) procedures proposed for the treatment of foundations (Clause 3);
- (h) procedures and mass haul diagram proposed for the management of excavation and the placement of earth and rock fill embankments, and rock facing, to ensure that no deficiency of earth fill occurs and conformity requirements are met (Clauses 2.1, 2.2, 4, 5 and 7);
- (i) methods to demonstrate that the specified compaction has been achieved over the full depth of each layer and that the specified layer thickness is not exceeded (Clauses 5, 6 and 7);
- (j) procedures proposed for protection of earthworks, including drainage of working areas, minimising ingress of excess water into earthworks, dealing with over-wet materials and over-dry materials (Clause 1.5); and
- (k) methods to ensure the effective use of nominated stockpile sites, including maximising the volume of material to be stored at each location. Do a preliminary assessment of likely stockpiled quantities and the available quantities that can be placed in nominated stockpile areas. Any inadequacies must be brought to the attention of the Principal together with other potential stockpile sites (Clause 2.3).

Notwithstanding the staged submission provisions of RMS Q, provide the EARTHWORKS PLAN in its entirety with the first stage submission of the PROJECT QUALITY PLAN.

Amend the EARTHWORKS PLAN in accordance with the requirements of RMS Q.

Submit to the Principal an updated EARTHWORKS PLAN:

- (a) at intervals not exceeding three months during the currency of the Contract;
- (b) within two weeks of any change of the EARTHWORKS PLAN for any Milestone or for the Works; and
- (c) within two weeks of receipt of the Principal's determination in respect of the earthworks construction, if such determination alters any details in the EARTHWORKS PLAN.

An updated EARTHWORKS PLAN must show:

- (i) the same level of detail as specified for the original EARTHWORKS PLAN;
- (ii) the "as-built" EARTHWORKS PLAN in respect of all work completed up to the date of updating; and
- (iii) reasons for any deviation from the previously submitted EARTHWORKS PLAN, and strategies if any, to correct any deviation within your control.

2 EARTHWORKS MATERIALS

2.1 GENERAL

You are responsible for:

- (a) any of your assumptions made in relation to the nature and types of the materials as encountered in excavations or imported, and the bulking and compaction characteristics of all such materials which are then incorporated in the Works;
- (b) determining suitable sources of material and any processing needed to satisfy the quality requirements; and
- (c) the design, and the cost of construction and/or maintenance of all tracks, roads, haul roads, pads and other earthworks structures required for the proper execution of the Works.

General earthworks includes all types of material, both earth and rock, encountered during excavation and placed in embankments or disposed of in other than embankments.

When surplus excavated material from other works under the Contract (such as trenching for drainage pipes or utility conduits) is used in the construction of embankments, the requirements of this specification also apply to such material.

If you cause a deficiency of material for embankment construction and other specified materials, by electing not to use acceptable material from excavations in the embankments or by constructing embankments with dimensions other than those shown on the Drawings or authorised in accordance with Clause 5.2, you must make good that deficiency from sources of material meeting the quality requirements specified in Clause 5.1. The cost of making good such deficiency of material must be borne by you.

2.2 MATERIALS MANAGEMENT

Manage your procurement of materials, whether obtained from sources external to the Site or from nominated sources or from within the Site, to ensure that the materials incorporated into the earthworks is of the specified quality.

A mass haul diagram detailing the types and quantities of materials to be excavated from each cutting and source and the locations for placement within the Works must be included in the EARTHWORKS PLAN.

2.3 STOCKPILE SITES

Locate stockpile sites so that they are outside the drip lines of trees and such that material from the stockpiles do not enter drainage lines or watercourses. Arrange stockpile sites to minimise damage to natural vegetation and trees and maintain the existing surface drainage. Locate the stockpile sites such that the stockpiled material is accessible for carting away at any time.

Carry out any clearing and grubbing required for these sites in accordance with Specification RMS G40. Install and maintain appropriate erosion and sedimentation control measures, in accordance with RMS G38 or RMS G39.

The Principal will only consider requests for new stockpile sites if all stockpile sites nominated on the Drawings have already been allocated for full use. You must obtain all the necessary written approvals, including environmental approvals, and provide copies of such approvals to the Principal when seeking to use a stockpile site other than those nominated. Such requests must be made at least ten working days before stockpiling is due to commence, specifying the maximum dimensions of the proposed stockpile.

Following completion of the Works, carry out restoration of the stockpile sites in accordance with Specification RMS R178.

2.4 UNSUITABLE MATERIAL

After the stripping of topsoil covering each embankment foundation or upon reaching the Designed Floor Level of cuttings, earthworks processes are held (refer to Hold Points in Clause 3.2 and Clause 3.4) to allow inspection of the foundation.

Where unsuitable material is found, such unsuitable material must be excavated to the extent directed by the Principal.

Promptly notify the Principal of any areas of the foundation or any layer within the formation that rut excessively, yield or show signs of distress or instability.

HOLD POINT

Process Held:	Replacement of each lot of unsuitable material.
Submission Details:	Notification that unsuitable material has been removed as directed.
Release of Hold Point:	The Principal will inspect the excavation and may direct removal of further material as unsuitable material prior to authorising the release of the Hold Point.

Material removed as unsuitable must be incorporated in embankments in accordance with Clause 5 unless directed to spoil in accordance with Clause 2.5.

Remove from the site any contaminated materials that cannot be treated and re-used within the Works, or stockpiled on the site. Remove the material from the site in accordance with Clause 2.5 of this specification, and Specification RMS G35 or RMS G36 as appropriate.

Material that has been removed in accordance with this Clause must be either:

- (a) replaced with suitable material in accordance with Clause 5.1;
- or
- (b) if directed, replaced with foundation treatments in accordance with Clause 3 or as shown on the Drawings.

The replacement of unsuitable material is deemed to form part of embankment construction.

All costs associated with reworking or replacing any material that has become unsuitable because of inappropriate construction activities must be borne by you. Inappropriate construction activities include poor surface drainage, restricted or inoperative subsurface drains, contamination, excessive sized plant where the imposed load exceeds the material strength, poorly maintained plant allowing leakage of oils and water onto the formation, and leaving the surface unsealed allowing moisture ingress during wet weather.

Before and after removal of unsuitable material, carry out a survey in accordance with Specification RMS G71 to determine the surface levels at sufficient locations to later determine the volume of unsuitable material removed. Where shown in Annexure R44/A1, the survey must be a Joint Survey in accordance with Clause 1.6. Alternatively, the Principal may agree to determination of volume by measurement and calculation.

2.5 SPOIL

2.5.1 Non-contaminated Materials

Except for contaminated materials, dispose of spoil generated from the Works under the Contract in the manner and at locations authorised or agreed to by the Principal. Use up all available areas within the site before proposing alternative locations.

Dispose of non-contaminated material by the following means:

- (a) flatter batter slopes being provided on embankments; or
- (b) uniform widening of embankments; or
- (c) stockpiling within the site; or
- (d) disposal at an approved, off-site location.

Embankment widening or batter flattening work is deemed to form part of the embankment construction and must be carried out in accordance with Clause 5. Spread and compact the spoil as specified in Clauses 5 and 7 for material in embankments. Maintain effective drainage for the whole of the embankment.

For spoil locations outside the limits of the Works, obtain all necessary written approvals, including environmental approvals, and provide copies to the Principal seven days prior to commencing the disposal of material off-site. Such spoil material located outside of the Site is deemed to be your property.

Payment for disposal of spoil within the limits of the Works is deemed to be included in the rates generally. However, where an approved location for spoil disposal is outside the limits of the Works, payment for disposal of spoil will be made under Pay Item R44P6 or Pay Item R44P1.2.

2.5.2 Contaminated Materials

Contaminated materials must be stockpiled and/or removed from the site in accordance with Clause 2.4 of this Specification and Specification RMS G35 or RMS G36, as applicable. If disposal methods and sites are not specified, it is your responsibility to determine the location(s) and method(s) for the disposal of the contaminated material.

Notify the Principal at least 24 hours prior to the removal of any contaminated material from the Works, and provide details of the proposed method and location of disposal.

Payment for excavation and stockpiling of contaminated material on site will be made under Pay Item R44P1.2 or Pay Item R44P2. Additional payment will be made under Pay Item R44P8 for the identification, treatment, classification in accordance with OEH Waste Classification Guidelines and disposal of the contaminated material at sites legally authorised to accept the contaminated material.

Treatment and disposal of contaminated material caused by your operations will be at no cost to the Principal.

2.6 BORROW SITES

2.6.1 General

Detail the selection and quality control of materials obtained from borrow sites in the EARTHWORKS PLAN. Materials to be incorporated in the Works must comply with the requirements of this Specification.

Where any material is to be obtained from borrow sites, site preparation must be in accordance with Clause 2.7.1 and Specification RMS G40. Carry out restoration of borrow sites in accordance with Specification RMS R178.

2.6.2 Specified Borrow Sites

Where borrow sites are specified, the edges of any batter from the resulting excavation must not be closer than 3 m to any existing or proposed fence line, road reserve boundary or edge of excavation or embankment. Borrow sites must have adequate drainage outlets.

Cut batters must be as specified in Annexure R44/A4.1, and the borrow sites must be left in a tidy and safe condition and meet the requirements of Specification RMS G35 or RMS G36, as applicable.

2.6.3 Contractor Arranged Borrow Sites

For borrow sites arranged by you, take responsibility for obtaining any permits required for entry on to the land and for payment of any royalty for such borrow material.

Comply with any requirements of the Environmental Planning and Assessment Act, the, the Office of Rural Affairs (Dept of Lands), Department of Planning, Natural Resources Commission, the local Councils, and landowners as appropriate. Provide copies of all approvals to the Principal ten days prior to commencing work at these borrow sites.

You are responsible for all costs involved in opening up, maintaining and restoring any borrow sites arranged by you.

2.7 TOPSOIL

2.7.1 Removal of Topsoil

Commence removal of topsoil on any section of the Works only after erosion and sedimentation controls have been implemented and clearing, grubbing and removal of cleared materials has been completed on that section of the Works.

Do not remove topsoil in locations where a bridging layer is to be constructed in accordance with Clause 3.2.2, unless directed otherwise by the Principal.

Where specified in Annexure R44/A3 or where directed by the Principal, after removal of the topsoil,:

- (i) stockpile the topsoil within the work site in accordance with Clause 2.5.1, covered sufficiently to prevent weed seeds from germinating; or
- (ii) stockpile topsoil as a windrow longitudinally and adjacent to the toe of embankment batter,
- (iii) spoil the topsoil outside the work site in accordance with Clause 2.5.1; or
- (iv) if the topsoil has been identified as contaminated material, spoil the topsoil in accordance with Clause 2.5.2; or

otherwise, stockpile the topsoil separately from other materials and clear of the Works for use in revegetation.

2.7.2 Topsoil Stockpiles

Locate topsoil stockpiles in accordance with Clause 2.3.

Before stockpiling topsoil, carry out a survey in accordance with RMS G71 to determine the surface levels at each stockpile site at sufficient locations to later determine the volumes of topsoil placed at the site. When shown in Annexure R44/A1, the survey must be a Joint Survey in accordance with Clause 1.6.

Topsoil stockpiles must:

- (a) be free from subsoil, other excavated materials, contaminated materials, refuse, clay lumps and stones, timber or other rubbish;
- (b) be trimmed to a regular shape to facilitate measuring with a height not exceeding 2.5 m and batter slopes not steeper than 2H:1V;
- (c) have their batters track rolled or stabilised by other means acceptable to the Principal; and
- (d) be seeded in accordance with Specification RMS R178, to encourage vegetation cover. Seeding must be carried out progressively within seven days of completion of each 500 m² of exposed batter face.

2.7.3 Survey after Removal of Topsoil

After removing the topsoil, determine the surface levels in each cutting and embankment at sufficient locations to determine the volume of excavation for general earthworks and the volume of unsuitable material.

When shown in Annexure R44/A1, the survey must be a Joint Survey in accordance with Clause 1.6.

HOLD POINT

Process Held:	Any works which will alter the ground surface as surveyed.
Submission Details:	At least three working days before the proposed date for altering the surfaces, submit a Survey Report of the existing surface levels, and a notification that the set out specified in Clause 1.6.1 and the set out of the cut/fill intersection line and Transition Zone specified in Clause 3.5 have been marked.
Release of Hold Point:	The Principal will inspect the surfaces and set out and may direct further action prior to authorising the release of the Hold Point. Further action may include altering the limits of the cut to fill transition.

2.8 MATERIAL IN UPPER ZONE OF FORMATION, SHALLOW EMBANKMENTS AND VERGES

The material placed in the Upper Zone of Formation must be selected, placed and controlled to meet the Contract requirements. The Upper Zone of Formation in embankments consists of 2 main components as shown in Figure R44.2. The top component of Upper Zone of Formation is the Selected Material Zone.

2.8.1 Material Source

Unless specified to be imported in Annexure R44/A4.1 (from sources as detailed in Annexure R44/A4.1), source Upper Zone Material of the specified quality from cuttings within the Limit of Works.

In the event of a planned or unplanned shortage of site won Upper Zone Material, the sources of Imported Material must be those detailed in Annexure R44/A4.1 or as approved by the Principal.

Where the source of imported material is not stated, source them from legally operating quarries or recycling facilities or other sources acceptable to the Principal. Provide the Principal with details of the proposed source locations, quantities and types of material before the imported material is delivered to site.

Prior to testing, pre-treat any Upper Zone Material which are susceptible to breakdown or weathering, such as shales, by crushing to size, artificial weathering in accordance with Test Method RMS T103 and repeated compaction in accordance with Test Method RMS T102 (Method A).

Before placement of material from any source, establish the response of that material to pre-treatment and adopt an appropriate pre-treatment regime for subsequent conformity testing.

2.8.2 Upper Zone of Formation Material other than Selected Material

2.8.2.1 Site Won Material

Material in the Upper Zone of Formation and in Shallow Embankments, for the thickness and depth specified in Annexure R44/A3, must:

- (a) have a CBR value as that stated in Annexure R44/A4.2;
- (b) have a PI values as that stated in Annexure R44/A4.2; and

- (c) where safety barriers, posts, subsurface drainage or services are to be installed (either as part of this Contract or subsequently):
 - (i) be free from stone larger than 100 mm maximum dimension; and
 - (ii) have no less than 50% passing the 19 mm sieve.

2.8.2.2 Imported Material

Sources and quality of Imported Material must be as detailed in Annexure R44/A4 or approved by the Principal.

Where safety barriers, posts, subsurface drainage or services are to be installed (either as part of this Contract or subsequently), then Clause 2.8.2.1 part (c) will also apply.

2.8.3 Selected Material

2.8.3.1 Site Won Selected Material

Material excavated from within the Site and processed, placed and compacted in the Selected Material Zone must meet the following requirements:

- (a) be free from stone larger than 100 mm maximum dimension and have no less than 50% passing the 19mm sieve;
- (b) have a characteristic CBR value as stated in Annexure R44/A4.2, for the fraction passing 19.0 mm AS sieve; and
- (c) have a Plasticity Index as stated in Annexure R44/A4.2.

When chemical modification is specified in Annexure R44/A3 or shown in the Drawings, or directed, the Selected Material immediately prior to incorporation of the stabilising agent must satisfy these requirements.

2.8.3.2 Imported Selected Material

Material imported for the Selected Material Zone must meet the requirements of Specification RMS 3071.

2.8.4 Verge Material

2.8.4.1 Site Won Verge Material

Material excavated from within the Site and processed, placed and compacted in the verges must meet the following requirements:

- (a) be free from stone larger than 50 mm maximum dimension and have no less than 50% passing the 19mm sieve;
- (b) have a CBR value as stated in Annexure R44/A4.2, for the fraction passing 19.0 mm AS sieve; and
- (c) have a Plasticity Index within the range specified in Annexure R44/A4.2.

When chemical stabilisation is specified, these requirements must apply to the verge material immediately prior to incorporating the stabilising agent.

2.8.4.2 Imported Verge Material

Material imported to the project site and placed and compacted in the verges must meet the requirements of RMS 3071 for Selected Material Type B except that it must:

- (a) have a CBR value not less than that specified in Annexure R44/A4.2, for the fraction passing 19.0 mm AS sieve; and
- (b) have a Plasticity Index within the range specified in Annexure R44/A4.2.

Where safety barriers, posts, subsurface drainage or services are to be installed (either as part of this Contract or subsequently), then Clause 2.8.2.1 part (c) will apply.

3 FOUNDATIONS

3.1 GENERAL

This section contains requirements for the treatment of the foundations of the formation at the base of embankments and in the floors of cuttings.

Embankment foundation treatments are applied after removal of unsuitable material, excavating areas of Shallow Embankment to provide minimum embankment height (refer to Clause 5.1.3), and in conjunction with terracing of hillside embankment foundations.

Foundation treatments in cuttings are applied after excavation to the Designed Floor Level and removal of unsuitable material.

Taking into account the site, traffic, access, environmental/climatic conditions and in situ materials, select your equipment and techniques and use them in such a manner that minimises surface heaving or other foundation damage during preparation of the foundation and construction of overlying layers.

Unless otherwise specified, the cost of foundation treatments is deemed to be included in the rates generally.

Construct other measures (such as trench and foundation drains, constructed in accordance with Specification RMS R33) in conjunction with foundation treatments as detailed in the Specification, as shown on the Drawings, or as authorised or directed by the Principal.

3.2 FOUNDATIONS FOR EMBANKMENTS

Present the embankment foundation area for inspection by the Principal prior to placing embankment materials.

HOLD POINT

Process Held:	Preparation of each lot of embankment foundation.
Submission Details:	<ul style="list-style-type: none"> (a) Survey report; (b) Notification of completion of: clearing operations; and, (c) in the areas other than beneath Shallow Embankments, notification of: <ul style="list-style-type: none"> (i) topsoil removal in accordance with Clause 2.7; or (ii) flattening/mowing of grasses if indicated on the Drawings or specified; or, (d) in the areas beneath Shallow Embankments: <ul style="list-style-type: none"> (i) notification that topsoil has been removed and surface excavated in accordance with Clause 5.1.3; and (ii) CBR and PI test results.
Release of Hold Point:	<p>The Principal:</p> <ul style="list-style-type: none"> (a) will consider the submitted documents; (b) may inspect the excavated floor of cutting and embankment foundation; and (c) may direct further action prior to authorising the release of the Hold Point. Further action may include treatment in accordance with Clause 2.4, treatment in accordance with Specification RMS R50, or treatments in accordance with this Clause.

For the material in the foundations of Shallow Embankments, as defined in Annexure R44/A6, determine the CBR and Plasticity Index values by the Test Methods stated in Annexure R44/A4.2.

Maintain the embankment foundation in its conforming condition until embankment construction commences. You will bear the cost of additional foundation treatments required as a result of damage to the foundations that is caused or allowed to occur by you.

Unless otherwise shown on the Drawings or directed by the Principal, treat foundations for embankments in accordance with Type E1. Where shown on the Drawings or directed by the Principal, treat foundations for embankments in accordance with Type E2 to Type E6. The treatments are described below and depicted in Figures R44.4 (a), (b), (c), (d), (e) and (f) or under Clause 3.2.6. These must be installed, individually or in combination, as shown on the Drawings, or specified, or shown in Annexure R44/A7, or as authorised by the Principal.

3.2.1 Type E1 Treatment – Loosen and Compact

Unless otherwise specified or directed by the Principal, and after any unsuitable material has been treated or replaced, the remaining area of the foundation must be:

- (i) prepared for embankment construction by loosening by ripping the material exposed (to a depth of 300 mm);
- (ii) terracing as required by Clause 3.3;
- (iii) adjusting the moisture content of the loosened material; and

- (iv) compacting as specified in Clause 7.

No account will be taken of the volume involved in loosening when measuring the volume of excavations for payment.

Batter

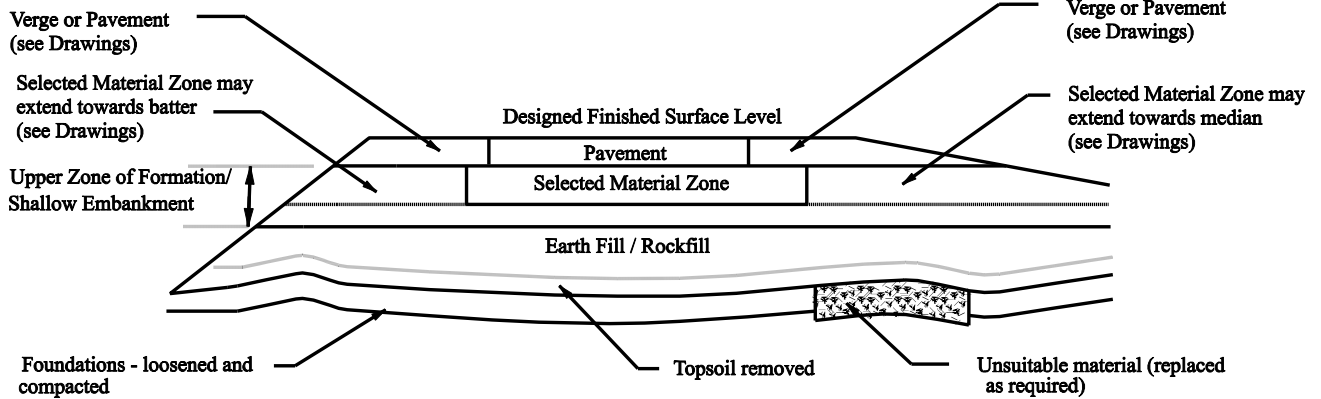


Figure R44.4(a) – Embankment Foundation Treatment – Type E1

3.2.2 Type E2 Treatment – Bridging Layer

Where specified or where directed by the Principal, or where you demonstrate that it is impracticable to achieve the degree of compaction specified for the foundation in Clause 7, the Principal may approve the placement of a bridging layer.

Do not place a bridging layer within the depth below the underside of the pavement stated in Annexure R44/A7. The thickness of the bridging layer must not exceed the value stated in Annexure R44/A7.

The bridging layer must be constructed from earth fill or rock fill materials conforming with the requirements of Clauses 5.1.1 or 5.1.2. If earth fill is used, it must consist of granular material with strong mechanical interlock and low sensitivity to moisture. The bridging layer material must have sufficient strength to provide a stable platform on which an earthworks layer can be constructed.

The material must be end-dumped and spread in a single layer and in sufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Clause 7 will not apply to the bridging layer.

If specified or directed by the Principal, place a geotextile complying with the quality requirements of Specification RMS R63.

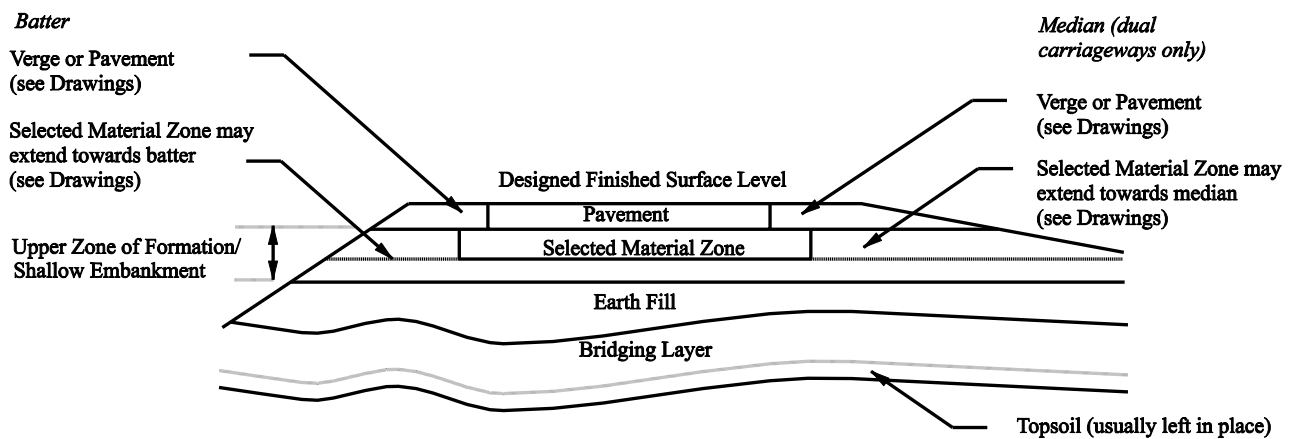


Figure R44.4(b) – Embankment Foundation Treatment – Type E2

3.2.3 Type E3 Treatment – Working Platform

Where specified or where directed by the Principal, strengthen the insitu material to form a Working Platform on which to construct the formation. The Working Platform is created by the chemical stabilisation of in situ material in accordance with Specification RMS R50. When specified or directed, this work will be paid for under the appropriate Pay Items for STABILISATION (RMS R50).

Alternatively, a Working Platform of imported stabilised material may be specified in Annexure R44/A4 or directed. When specified or directed, this work will be paid for under the appropriate Pay Items for STABILISATION (RMS R50) and Imported Material (Pay Item R44P3).

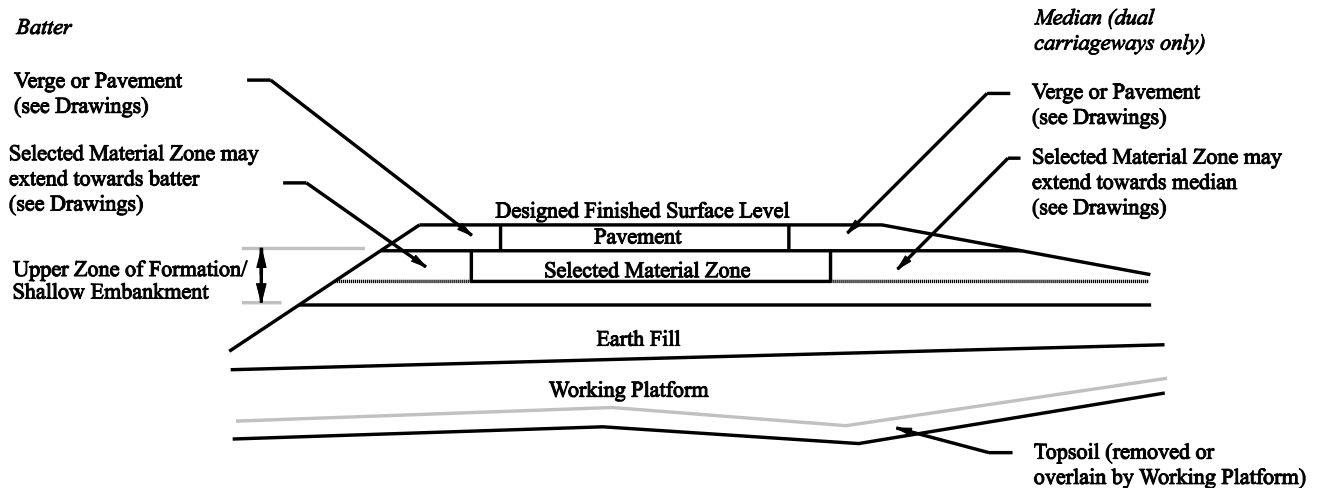


Figure R44.4(c) – Embankment Foundation Treatment – Type E3

3.2.4 Type E4 Treatment – Geotextile/Geogrid Layer(s)

Where specified or directed by the Principal, construct Type E4 treatment, consisting of a layer or layers of geotextile and/or geogrid. Supply and place the geotextile and geogrid in accordance with Specifications RMS R63 and RMS R67 respectively.

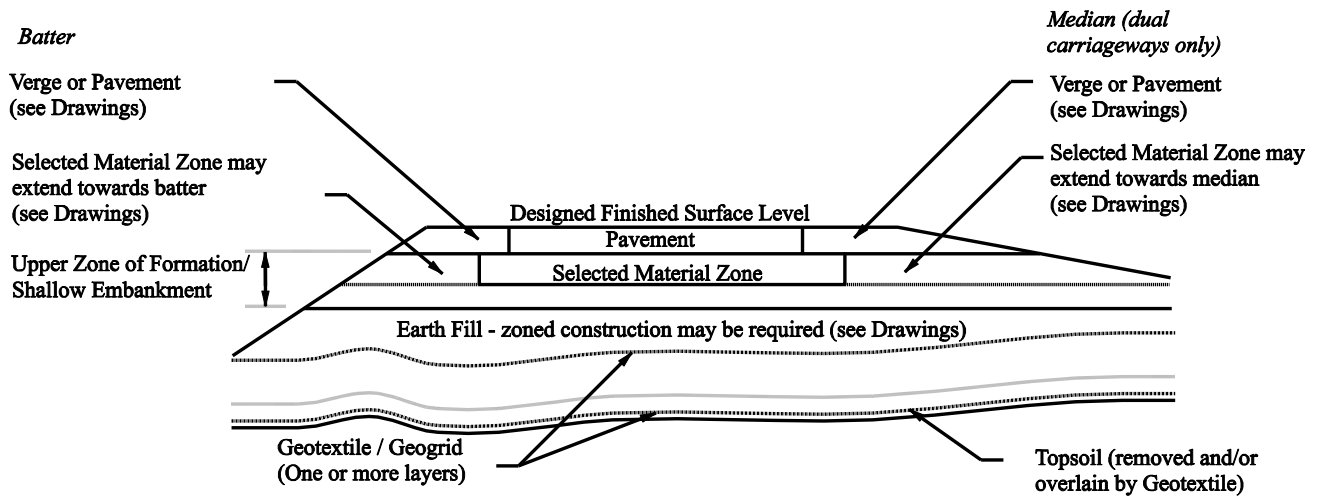


Figure R44.4(d) – Embankment Foundation Treatment – Type E4

3.2.5 Type E5 Treatment – Drainage Blanket

Where specified or directed by the Principal, treat embankment foundations with a drainage blanket consisting of a rock layer enclosed by geotextile.

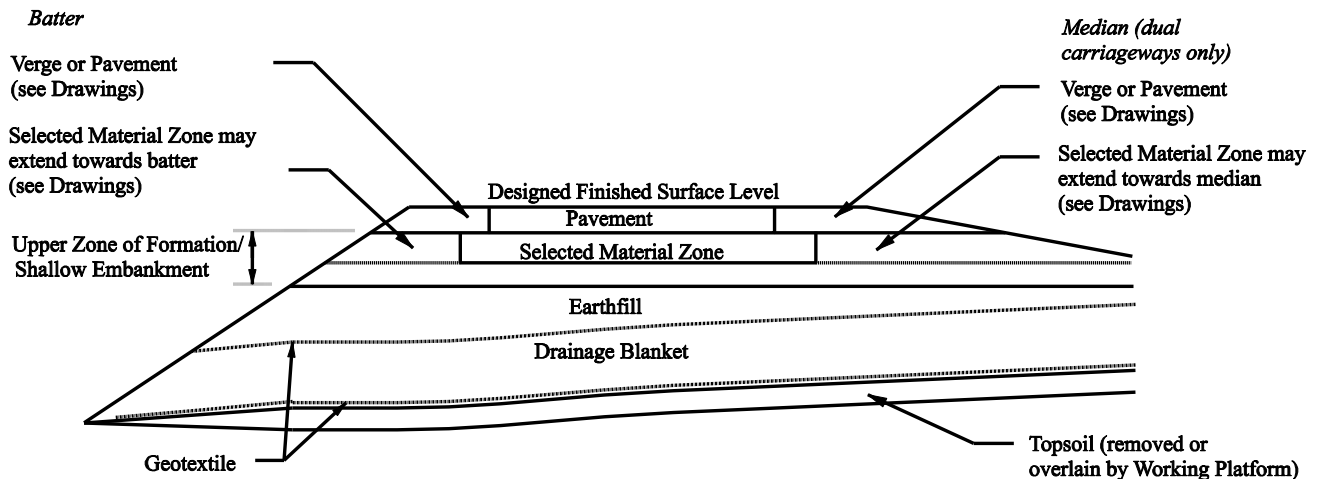


Figure R44.4(e) – Embankment Foundation Treatment – Type E5

Shape and trim the embankment foundation so as to ensure drainage of the embankment. Ensure that post construction, a clear drainage path through the blanket is maintained at the outer embankment edges.

Construct the drainage blanket so that the completed thickness of the layer is 300 mm (+100 / -0 mm), comprising material meeting the following properties:

Property	Criterion (% by mass)
Percentage passing 125 mm	100
Percentage passing 19.0 mm sieve	0 – 15
Percentage passing 1.18 mm sieve	0 – 5
Percentage passing the 75µm Sieve	< 0.5%
Percentage of + 19.0 mm fraction with $I_{s(50)} < \text{Annexure R44/A4.2}$	10 (max)
Wet/Dry strength variation	Annexure R44/A4.2

The drainage blanket material must not contain clay fines or silt.

Adjust the grading of the drainage blanket as necessary within the above limits to ensure that it provides a stable foundation for compaction of the overlying embankment.

Place and spread the drainage blanket material in such a way as to avoid segregation and to ensure that it is not contaminated with foreign materials. It must be compacted using the nominated compaction routine developed as specified in Clause 7.3.

Place a geotextile, meeting the requirements of Class C and Filtration Class 5 of RMS R63, at both the interface between the rock layer and the embankment foundation and the interface between the rock layer and the embankment fill.

End outlet/drainage treatment must be as shown on the Drawings or directed by the Principal.

3.2.6 Type E6 - Other Treatments

Adopt other foundation treatments as shown on the Drawings or as directed or agreed by the Principal.

3.3 HILLSIDE EMBANKMENT FOUNDATIONS

Where embankments are to be constructed on or against any slopes or batter of existing embankments (including batters resulting from the partial construction of embankments under the Contract), and the existing slope or batter is steeper than 10H:1V in any direction, then cut horizontal terraces into such slopes or batters which will be covered by the embankment to be constructed.

Progressively step the existing slope or batter in successive terraces, each at least 1 metre in width as shown in Figure R44.4(f). Cut the terraces to a minimum depth of 300 mm at the steps except where the existing slope or batter is 4H:1V or steeper, in which cases the terraces must be cut to a minimum depth of 600 mm at the steps. Cut the terraces progressively as the embankment is placed. Wherever possible, terraces must coincide with natural discontinuities.

Inspect the floor of each terrace in accordance with Clause 2.4 to check for any unsuitable material. Unless directed otherwise by the Principal, the material thus excavated must be incorporated in embankments in accordance with Clause 5 or identified as spoil and disposed of in accordance with Clause 2.5.

No account will be taken of the material removed in terracing when determining the general earthworks excavated volume.

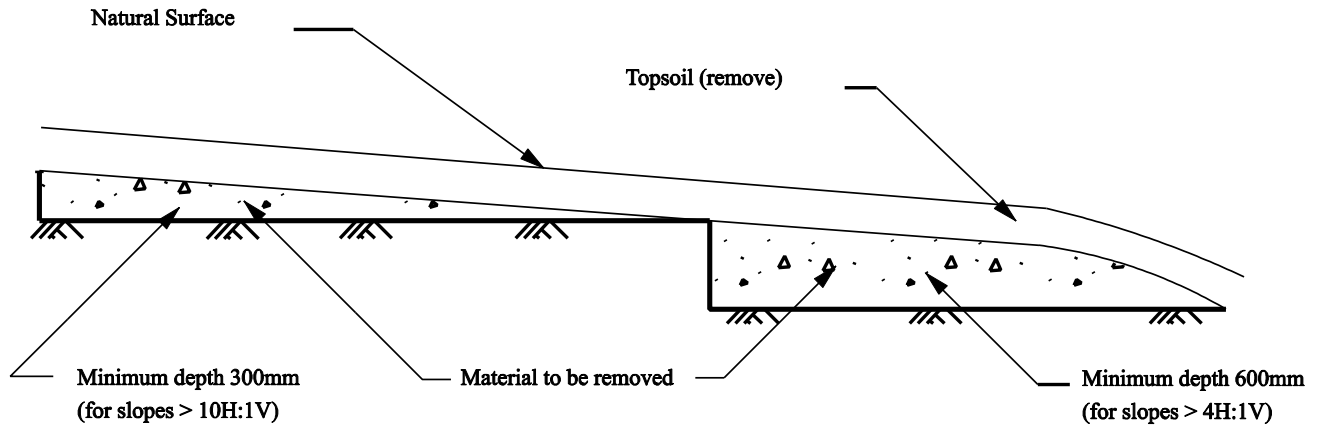


Figure R44.4(f) – Hillside Embankment Nomenclature and Foundation Treatments

3.4 FOUNDATION TREATMENTS FOR CUTTINGS

Excavate cuttings to the Designed Floor Level. The excavated cutting floor must comply with Clause 7.5.

Prior to placing formation materials and carrying out any designed Foundation Treatments, the cutting floor must be tested and presented for inspection by the Principal. Determine the CBR and Plasticity Index values of the material in the floors of cuttings by the Test Methods shown in Annexure R44/A4.

HOLD POINT

Process Held: Treatment of each lot of floors of cuttings.

Submission Details: (a) Notification that:

- (i) excavation to Designed Floor Level; and
- (ii) depth specified for cut/fill transition (refer to Clause 3.5), has been reached;

(b) CBR and PI test results.

(The submission must be concurrent with the submission for any adjoining Shallow Embankment foundation required by the Hold Point in Clause 3.2.)

Release of Hold Point: The Principal:

- (a) will consider the submitted documents;
- (b) will inspect the excavated floor; and
- (c) may direct further action prior to authorising the release of the Hold Point. Further action may include the removal of unsuitable material in accordance with Clause 2.4; installation of trench drains in accordance with Specification RMS R33, or foundation treatments in accordance with Clause 3.4, treatment in accordance with Specification RMS R50, or other treatments in accordance with this Clause or changes to the area to be excavated. You must maintain the cutting foundation in its conforming condition until backfill construction commences.

Unless otherwise shown on the Drawings or directed by the Principal, treat foundations within cuttings in accordance with Type C1. Where shown on the Drawings or directed by the Principal, treat foundations within cuttings in accordance with Foundation Treatments Type C2 to Type C5.

The treatments are described below and depicted in Figures R44.5 (a), (b), (c) and (d), Clause 3.4.5, Type C5 Treatment – Geotextile and Geogrids and Clause 3.4.6, Other Treatments. These may be applied individually or in combination, as specified in Annexure R44/A7.

Where CBR and PI conforms to the requirements of Annexure R44/A4.2, loosen and recompact the underlying material in accordance with Foundation Treatment Type C1. Where the CBR of the material in the floor of the cutting is less than, or where the PI is greater than, the requirement nominated in Annexure R44/A4.2, remove the material to the appropriate depth to provide for the directed foundation treatment (Foundation Treatment Type C2 to Type C5).

Maintain the cutting foundation in its conforming condition until construction of Upper Zone of Formation and any subsurface drainage is completed.

You must bear the cost of treatment selected for your convenience or required as a result of damage to the foundations caused or allowed by you.

3.4.1 Type C1 Treatment – Loosen and Compact

Unless shown on the Drawings or otherwise specified or directed by the Principal, treat the floors of cuttings as described below.

- (a) Following excavation and removal of unsuitable material, loosen all material remaining in the floor by ripping to a minimum depth of 300 mm below the Designed Floor Level for the width of the Selected Material Zone as shown on the Drawings or the width of the pavement layers plus one metre each side (whichever width is the greater).
- (b) Recompact the loosened material in accordance with Clause 7. The maximum dimension of particles in the compacted material must not exceed 200 mm.
- (c) After recompaction, trim the floors of cuttings parallel with the finished wearing surface so that their levels do not vary from the Designed Floor Levels by more than the tolerances shown in Clause 7.5.

As part of the trimming operation, prepare the surface in accordance with Test Method RMS T199, for deflection monitoring as required in Clause 7.4.

No account must be taken of the volume involved in loosening when measuring the volume of excavations.

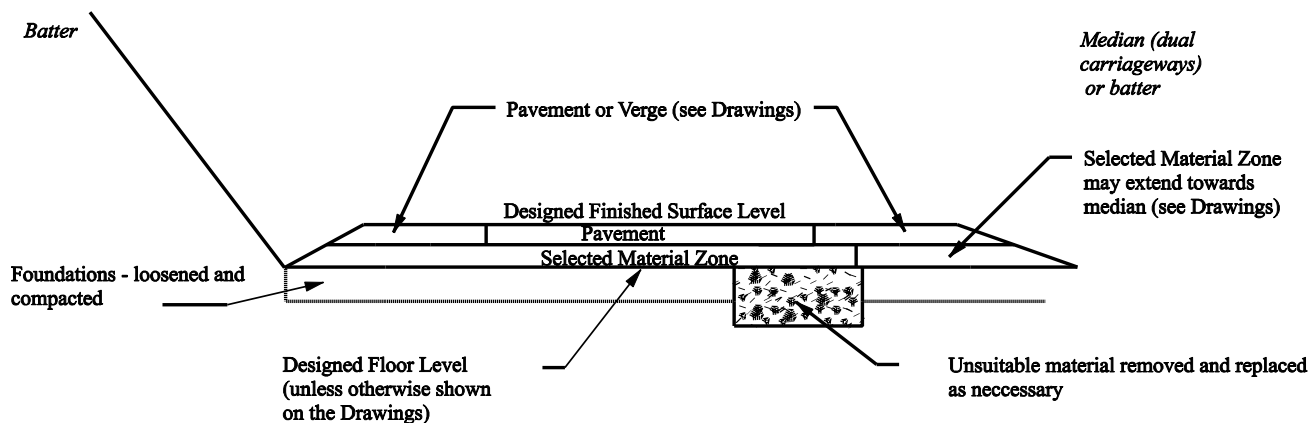


Figure R44.5(a) – Cutting Floor Treatment – Type C1

3.4.2 Type C2 Treatment – Drainage Blanket

Where specified or where directed by the Principal, treat the floors of the cuttings as described below:

- Excavate cuttings parallel to the designed grade line, to a foundation level which will be at a depth below the Designed Floor Level equal to the thickness of the drainage blanket. Trim the excavation to the same crossfall as the pavement above and in such a manner as to ensure drainage of the cutting occurs. Where the horizontal alignment of the road is in crossfall transition, ensure that the floor of the cutting has a minimum 1% crossfall.
- Compact the material exposed at the base of the excavation with not less than six passes of a vibrating roller.
- Place the drainage blanket at the base of the Selected Material Zone with a minimum thickness of 300 mm material meeting the following properties:

Properties	Criterion (% by mass)
Percentage passing 125 mm	100
Percentage passing 19.0 mm sieve	0 – 15
Percentage passing 1.18 mm sieve	0 – 5
Percentage passing 75µm sieve	< 0.5
Percentage of + 19.0 mm fraction with $I_{s(50)} < \text{Annexure R44/A4.2}$	10 (max)
Wet/Dry strength variation	Annexure R44/A4.2

The drainage blanket material must not contain clay fines or silt.

Adjust the grading of the drainage blanket as necessary within the above limits to ensure that it provides a stable foundation for compaction of the overlying Selected Material,

Place and spread the drainage blanket material in such a way as to avoid segregation and to ensure that it is not contaminated with foreign materials. It must be compacted using a roller routine developed in accordance with Clause 7.3.

After compaction, the upper surface of the drainage blanket must not vary from the designed levels by more than shown in Clause 7.5.1.

- (d) Place a geotextile, meeting the requirements of Class C and Filtration Class 5 of RMS R63, under the drainage blanket in areas other than the floors of rock cuttings and above the drainage blanket.
- (e) End outlet/drainage treatment must be as shown on the Drawings or directed by the Principal.

Payment for the Drainage Blanket will be made in accordance with Pay Item R44P7.4. Material excavated will be measured and paid in accordance with Pay Item R44P2 or R44P4. The geotextile will be paid for in accordance with Pay Item R44P7.

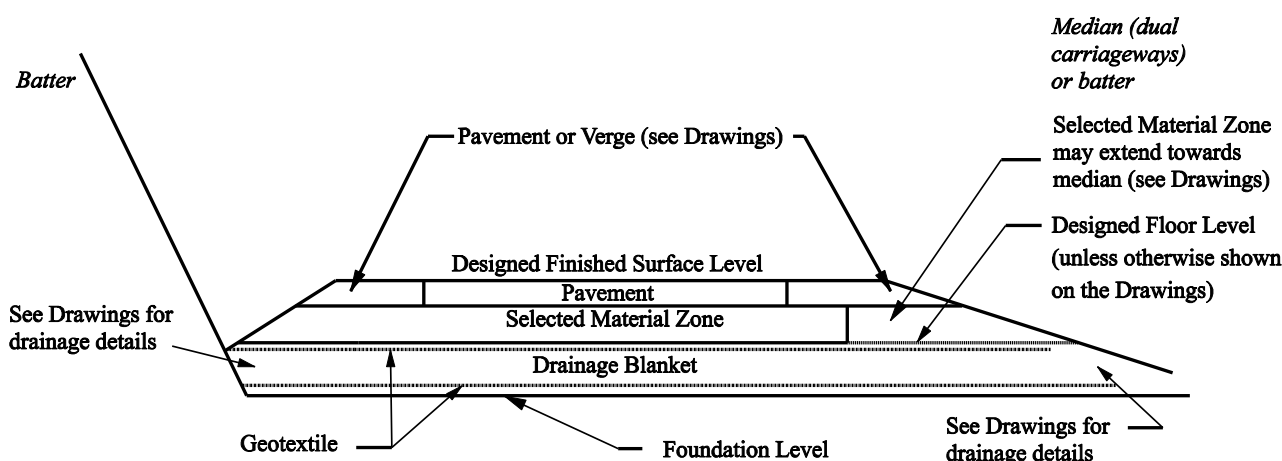


Figure R44.5(b) – Cutting Floor Treatment – Type C2

3.4.3 Type C3 Treatment – Excavation and Backfill

Where specified or directed by the Principal, treat the floors of the cuttings as described below:

- (a) The floors of cuttings must be excavated, parallel to the designed grade line, to a foundation level that will be at a depth below the Designed Floor Level equal to the nominated thickness of backfill. Trim the floors to the tolerance stated in Clause 7.5. Loosen, compact and trim the floor of the cutting in accordance with Clause 3.4.1.
- (b) Place, compact and trim backfill material meeting the requirements of Annexure R44/A4.2 in accordance with the requirements for earth fill.

The material excavated between the underside of the Selected Material Zone and the Foundation Level is to be included in the excavated volume for general earthworks.

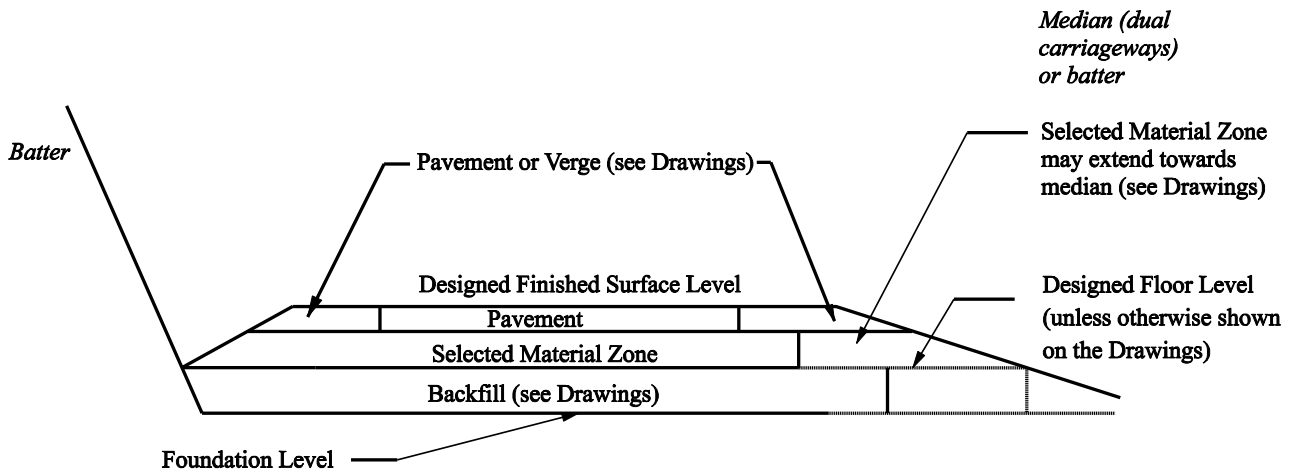


Figure R44.5(c) – Cutting Floor Treatment – Type C3

3.4.4 Type C4 Treatment – Working Platform

Where specified or directed by the Principal, treat the floors of the cuttings as described below:

- (a) Strength insitu material to form a Working Platform on which to construct the formation. The Working Platform is created by the chemical stabilisation of in situ material in accordance with RMS R50.
- (b) Alternatively, a Working Platform of imported stabilised material may be specified in Annexure R44/A4.1 or directed. If specified or directed, this work will be paid for under the appropriate Pay Items for STABILISATION (RMS R50) and imported material (Pay Item R44P3). The material excavated between the Designed Floor Level and the Foundation Level, at the underside of the Working Platform, will be included in the excavated volume for General Earthworks and paid in accordance with Pay Item R44P2.

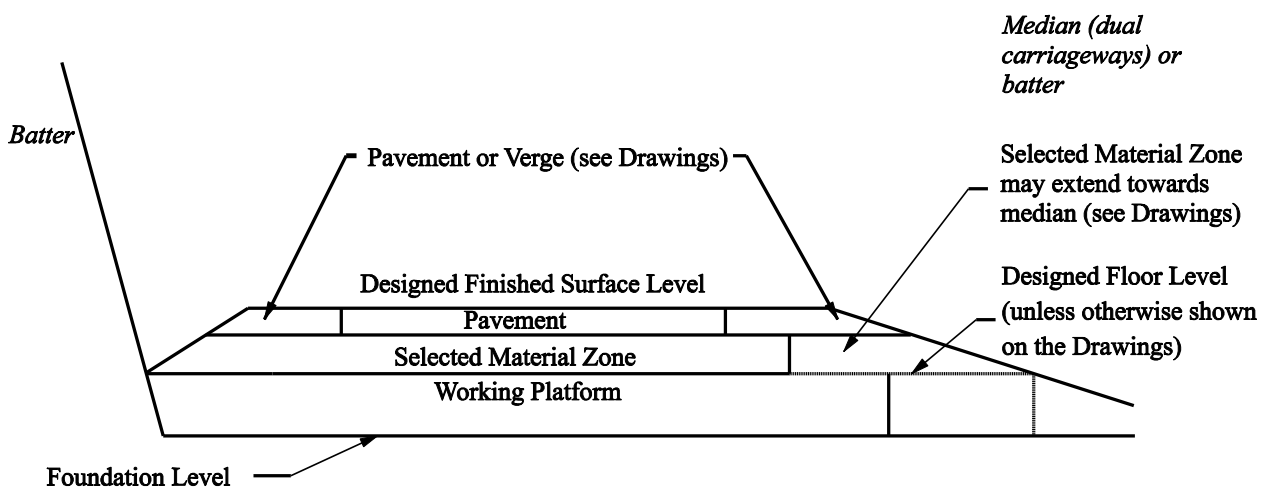


Figure R44.5(d) – Cutting Floor Treatment – Type C4

3.4.5 Type C5 Treatment – Geotextile and Geogrids

Where specified or directed by the Principal, construct a Type C5 treatment, consisting of a layer or layers of geotextile and/or geogrid on the floor of the cutting.

Supply and place the geotextile and geogrid in accordance with RMS R63 and/or RMS R67 respectively. Payment for the geotextile and geogrid used in the Works will be paid for in accordance with Pay Item R44P7 or Pay Item R67P1.

3.4.6 Other Treatments

Other foundation treatments may be adopted as shown on the Drawings or as directed or agreed by the Principal.

3.5 TRANSITION FROM CUT TO FILL

Following excavation to the Designed Floor Level of the cutting at the transition from cut to fill, carry out further excavation below the Designed Floor Level for the Transition Zone to a depth equivalent to the thickness specified for the cut/fill transition in Annexure R44/A3 and parallel to the cutting floor, as shown in Figure R44.6, except where:

- (a) a Shallow Embankment (refer to Clause 5.1.3) adjoins the cut/fill transition, the depth of excavation for the transition treatment must not be less than the thickness of the Upper Zone of Formation; and
- (b) otherwise approved by the Principal.

The excavation must extend into the cut for a distance of 10 m from the intersection line of the Designed Floor Level of the adjacent cutting, and the stripped surface, as shown in Figure R44.6, measured normal to the intersection line. The transition treatment must not however extend into the cutting batter.

The material excavated is to be included in the excavated volume for general earthworks.

The material placed above the base of excavation must satisfy the quality requirements of Clause 6.1 and must be compacted in accordance with Clause 7.

Ensure that the excavation is free-draining by either sloping toward the nearest exit of the cutting at a minimum grade of 1%, or installing a subsurface drain at the down grade end of the excavation (where directed by the Principal).

Subsurface drains are to be installed and paid for in accordance with Specification RMS R33.

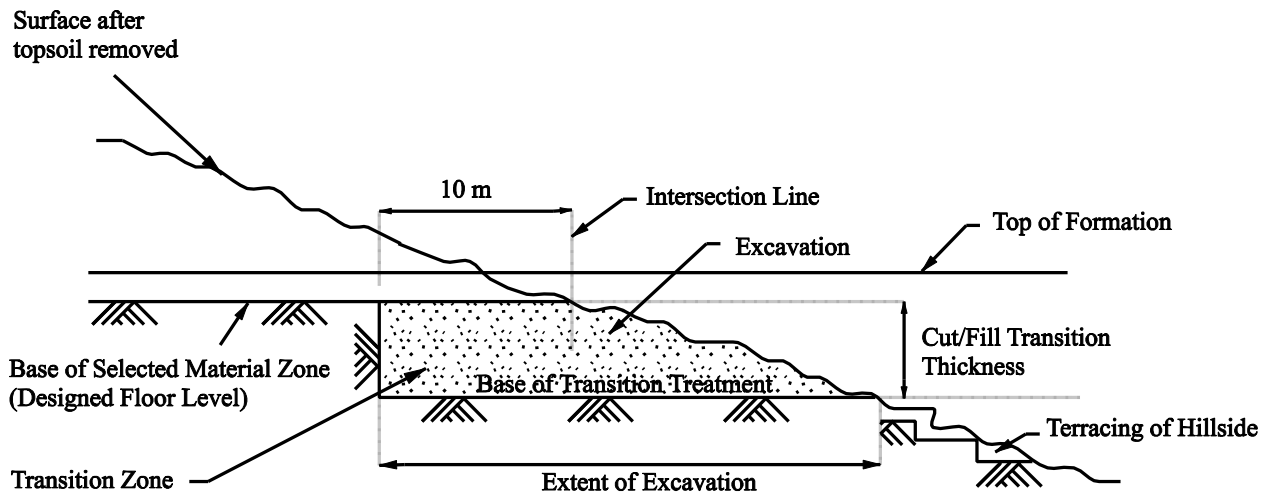


Figure R44.6 – Cut to Fill Transition Treatment

4 CUTTINGS

4.1 GENERAL

Construction of cuttings includes all operations associated with the excavation of material within the limits of the batters including benching, terracing of cut batters, cleaning of batter surfaces, treatment of cutting floors, foundation treatments in accordance with Clause 3.4, beneath Shallow Embankments in accordance with Clause 5.1.3, and transition from cut to fill in accordance with Clause 3.5.

4.2 EXCAVATION

Loosen and process materials encountered in cuttings as required so that they meet the requirements of the Specification for incorporation in the Works. In this regard, attention is drawn to Clause 2, Clause 5.4 and Clause 6.

The batter slopes in cuttings must be in accordance with those shown on the Drawings or as redetermined by the Principal on the basis of site inspection and investigation during the excavation.

Round the tops of cuttings to the dimensions shown on the Drawings unless otherwise directed. Batters will generally require progressive flattening at the ends of cuttings owing to the presence of less stable material. In all cuttings, undulations in the general plane of the batter are not acceptable. The cutting must be free of rills running down the face of the batter (presplitting holes excepted) and treated in accordance with Annexure R44/A3.

Clear the cut faces of any loose or unstable material progressively as the excavation proceeds.

4.2.1 Rock Cuttings

Clean the cut batters with designed slopes of 1H:1V or steeper in rock by compressed air to allow inspection and assessment of stability immediately following completion of excavation to the level of each bench. Do not use water jets and air-water jets unless specifically approved by the Principal in approved areas. Remove loose or unstable blocks, which are too large to be removed by the above means, by hand or machine, unless otherwise directed by the Principal.

Clean the surface of the bench at the top of the batter by compressed air, unless otherwise directed by the Principal.

Continue cleaning until all loose rock and soil material is removed, and all rock and joint surfaces are sufficiently exposed so that the Principal can assess their condition and likely effect on the stability of the batter.

HOLD POINT

Process Held:	Excavation below bench level for slopes of 1H:1V or steeper.
Submission Details:	Presentation of cleaned batter and bench/floor surfaces for Geotechnical inspection.
Release of Hold Point:	The Principal will inspect the cleaned surfaces and may direct further action prior to authorising the release of the Hold Point. Further action may include additional cleaning (if the condition of the faces cannot, in the opinion of the Principal, be adequately assessed), and stabilisation works, prior to or concurrent with any further work within the cutting.

Following inspection, the Principal may direct additional stabilisation works, including changes to the batter slope.

Where the Principal re-determines the batter slope of any section of a cutting after it has been completed in accordance with this Clause, the Principal will order a variation to the Works for the resetting out, removal of additional material and re-trimming of the batter.

4.3 BATTER TOLERANCES

The tolerances for the excavation of batters are given in Table R44.2.

Table R44.2 — Excavation Tolerances for Batters

Location	Tolerance (mm)	
	Slope 1H:1V or flatter	Steeper than 1H:1V
Batters at toe of batter	+0 / -150	+0 / -200
2 m above toe of batter and higher	+300 / -300	+300 / -600
Between level of toe of batter and 2 m above toe of batter	pro rata basis	pro rata basis

NOTE: Plus (+) is towards the roadway and minus (-) is away from the roadway. Tolerances are measured perpendicular to the plane of the slope.

If the batter is over-excavated beyond the tolerance applicable for the batter slope line, or after cleaning the batter is beyond the tolerance applicable, restore the batter to the specified slope and stability to the Principal's satisfaction. Proposals for restoration must take into account long-term stability, durability, and consideration of urban design solutions. The cost of restoring or reforming the batter must be borne by you.

For batters steeper than 1H:1V, if any section of the batter up to a height of 3 m above the toe of batter has been over excavated beyond the tolerance limit specified, the Principal may direct that the batter be reformed to the average batter slope using randomly mortared stone or other treatments. Where stone is directed, it must be similar to the sound rock in the cutting and the mortar must be coloured to match the colour of the rock.

Alternatively, you may request a minor change in the general slope of the batter to suit your convenience. If the Principal approves such a change, it will not be regarded as a redetermination of the batter slope under Clause 4.2 and no extra payment will result. If your request is denied, restore the batter to the specified slope and stability to the satisfaction of Principal.

4.4 BENCHING IN CUTTINGS

Cut batters must be benched as shown on the Drawings to provide drainage and erosion control, to provide geotechnical stability, and to allow access for maintenance purposes. Notwithstanding the tolerances permitted under Clause 4.3, bench widths must not be less than those shown on the Drawings.

The floor of the bench must not vary from levels shown on the Drawings by more than the tolerances shown in Clause 7.5, but the bench must have a crossfall to drain water away from the cut face immediately below the bench. Provide and maintain longitudinal drainage to prevent ponding of water on the benches.

Construct bench drains, where shown on the Drawings, progressively as each batter face is completed. Payment for this work will be made in accordance with RMS R33.

Maintain and clean benches of loose materials regularly throughout the Contract period. The cost of such maintenance and cleaning of benches is deemed to be included in the rates generally.

4.5 BLASTING

4.5.1 General

The following applies only where blasting is permitted under the Contract, as indicated in Annexure R44/A2.

Obtain all necessary licences from the appropriate authorities and comply with all Government regulations relating to transport, storage, handling and the use of explosives and also the rules set out in AS 2187 Parts 1 and 2. Comply with the requirements of all external agencies including, but not limited to, the Office of Environment and Heritage (OEH) and the WorkCover Authority and demonstrate compliance.

A person shall not, receive explosives unless the person is authorised by or under the Dangerous Goods Act 1975. Any person intending to use explosives in the ACT must first be the holder of a Shotfirer's Permit, issued under the Dangerous Goods Regulations 1978. That person must then obtain a Permit to Use Explosives under the Occupational Health & Safety Regulations. Application for a Permit to Use Explosives should be made to the Registrar under the Occupational

Health & Safety Act. Application must be made at least 14 working days prior to the commencement of work involving the use of explosives. The application must be accompanied by a Blast Plan containing all of the information requested in the application form. Application forms are available from ACT WorkCover.

To contact ACT WorkCover please dial (02) 6205 0200 or send your inquiry via e-mail to www.workcover@act.gov.au.

Do not use exposed detonating cord in built up areas. Demonstrate compliance with Clause 6.8 of RMS G35 or RMS G36.

The Vibration and Air Blast Management Plan (refer to RMS G35 or RMS G36, as applicable) must contain review and verification of the above requirements and its operations to ensure that the public, building structures and infrastructure are protected.

Provide certification of the adequacy of the Building Condition Inspection to the Principal at least three days before the blasting is due to commence. Monitor and report the Building Condition during the blasting operations. You are responsible for all costs associated with the inspections and reports.

HOLD POINT

Process Held: Start of each blasting operation.

Submission Details: Written details of the proposed blasting procedure including the quantity and type of explosive to be detonated, the blasting pattern to be used and measures proposed to limit noise and to ensure that vibration from blasting does not adversely affect nearby structures. This must be contained in the Vibration and Air Blast Management Plan.

Release of Hold Point: The Principal will consider the submitted documents, prior to authorising the release of the Hold Point.

Monitor all blasts for ground vibration and air blast. Ensure that the blasting methods, peak particle velocity and air blast do not cause damage to property.

Ground vibration and air blast level caused by blasting must not exceed the respective values of peak particle velocity and air blast overpressure listed in Annexure R44/A2 and the requirements of RMS G35 or RMS G36, as applicable.

Implement and maintain a community liaison program during blasting activities to keep people in the vicinity of the Works informed of any activities. Address levels of vibration or air blast.

Advise all residents within a radius of 1 km from the site of the proposed blast, before blasting operations commence. Written advice must include the likely times, frequency and duration of blasting and precautions being taken to ensure that damage to property will not result.

Confine blasting operations to the periods Mondays to Fridays (excluding public holidays), between the hours of 9 am and 3 pm, unless otherwise approved by the Principal.

Do not detonate a blast prior to the time that has been announced for that blast, unless otherwise approved by the Principal.

When blasting operations are being carried out, take precautions relating to the safety of persons and animals. Close any road likely to be affected by the blast to traffic and the appropriate signs erected in accordance with Specification RMS G10. A standard warning procedure such as that given in the NAASRA Explosives in Roadworks Users Guide 1982 must be established and observed at all times. Clearly outline in the Vibration and Air Blast Management Plan a detailed procedure to be followed in the event of a misfire.

4.5.2 Presplitting or Line Drilling

Use presplitting or line drilling to ensure protection of batters prior to burden blasts. Prior to commencing blasting, batters with gradients 1H:1V or steeper must be pre-split or line drilled to the design batter profile at sufficiently close centres to produce a uniform and neat batter surface after excavation acceptable to the Principal.

The Principal will give consideration to an alternative method of excavation and preparation of the cut face so as to provide an equivalent result to that required from pre-splitting or line drilling. Approval may be granted to such alternative method at the absolute discretion of the Principal, who may require a trial section of the proposed method to be carried out to demonstrate its suitability.

Where presplitting or line drilling is carried out, the centre to centre spacing of drill holes must not exceed the following:

Cut Batter Treatment	Hole Diameter (mm)	Maximum Hole Spacing (mm)
Pre-splitting	38 – 51	450
Pre-splitting	51 – 64	750
Pre-splitting	76 – 89	900
Line Drilling	Up to 51	150
Line Drilling	51 – 76	250

4.5.3 Blasting Records

Maintain accurate records of each blast including the details listed below:

Date, identification number and time of blast;

- (b) Location, number and diameter of blast holes loaded;
- (c) Depth of each drill hole loaded;
- (d) Inclination of drill holes;
- (e) Burden(s) and spacing(s);
- (f) Types and amounts of explosives used;
- (g) Maximum instantaneous charge;
- (h) Initiation Plan;
- (i) Length and type of stemming in each blast hole;
- (j) Ground vibration and noise levels at measuring locations.

The records must be prepared as holes are loaded and must be signed by the shotfirer. Provide a copy of the records to the Principal on the day of the blast.

5 EMBANKMENTS

5.1 GENERAL

Embankment construction includes all operations associated with the preparation of the foundation areas on which fill material is to be placed as described in Clause 3. This includes:

- (a) the placement and compaction of conforming material within areas from which unsuitable material has been removed in accordance with Clause 2.4 and within areas where material has been removed below the pavement zone in cuttings and cut/fill transitions;
- (b) the placement and compaction of fill material and of materials of specified quality in nominated zones throughout the Works, including zones at “spill-through” bridge abutments where subsequent pile foundation works are to be undertaken;
- (c) backfilling of excavations undertaken for foundation treatments for both cuttings and embankments; and
- (d) all other activities required to produce embankments as specified to the alignment, grading and dimensions shown on the Drawings.

Earth fill embankments are embankments not conforming to rock fill requirements; see Clause 5.1.2.1.

Material for embankment construction must be obtained from the excavations within the Works and, where authorised by the Principal, may be supplemented with borrowed or imported material in accordance with Clauses 2.6 and 2.8. The material must be free of tree stumps, roots and refuse.

Embankment construction (other than the Upper Zone of Formation, verges and the foundation treatments required for the construction of earth fill embankment and rock fill embankment as specified in Clause 3) must be in accordance with the requirements of either Clause 5.1.1 or Clause 5.1.2, as applicable.

Process materials which do not meet the requirements of these Clauses to ensure conformity prior to placement. Select the methods of excavation, transport, depositing and spreading of the fill material so as to ensure that the placed material in any lot is homogeneous.

Place fill material for embankment construction in layers parallel to the grade line.

Achieve relative compaction specified in Clause 7 over the full depth of the layer. Describe in the EARTHWORKS PLAN the method used to verify that the specified compaction has been achieved over the full layer depth and that the layer depth has not been exceeded.

Programme and manage the Works as detailed in EARTHWORKS PLAN (Clauses 1.7 and 2.2) so that material of the quality specified in Clause 2.8 for the Upper Zone of Formation and verges is available when required.

Embankment material zones are as illustrated in Figure R44.2.

5.1.1 Earth Fill Embankments

Construct the embankment so as to derive its stability from compaction of the fine material around the coarser particles. Rock material must be broken down and evenly distributed throughout the layer to prevent the formation of voids and produce a dense compact embankment. To meet this requirement, additional fine material may need to be obtained from other places within the Works or by a change in the method of winning and processing the material.

Maximum layer thicknesses and particle size limitations are given in the table below.

Maximum Layer Thickness (mm)	Minimum Quantity Rock (by volume)	Maximum Rock Size (any dimension, mm)	% Passing the AS37.5mm Sieve (by mass)
300	Not specified	200	> 60%
500	25% > 200 mm	300	> 60%

Where more than 20% by mass of fill material is retained on the 37.5 mm AS sieve, or the compacted layer thickness exceeds 300 mm, do not use nuclear density gauges for insitu density tests.

The layer thickness (after compaction) must not be less than 100 mm.

In placing embankment layers, use equipment and techniques to avoid surface heaving or other damage to the foundations and underlying embankment layers.

5.1.1.1 Earth Fill at “Spill-Through” Bridge Abutments

For the earth fill at “spill-through” bridge abutments, the materials used must not pose as obstructions to the bridge foundation works. The materials used must be non-dispersive and capable of being compacted to a dense and stable state, free from creep movements.

The grading of the material must conform with that specified for the Selected Material Zone in accordance with Clause 2.8.3. Other properties of the material must conform with those given in Clause 2.8.3.1(b) and (c) and Annexure R44/A4.2. Prior to placement, the material must be stockpiled, sampled and tested for conformity in accordance with the requirements of Clause 6.1.2.

The geometry of this fill is shown in Figure R44.7. At one end, it forms the sloping part of the “spill-through” embankment. At the other end, at the top, it extends a distance of 2h from the rear face of the bridge abutment headstock; at the bottom at embankment foundation level, it extends a distance of 0.5h from this rear face. (For the purpose of this Clause, the height “h” is the distance between the soffit of the capping beam and the embankment foundation level. Where excavation is required for foundation improvement, the height “h” is measured to the base of the excavation.)

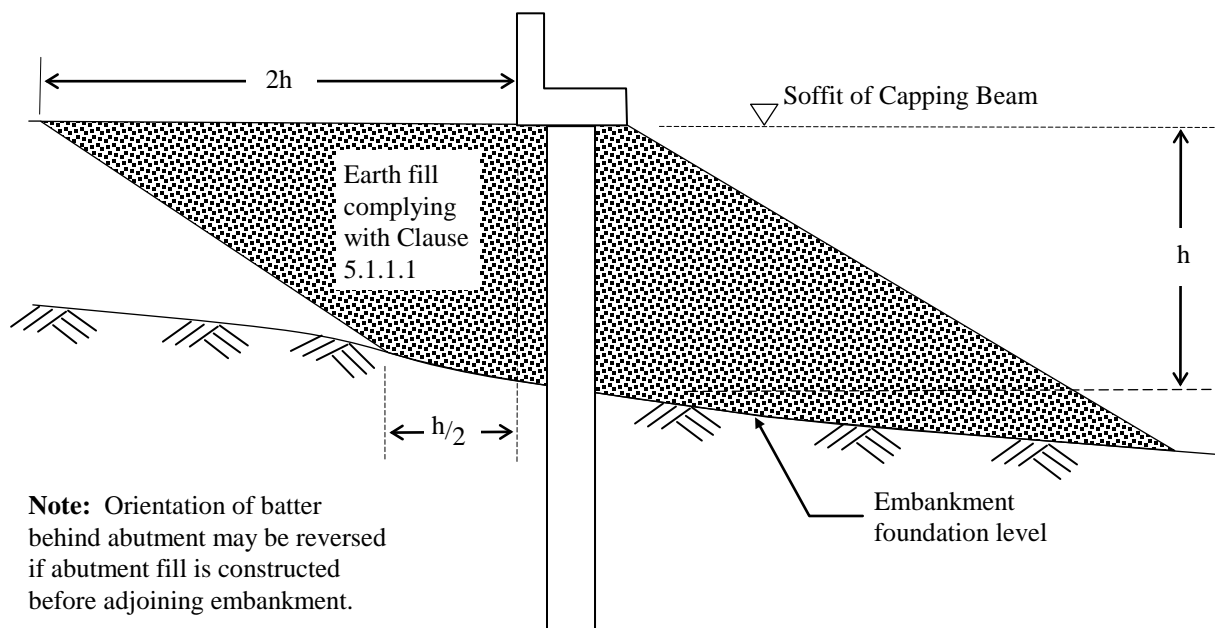


Figure R44.7 - Dimensions of Fill at “Spill-Through” Bridge Abutments

The compacted thickness of each layer must not exceed 150 mm and must be compacted to the requirements stated in Table R44.5.

Scour protection of the embankment is not considered in this Clause and, where necessary, must be considered separately.

5.1.2 Rock Fill Embankments

5.1.2.1 Introduction

For the purpose of this Clause, a rock fill embankment is an embankment composed of hard, sound rock, containing only a small amount of fine particles, which has been constructed to derive its stability from the mechanical interlock of the coarser particles, and not from the compaction of the finer material.

Except where shown on the Drawings or Annexures, do not place rock fill in areas where earth fill has previously been constructed. If you elect to construct a rock fill embankment, adjust the working methods employed in the excavation of cuttings so as to produce rock fill material of the grading and rock strength specified in Clause 5.1.2.2. Such working methods must include screening and, if necessary, secondary processing.

Place and spread the rock fill material in such a way as to avoid segregation and to ensure that it is not contaminated with foreign material. The compacted rock fill layer thickness must not exceed 550 mm.

Compact rock fill using the nominated compaction routine, developed as specified in Clause 7.3.

Material that does not meet the requirements for rock fill specified in this Clause must be subjected to additional breakdown, or have additional fines incorporated, and used in earth fill embankments in accordance with Clause 5.1.1.

Nominate to the Principal the proposed areas of rock fill. If you elect to construct earth fill in part or all of the nominated rock fill locations, and a surplus of rock, capable of being processed for rock fill, is later found to exist, then treat the surplus by:

- (a) processing the material for use as earth fill; or
- (b) removal of earth fill and placement of the surplus rock as rock fill at your cost.

Shape and treat the foundations under rock fills to maintain drainage and to ensure that erosion of the foundation will not occur.

5.1.2.2 Rock Fill Material

Rock fill material must be well graded in accordance with the table below and with no particle dimension exceeding 350 mm. The constituent particles must be of uniform strength and soundness and not more than 10% by mass of particles with dimensions greater than 100 mm having a Point Load Strength Index ($I_{s(50)}$) of less than that shown in Annexure R44/A4.2 and Wet/Dry strength variation more than that shown in Annexure R44/A4.2.

Prior to placement, the rock fill material must have the following properties:

Property of Rock Fill Material		Criterion (% by mass)
Percentage Passing:	100 mm AS sieve	0 – 20
	19.0 mm AS sieve	0 – 10
	1.18 mm AS sieve	0 – 5

5.1.2.3 Overlying Layers

Do not place rock fill within 600 mm of the underside of the Selected Material Zone. The minimum depth to rock fill below the underside of the Selected Material Zone must be increased to 1.0 m where safety barrier, posts, subsurface drainage or services are to be installed.

A capping layer is a graded rock fill layer and must be placed immediately above completed rock fill embankments. Construct the capping layer so that the completed thickness of the layer is 300 mm (+100 mm / –0 mm), with material that complies with the following properties and meeting the material property requirements of Clause 5.1.2.2.

Property of Capping Layer	Criterion (% by mass)
Percentage passing 150 mm	100
Percentage passing 19.0 mm AS sieve	0 – 10
Percentage passing 1.18mm AS sieve	0 – 5
Percentage of + 19.0 mm fraction with $I_{s(50)} < \text{Annexure R44/A4.2}$	10 (max)

Place and spread the Capping Layer material in such a way as to avoid segregation and to ensure that it is not contaminated with foreign material. It must be compacted using the nominated compaction routine, developed as specified in Clause 7.3.

5.1.2.4 Rock Fill Around Structures

Notwithstanding requirements elsewhere in this Specification, the thickness of backfill around structures specified in Clause 5.4.3 within rock fill embankments must be at least:

horizontally: 2.0 m (measured normal to the axis of the structure)

vertically: 1.0 m (where rock fill is to be placed over the structure).

5.1.2.5 Geotextiles

Place geotextile separation layers conforming to the requirements of RMS R63 as follows:

Class D: beneath the first layer of rock fill

Class D: over any backfill to structures and the adjacent rock fill

Class C: between the capping layer defined in 5.1.2.3 and the overlying layer of earth fill.

Payment for geotextiles will be in accordance with Pay Item R44P7.3 for Treatment Type E4.

5.1.3 Shallow Embankment

Unless otherwise shown on the Drawings or directed by the Principal, excavate the area of Shallow Embankment to a depth to achieve the minimum height of Shallow Embankment specified in Annexure R44/A6.

Where a Shallow Embankment adjoins the cut/fill transition, the depth of the excavation for the transition treatment must meet the requirements of Clause 3.5(a).

When the excavation is completed, carry out CBR and PI tests on the embankment foundation, unless directed otherwise by the Principal. Observe the Hold Point in Clause 3.2 and carry out embankment foundation treatments in accordance with Clause 3.2, before placing the overlying formation.

5.2 EMBANKMENT BATTERS

The batter slopes shown on the Drawings may be subject to redetermination by the Principal depending upon the materials encountered.

When completed, the batters of embankments must conform to those shown on the Drawings unless otherwise authorised or redetermined by the Principal.

For a vertical distance of 1 metre below the shoulder, no point on the completed batter may vary from the specified slope line by more than 150 mm when measured at right angles to the slope line. At distances greater than 1 metre vertically below the shoulder, no point on the completed batter may vary from the specified slope line by more than 300 mm when measured at right angles to the slope.

Notwithstanding the above, the edge of the formation at the underside of the pavement must not be nearer to the roadway than that shown on the Drawings. Undulations in the general plane of the batter is not acceptable. The completed batter must be free of rills running down the face of the batter.

Promptly remove any loose material on the batters as the work progresses.

Where the Principal redetermines the slope of any section of an embankment batter which has been completed in accordance with Clause 5.2, the Principal will order a Variation to the Works for the resetting out, removal or addition of fill material, and retrimming of the batter.

Placement of additional material on the existing embankment batters must be carried out in the same manner as specified for placement of hillside embankments in Clause 3.3.

5.3 ROCK FACING OF EMBANKMENTS

Where shown on the Drawings, provide embankment batters (including embankments at bridge structures) with a facing of clean, hard, durable rock separated from the earth fill embankment with a graded filter or geotextile in accordance with RMS R63. Place rock facing outside of the general embankment dimensions.

Rock used for rock facing must have a Point Load Strength Index ($I_{s(50)}$), as determined by Test Method RMS T223, and a Wet/Dry Strength Variation, meeting the respective requirements stated in Annexure R44/A4.2, and have a minimum dimension of 500 mm.

You may elect, with the approval of the Principal, to place surplus rock conforming to the above as rock facing.

The rock facing must be built up in layers ahead of each layer of filling and placed in accordance with the Supplementary Drawings. Do not place rock facing higher than 1.5 m below the designed finish level of the adjacent pavement. Place rock in such a manner that its least dimension is vertical and that mechanical interlock between the larger stones occurs. Remove any excess of fine material surrounding any rock placed within the rock facing by removing the rock, removing the excess fine material and re-placing the rock.

Adjust the working methods and program of work to obtain sufficient hard and durable rock of the specified dimensions to complete the facing as is required. Fill the space between larger batter rocks and adjacent fill material with progressively smaller rocks to form a graded filter which prevents the leaching out of fines from the fill material but which does not overfill the voids between larger rocks, or cause the larger rocks to lose contact with one another.

Where adjacent geology and terrain are likely to produce moisture flow through the embankment, provide at the base of the fill a drainage blanket with properties specified in Clause 3.4.2 of minimum 300 mm thickness.

Where wave action or inundation may occur, place a geotextile in accordance with Specification RMS R63 between the rock facing and the graded filter. In this case, place the earth fill and filter ahead of the rock facing.

Exercise extreme caution whilst placing the rock facing. Where embankment material is placed in the formation above other roads in use, place the outer rock layer in such a manner as to prevent spillage down the batter. Implement measures to prevent any rock being dislodged and allowed to roll down on to any adjacent roadway or track in use.

Payment for the rock facing and drainage blanket will be in accordance with Pay Item R44P2. Payment for the geotextile will be in accordance with Pay Item R44P7.3(a).

5.4 FILL ADJACENT TO STRUCTURES

5.4.1 General

Supply and placement of fill adjacent to structures is deemed to be part of general earthworks.

For the purpose of this Clause, structures include bridges, box and pipe culverts, headwalls and concrete/masonry retaining walls. This Clause does not apply to reinforced soil walls (refer to Specifications RMS R58 and RMS R59 for their requirements).

Fill adjacent to culverts and drainage structures, except that adjacent to weep holes, must be provided in accordance with Specifications RMS R11 or RMS R22, as applicable. Fill against other structures (select fill) must conform with the requirements of Specification RMS B30. Fill material within the Upper Zone of Formation must also comply with the relevant requirements of Clause 2.8.

5.4.2 Treatment at Weepholes

Provide drainage adjacent to weepholes by broken stone or river gravel consisting of clean, hard, durable particles graded from 50 mm to 10 mm such that:

- (i) the maximum particle dimension does not exceed 50 mm; and
- (ii) no more than 5% by mass passes the 9.5 mm AS sieve.

The broken stone or river gravel must be continuous in the line of the weep holes, extend at least 300 mm horizontally into the fill and extend at least 450 mm vertically above the level of the weepholes.

Alternatively, you may provide a synthetic membrane of equivalent drainage capacity at no extra cost to the Principal. Store and install it in accordance with Manufacturer's instructions. The use of synthetic membrane as a substitute is subject to the Principal's concurrence.

5.4.3 Placing Fill Adjacent to Structures

After completion of any backfilling required by Specifications RMS B30, RMS R11 and RMS R22, place fill complying with Clause 5.4.1 adjacent to structures in accordance with Table R44.3.

Place the fill in accordance with Clauses 3.3 and 5.1.1 except that layers must have a compacted thickness between 100 mm and 150 mm. Place layers simultaneously on both sides of box culverts to avoid differential loading. Compaction must start at the wall and proceed away from it, and must meet the requirements of Clause 7.

Cut the existing slope behind the structures listed in Table R44.3 in the form of successive horizontal terraces, each terrace being at least 1 metre in width, 600 mm in height, and place the fill in accordance with Clause 5.1.1.

Do not place fill against structures within twenty-one days after placing concrete in these structures, unless the concrete strength is verified to have reached the specified 28-day strength.

Where a bridge deck is being concreted adjacent to an abutment, do not place fill against the abutment within twenty-one days after placing concrete in the bridge deck, unless the concrete strength in the bridge deck is verified to have reached the specified 28-day strength.

In the case of spill-through abutments, rocks must not be dumped against the columns or retaining walls but must be built up evenly by hand placing around or against such structures.

In the case of framed structures, bring up embankments at both ends of the structure simultaneously and the difference between the levels of the embankments at the respective abutments must not exceed 500 mm unless otherwise shown on the Drawings or within the Specification.

Table R44.3 — Placing of Select Fill

Structure	Select Fill	
	Width	Height
Bridge Abutments	2 m	H
Box Culverts	H/3	H + 300 mm
Retaining Walls	H/3	H
(where H = height of structure)		

6 STRUCTURAL TREATMENTS

6.1 UPPER ZONE OF FORMATION

6.1.1 General

An Upper Zone of Formation, including a Selected Material Zone (see Figures R44.2 and R44.3), must be provided to the thickness specified in Annexure R44/A3 and must meet the quality requirements specified in Clause 2.8.

Unless otherwise specified, do not place imported material in the Works until all material of suitable quality available from the cuttings in the Works has been placed or has been assigned to be placed in the formation.

HOLD POINT

Process Held: Delivery of imported and site won material for the Upper Zone of Formation.

Submission Details: Proposed location, quantities and type of material, and verification of conformity. Verification that all possible on site sources of the material have been exhausted.

Release of Hold Point: The Principal will examine details and may inspect the source and stockpiles of material prior to authorising the release of the Hold Point.

Before placing imported Upper Zone Material in any formation, carry out a survey in accordance with RMS G71 to determine the surface levels at sufficient locations to later determine the volume of compacted imported material placed in the Works. When shown in Annexure R44/A1, the survey must be a Joint Survey in accordance with Clause 1.6.

Compaction must be in accordance with Clause 7.

6.1.2 Selected Material Zone

Provide a Selected Material Zone (see Figures R44.2 and R44.3) where specified or shown on the Drawings. The Selected Material Zone must be placed and compacted in layers with the compacted thickness of each layer not exceeding 150 mm unless otherwise specified in Annexure R44/A6.

Where specified in Annexure R44/A4.1, the material placed in the upper layer of the Selected Material Zone at any particular location must be from the same source, produced using the same process and exhibit similar properties prior to any chemical modification which may be required, as that placed in the lower layer at that same location.

Prior to placement, all material intended for use in the Selected Material Zone must be stockpiled and tested for conformity with the requirements of Clause 2.8.3 and Annexure R44/A4.2. The total mass of each lot of stockpiled material must not exceed 4000 tonnes.

Sampling must be in accordance with Table R44.4 and the characteristic value (Q) of the CBR for each lot calculated in accordance with Specification RMS Q. For the purpose of this calculation, report the individual CBR values to the nearest 1% and the characteristic value (Q) to the nearest 0.1%

Table R44.4 – Sampling Frequency for Selected Material Zone Lots Before Placement

Total Mass of Lot represented (tonnes)	1 – 500	501 – 1000	1001 – 2000	2001 – 4000
Minimum Number of Samples per Lot	2	3	4	5

HOLD POINT

Process Held: Placement of each lot of Selected Material Zone.

Submission Details: Submit test reports verifying conformity of each lot of stockpiled material for use in Selected Material Zone.

Release of Hold Point: The Principal will consider the submitted documents, prior to authorising the release of the Hold Point.

After placement, the Selected Material must be homogeneous and free from patches containing segregated stone or excess fines. The placement methods used must ensure conformity with the requirements of Clause 2.8.3 and Annexure R44/A4.2.

Trim the Selected Material Zone to meet the tolerances shown in Clause 7.5.1. As part of the trimming operation, prepare the surface in accordance with Test Method RMS T199, for deflection monitoring as required in Clause 7.4.

HOLD POINT

Process Held: Covering of each lot of Selected Material Zone.

Submission Details: Verification of conformity of each lot of Selected Material Zone with relevant test and survey reports.

Release of Hold Point: The Principal will consider the submitted documents, prior to authorising the release of the Hold Point.

6.2 VERGES

Provide verges as shown on the Drawings to meet the quality requirements specified in Clause 2.8.

Unless otherwise specified, do not place imported material in the Works until all material of suitable quality available from the cuttings in the Works has been placed or has been assigned to be placed in the formation.

HOLD POINT

Process Held: Delivery of imported material for the verges.

Submission Details: Proposed location, quantities and type of material, and verification of conformity. Verification that all possible on site sources of the material have been exhausted.

Release of Hold Point: The Principal will examine details and may inspect the source and stockpiles of material prior to authorising the release of the Hold Point.

Carry out a survey in accordance with Specification RMS G71:

- (a) before placing material in any verge to determine the surface levels at sufficient locations to later determine the volume of compacted verge material placed in the Works; and
- (b) before placing imported material to determine the surface levels at sufficient locations to later determine the volume of compacted imported material placed in the Works.

When shown in Annexure R44/A1, the surveys must be a Joint Survey in accordance with Clause 1.6.

Place and compact the verge material in layers with the compacted thickness of each layer between 100 mm and 200 mm unless otherwise specified in Annexure R44/A6.

After placement, the material must be homogeneous and free from patches containing segregated stone or excess fines.

Compaction must be as specified in Clause 7. Compact adjacent to concrete pavement after 10 days after the placement of concrete or after joint sealing is completed, whichever is the later.

Trim the verge to meet the tolerances shown in Clause 7.5.

6.3 OTHER TREATMENTS

Provide other Structural Treatments where shown on the Drawings, to comply with geotechnical or other design requirements.

7 ADDITIONAL CONFORMITY REQUIREMENTS

7.1 GENERAL

Compact all layers of material placed in the Works uniformly over the full area and depth of the layer to achieve the relative compaction specified before the next layer is commenced. Trim each layer of material prior to and during compaction. Complete the compaction promptly to ensure that moisture content remains conforming and uniform and to minimise the possibility of rain damage.

Show in the Vibration and Air Blast Plan (refer to Specification RMS G35 or RMS G36, as applicable) its review of the above requirements and its operations to ensure that the public and structures are protected from vibrations generated from construction activities.

7.2 EARTH FILL

For all areas and materials listed in Table R44.5, uniformly compact each layer over the full area and depth of the layer to achieve the relative compaction specified in Clause 7.2.1 before the next layer is commenced.

At the time of compaction, maintain the moisture content within the range specified in Annexure R44/A5 at all locations within the lot. Adjust the moisture content within that range to enable the specified compaction to be achieved. Address monitoring and adjusting of moisture content in the EARTHWORKS PLAN.

Do not compact material that becomes wetted-up after placement until it has dried out so that the moisture content is within the specified range. The drying process may be assisted by aeration or, where approved by the Principal, by the use of hydrated or quick lime at your cost. Alternatively, you may remove the wet material to a stockpile site for drying out and later use as fill material. Any cost of removal to stockpile, for drying out and later use is deemed to be included in the rates generally.

Any material placed by you with a moisture content greater than that specified in Annexure R44/A5 must be dried out and uniformly recompact to the specified compaction before the next layer of material is placed. The affected material must be considered as a new lot. Alternatively, you may remove wet material to a stockpile site for drying and later re-use. The cost of the removal to stockpile, drying out and re-use of the material must be borne by you.

If there is insufficient moisture in the material for it to be compacted as specified, add water. The added water must be applied uniformly and thoroughly mixed with the material until a homogeneous mixture is obtained. The cost of such wetting of the material must be borne by you.

7.2.1 Relative Compaction Conformity Criteria

Carry out compaction control using Standard compaction on lots using statistical techniques in accordance with Specification RMS Q. Conformity of a lot will be achieved if the characteristic relative compaction of that lot is not less than the lower limit specified in Table R44.5.

Table R44.5 — Lower Limit for Characteristic Relative Compaction

Location	Lower Limit of Characteristic Relative Compaction
Earth mounds Spoil	90.0%
Foundation for Embankments (except where a bridging layer is used, as provided for in Clause 3.2). Each layer of material replacing unsuitable material as detailed in Clause 2.4 (except within 300 mm of design level of floor of cuttings). Foundation Treatment Types E1 and E3, and Working Platforms in embankments specified in Clause 3.2.3.	95.0%
Each layer of material placed in formations up to the underside of the Selected Material Zone. The entire area on the floors of cuttings. Material in verges or within medians up to the level at which topsoil is placed. Select fill placed adjacent to structures, as specified in Clause 5.4. Other areas not specifically mentioned herein.	98.0%
Materials placed in the "spill-through" bridge embankment zone, as specified in Clause 5.1.1.1.	100.0%
Each layer of the Selected Material Zone.	102.0%

A lot must contain only areas of work that are essentially homogeneous. This occurs when material origin and properties, general appearance, moisture condition during compaction, compaction technique, response to compactors, and state of underlying materials are substantially alike. Areas that fail to meet these conditions must be excluded from the lot and must be tested separately as one or more additional lots.

7.2.2 Sampling and Testing

Ensure that the laboratory independently carries out its responsibilities, as detailed in RMS Q, for locating and carrying out sampling and testing.

Provide a smooth surface at each sampling location for the purpose of obtaining samples.

The PROJECT QUALITY PLAN must ensure that lots are inspected for homogeneity as defined in RMS Q Annexure Q/L Clause L1.

At each sample location selected for determination of compaction, carry out a field density test and a field moisture test and obtain a sample for a laboratory maximum dry density test.

Carry out field (in situ) density tests in accordance with either Test Methods RMS T119 or RMS T173.

Conduct all tests within a particular lot using only one of the above Test Methods. Do not combine results obtained from more than one Test Method for a statistical assessment of a particular lot.

Where Test Method RMS T173 is used for the in situ density determination, extend the probe to be located within the layer and close to the bottom of the nominated lift. Once the test is completed, take a sample from below the test site, within the circle of area between the probe and the detector and for the full depth of the layer. The size of this sample must be sufficient for the laboratory determination of maximum density.

Repair test holes using freshly mixed material of the same type as used in the surrounding earthworks layer. Compact repair material to a degree equal to that of the surrounding earthworks layer. Detail in the PROJECT QUALITY PLAN the method of repairing the test holes.

Irrespective of the Test Method used to determine the in situ density, the proportion and density of oversize material retained on the 37.5 mm AS sieve in the sample for the laboratory maximum dry density test must also be determined, in accordance with the procedure described in Test Method RMS T119.

Determine field moisture content in accordance with Test Methods RMS T120, RMS T121, or RMS T180. Only use RMS T121 and RMS T180 where results have previously been calibrated against those of RMS T120 for the range of materials being compacted.

Determine maximum density using Test Methods RMS T111 or RMS T162.

7.2.3 Relative Compaction

Calculate relative compaction using Test Method RMS T166.

Round off the relative compaction value and the characteristic relative compaction value to the nearest 0.1%.

7.3 ROCK FILL

Conformity of a lot of rock fill is based on compliance with the nominated compaction routine verified in accordance with this Clause, and proof rolling in accordance with Clause 7.4.

Develop a materials grading, mixing, watering and rolling routine after construction and testing of trial sections, and nominate the verified routine to the Principal. If the routine includes in-situ modification (e.g. with a grid roller or similar), then verify the after-compaction grading of the material.

The length of a trial section must not exceed 50 m, and the width must be greater than or equal to 2 times the maximum roller drum width. Do not construct trial sections within 1.5 m of the bottom of the Selected Material Zone (SMZ).

Verification of a compaction routine will be based on results from two (2) successive trial sections. Two contiguous trial sections, constructed over the same time period in a continuous operation, will not be deemed to be two successive trial sections.

The compaction routine must include at least one vibrating roller.

WITNESS POINT

Process Witnessed: Construction of each trial section of rock fill

Submission Details: Notification of the place, date and time of construction of the trial section, at least 3 working days prior to commencement with details of:

- (i) Test results of all previous trial sections;
- (ii) Material type(s) and specifications, including moisture conditioning prior to and during rolling;
- (iii) Plant types and specifications;

- (iv) Number of roller passes;
- (v) Maximum and minimum roller speed and frequency of vibration;
- (vi) In-process testing regime and proof that there is no remaining internal settlement and proof that embankment stability exists.

HOLD POINT

Process Held:	Compaction of Rock Fills.
Submission Details:	Verification, including test results, of conformity of each trial section including details of the proposed compaction routine, any test results and survey reports.
Release of Hold Point:	The Principal will consider the submitted documents, prior to authorising the release of the Hold Point.

Where in-process testing of the compaction routine reveals nonconforming results, cease placing and compacting, and redevelop the routine using trial sections in accordance with the above or break down and/or sort rock material to achieve an earth fill in accordance with Clause 5.1.1. The above Hold Point applies to the redeveloped routine prior to recommencement of placement and compaction operations.

All costs associated with the development and nomination and verification of the compaction routine, and the utilisation of the nominated compaction routine on rock fill layers is deemed to be included in the rate for General Earthworks.

7.4 DEFLECTION TESTING

7.4.1 Proof Rolling

All embankment lots, and all other surfaces within 1.5 metres of the underside of the Selected Material Zone (SMZ) must be capable of withstanding proof rolling to verify their stability.

Unless otherwise approved by the Principal, undertake proof rolling in accordance with Test Method RMS T198 in the presence of the Principal.

The moisture content of the compacted material being proof rolled must be within the range specified in Annexure R44/A5. Proof roll each layer immediately following compaction. For the purpose of deflection testing by proof rolling, take the testing paths along the full width and length of each lot.

WITNESS POINT

Process to be Witnessed:	Proof rolling of any embankment fill layer, or any other surface within 1.5 metres of the underside of the Selected Material Zone.
Submission Details:	At least 1 working day's notice of intention to proof roll any surface with the proof rolling plan and verification of the layer or surface conforms (except proof rolling).

The tests must not exhibit visible deformation, rutting, or yielding and/or show signs of distress or instability.

If further proof rolling is required at a later date, the layer must be re-conditioned such that the moisture content is within the range specified in Annexure R44/A5, re-verified as conforming for density and survey requirements of this Specification, and given not less than eight (8) passes with the roller to be subsequently used for the proof rolling operation.

7.4.2 Benkelman Beam

Where shown in Annexure R44/A6, carry out deflection testing following completion of the formation to the underside and top of the Selected Material Zone (or underside of pavement where no Selected Material Zone is specified) using the Benkelman Beam in accordance with Test Method RMS T199.

Where the required characteristic deflection does not exceed 1.2 mm, the standard deviation of the lot must not exceed 0.2 mm. If the required characteristic deflection exceeds 1.2 mm, the coefficient of variation of the lot must not exceed 25%.

For the purpose of deflection testing with the Benkelman Beam, a lot must consist of a continuous length of formation of at least 300 m and of at least a single carriageway width that is generally homogeneous with respect to material and appearance. In urban areas or area with severe restrictions, the Principal may reduce the length of the lot. Mark the boundaries of each lot such that they are clearly identifiable in the field.

Take deflection testing by Benkelman Beam within 3 days of compaction of the material. Undertake testing over the plan area of the Selected Material Zone within each lot and any other area within the lot as directed by the Principal.

Obtain the Characteristic Deflection for each lot from the equation contained in Annexure R44/A6.

Where the characteristic deflection exceeds the value in Annexure R44/A6, re-examine the lot boundaries, re-check the lot for homogeneity, and subsequently re-nominate the lot (or parts thereof) for further testing.

WITNESS POINT (when Benkelman Beam Testing is specified)

Process to be Witnessed: Benkelman Beam testing of the surface under the first layer of pavement.

Submission Details: Notification of time, date and location of Benkelman Beam testing and results of proof rolling at least 1 working day prior to the proposed date of Benkelman Beam testing.

HOLD POINT

Process Held: Placing each lot of Selected Material Zone or pavement (where there is no Selected Material Zone).

Submission Details: Deflection test results, Survey Report of the finished surface and verification of conformity of each lot of formation at least 3 working days before the work is programmed to be covered up.

Release of Hold Point: The Principal will consider the submitted documents, and may direct further action prior to authorising the release of the Hold Point.

7.5 LEVEL CONTROL

7.5.1 Tolerances

Finish the surface levels of the batters, floors of cuttings, transitions, earthworks layers and zones, and verges to the design surface levels less the nominated thicknesses of the relevant overlying courses and zones to within the following tolerances:

Table R44.6 — Level Control - Tolerances

Position	Tolerance
(a) Top of Selected Material Zone and top of formation where there is no Selected Material Zone <ul style="list-style-type: none"> - where overlying layer is part of the Contract and the quantity for payment is in units of area (Case A). - for all other cases (Case C). 	+0 mm / -20 mm +0 mm / -20 mm
(b) Formation at the underside of Selected Material Zone (level of underside of Selected Material Zone) <ul style="list-style-type: none"> - where overlying layer is part of the Contract and the quantity for payment is in units of area (Case A). - where the underlying layer is a Drainage Blanket or Working Platform (Case B) - for all other cases (Case C). 	+0 mm / -100 mm +0 mm / -20 mm +0 mm / -20 mm
(c) Floor of cutting (before Foundation Treatment Type C1 and insitu stabilisation)	+50 mm / -50 mm
(d) Floor of cutting before placing foundation treatment materials or formation: Where equal to underside of the Selected Material Zone <ul style="list-style-type: none"> - where overlying layer is part of the Contract and the quantity for payment is in units of area (Case A). - for all other cases (Case C). Where below the underside of the Selected Material Zone	+0 mm / -100 mm +0 mm / -20 mm +0 mm / -100 mm
(e) Top of Drainage Blanket or Working Platform (unless at the underside of the Selected Material Zone)	+20 mm / -20 mm
(f) Floor of terrace at cut to fill transition	+0 mm / -100 mm
(g) Floor of benching in cuttings	+0 mm / -100 mm
(h) Top of rock fill	+0 mm / -100 mm
(i) Surface of verges	+0 mm / -20 mm

7.5.2 Areas below Level Tolerances

Where the overlying layer is Case C, as defined in Clause 7.5.1, the finished surface level will be accepted by the Principal on the following conditions:

- (a) Deductions are made at the rate shown in Annexure R44/A6;
- (b) The surface level does not exceed the tolerances detailed in Clause 7.5.1 for the relevant Case A; and
- (c) Your methods of survey and calculation and the calculations are agreed by the Principal.

7.5.3 Median Areas

The batter slopes for median areas must comply with those shown on the Drawings and undulations in the general plane of the batter slope will not be permitted outside of the following tolerances.

For a horizontal distance of up to 2 m from the edge of the shoulder (except areas where verges are required), no point on the completed batter may vary from the specified slope line by more than 35 mm when measured at right angles to the slope line. At distances greater than 2 m horizontally from the edge of the shoulder, no point on the completed batter may vary from the specified slope line by more than 75 mm when measured at right angles to the slope line.

Notwithstanding the tolerance of construction above, grade medians so as not to pond water.

8 CONTROL OF EARTHWORKS PROCESS

A summary of the earthworks construction requirements and process as required test methods, and minimum frequencies of testing and acceptance criteria is given in Table R44.7.

Table R44.7 – Control of Earthworks Process

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
1. Project Planning • Project QUALITY PLAN • EARTHWORKS PLAN	1.7 RMS Q 1.7 & 2.2		RMS Q 1.7	RMS Q 1.7
2. Clearing and Grubbing • Completion of clearing and grubbing	2.7.1 RMS G40		Each section	Complete
3. Erosion and Sedimentation Control • Installing and maintaining effective erosion and sedimentation control measures.	1.5 RMS G38 or G39	Inspection	Each section	Approved E&SC Plan
4. Setting Out of Earthworks • Establish and maintain batter profiles and Transition Zones. • Remove pegs at the completion of work	1.6 1.6	RMS G71 Inspection	Each section Each section	In place All removed
5. Stockpile Sites • Stockpile sites not shown on the Drawings - Obtain the Principal's approval at least 10 working days in advance • Install erosion and sedimentation measures • Restoration of stockpile sites	2.3 2.3 2.3, RMS G38 or G39 2.3	Inspection Inspection Inspection	Each stockpile Each stockpile Each stockpile	Approval Complete RMS R178
6. Topsoil	2.7			
6.1 Removal of Topsoil • Survey of stripped surfaces Hold Point	2.7.1 2.7.3, 1.6	RMS G71		
6.2 Stockpiling Topsoil • Survey of stockpile sites • Stockpile height and shape • Contents of stockpile • Seeding of stockpile	2.7.2, 1.6 2.7.2 2.7.2 2.7.2, RMS R178	RMS G71 Measure Inspection Inspection	Each stockpile Each stockpile Each stockpile RMS R178	RMS G71 Height < 2.5m Slope < 2:1 2.7.2 RMS R178
7. Embankment Foundations	3			
7.1 Preparation of Embankment Foundations • Removal of topsoil • Excavate foundation to ensure a minimum height of formation. • Stripped surface survey • Test Shallow Embankment for - CBR - PI • Preparation of each lot of embankment foundation Hold Point	3.2 2.7.1 5.1.3 1.6.3 3.2 3.2	Inspection Survey RMS G71 R44/A4.2 R44/A4.2	Each section RMS G71 Each section 1000 m ² 1000 m ² Each section	Complete Report Report R44/A4.2 R44/A4.2 Complete

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
7.2 Unsuitable Material	2.4			
• Removal of unsuitable material Hold Point	2.4	Inspection	Each lot	Complete
• Replacement of unsuitable material	2.4	Inspection	Each lot	Complete
- Compaction	5.1	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
- Moisture content	5.1	RMS T120, T121, T180	RMS Q	R44/A5
7.3 Loosen and Compact	3.2.1			
• Authorisation given	3.2.1		Each section	Authorised
• Ripping depth & extent	3.2.1	Inspection	Each section	3.2.1
• Compaction	7.2	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
• Moisture content	7.2	RMS T120, T121, T180	RMS Q	R44/A5
7.4 Use of Bridging Layer	3.2.2			
• Authorisation given	3.2.2		Each section	Authorised
• Material suitability	3.2.2	Inspection	Each section	3.2.2
• Bridging layer placed	3.2.2	Inspection	Each section	3.2.2
7.5 Use of Chemical Stabilisation	3.2.3			
• Authorisation given	3.2.3		Each section	Authorised
• Foundation stabilised	3.2.3	RMS R50	RMS R50	RMS R50
7.6 Use of Geotextile or Geogrid	3.2.4			
• Authorisation given	3.2.4		Each section	Authorised
• Material suitability	3.2.4	RMS R63, R67	RMS R63, R67	RMS R63, R67
• Geotextile or geogrid installation	3.2.4	RMS R63, R67	RMS R63, R67	RMS R63, R67
7.7 Use of Drainage Blanket	3.2.5			
• Authorisation given	3.2.5		Each section	Authorised
• Material Suitability				
- Grading	3.2.5	AS Sieve	200 m ³	3.2.5
- Point Load Strength of Rock	3.2.5	RMS T223	200 m ³	R44/A4.2
- Wet/Dry strength variation	3.2.5	RMS T215	Each source	R44/A4.2
• Drainage Blanket placed	3.2.5	Inspection	Each section	Complete
7.8 Use of Type E6 Foundation Treatment	3.2.6			
•				
8. Cuttings	3.4, 4			
8.1 Preparation of Cutting Area				
• Removal of topsoil	2.7.1	Inspection	Each section	Complete
• Stripped surface survey	1.6.3	RMS G71	Each section	Report
8.2 Excavation	4.2			
• Material loosened and broken down such that it can be incorporated into the Works, meeting the requirements for:-	2.1, 2.2, 4.2	Inspection & Audit		Materials available and conform
- Rock facing of batters	5.3			
- Placing adjacent to weepholes	5.4.2			
- Select fill adjacent to structures	5.4.3			
- Selected Material Zone	6.1.2			

Earthworks**R44**

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
<ul style="list-style-type: none"> - Verge - Other treatments - Earth fill - Rock fill - Bridging layers - Drainage blankets - Working platforms • Protection of earthworks 	6.2 6.3 5.1.1. 5.1.2 3.2.2 3.2.5, 3.4.2 3.2.3, 3.4.4	Inspection	Daily	1.5
8.3 Batters	4.3			
• Batters conform to specification tolerances	4.3	Survey	Each batter	Table R44.2
• Tops and ends of cuttings treated	4.2	Inspection	Each batter	4.2
• Rock cuttings cleaned down Hold Point	4.2.1	Inspection	Each batter	4.2.1
• Batter stabilisation works	4.2.1	As directed	As directed	As directed
• Treatment of batters	4.2	As directed	As directed	4.2
8.4 Benching in Cuttings	4.4			
• Benches must conform to tolerances and drain	4.4	Survey	Each bench	7.5
8.5 Blasting	4.5			
• Obtaining of licences and meeting regulatory requirements	4.5.1		Before blasting starts	AS 2187 Parts I & II
• Conducting Building Condition Inspection	4.5.1	Inspection	RMS G35 or G36 Clause 6.8	RMS G35 or G36 Clause 6.8
• Implement and maintain a community liaison program	4.5.1	Monitor	Each blast	RMS G35 or G36 Clause 6.8
• Presplitting of batters with slopes \geq 1:1 Drill hole spacing	4.5.2	Measure	Each blast	4.5.2
• Start of each blasting operation – submit details Hold Point	4.5.1		Each blast	Details OK
• Control airblast	4.5.4	AS2187.2	Each blast	Annex R44/A2
• Control ground vibration	4.5.5	AS2187.2	Each blast	Annex R44/A2
• Blasting records	4.5.3	Inspection	Each blast	Submitted on day of blast
8.6 Transition from Cut to Fill	3.5			
• Survey and mark the position of the intersection line between cutting and embankment occurring at the underside of the Selected Material Zone	1.6.1	Survey	Each transition	Report
• Excavate a Transition Zone	3.5	Survey	Each transition	3.5 & R44/A3
• Excavated terrace should be made free-draining	3.5	Inspection	Each transition	Drainage achieved
9. Foundation Treatments for Cuttings	3.4			
9.1 Preparation of Cutting Foundations	3.4			
• Removal of topsoil	2.7.1	Inspection	Each section	Complete
• Excavate cutting to Designed Floor Level	3.4	Survey	RMS G71	7.5
• Test Cutting Floor for	3.4			
- CBR		R44/A4.2	1000 m ²	R44/A4.2
- PI		R44/A4.2	1000 m ²	R44/A4.2
• Preparation of each lot of Cutting foundation Hold Point	3.4		Each section	Complete

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
9.2 Unsuitable Material	2.4			
• Removal of unsuitable material	2.4	Inspection	Each lot	Complete
Hold Point				
• Replacement of unsuitable material	2.4	Inspection	Each lot	Complete
- Compaction	5.1	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
- Moisture content	5.1	RMS T120, T121, T180	RMS Q	R44/A5
9.3 Loosen and Compact	3.4.1			
• Authorisation given	3.4.1		Each section	Authorised
• Ripping depth and extent and particle size	3.4.1	Inspection	1000 m ²	3.4.1
- Compaction	7.2	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
- Moisture content	7.2	RMS T120, T121, T180	RMS Q	R44/A5
9.4 Use of Drainage Blanket	3.4.2			
• Authorisation given	3.4.2		Each section	Authorised
• Material Suitability				
- Grading	3.4.2	AS Sieve	200 m ³	3.4.2
- Point Load Strength of Rock	3.4.2	RMS T223	200 m ³	R44/A4.2
- Wet/Dry strength variation	3.4.2	RMS T215	Each source	R44/A4.2
• Drainage blanket placed	3.4.2	Inspection	Each section	3.4.2, 7.3
• Trimming of drainage blanket	3.4.2	Survey	RMS G71	7.5
9.5 Excavation and Backfill	3.4.3			
• Authorisation given	3.4.3		Each section	Authorised
• Excavate cutting to Foundation Level.	3.4.3	Survey	RMS G71	7.5
• Loosen and compact as above	3.4.3, 3.4.1			
• Backfill material suitability	3.4.3			
- CBR		R44/A4.2	500 m ³	R44/A4.2
- PI		R44/A4.2	500 m ³	R44/A4.2
• Compaction of backfill	7.2	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
• Moisture content of backfill	7.2	RMS T120, T121, T180	RMS Q	R44/A5
• Trimming of backfill	3.4.3	Survey	RMS G71	7.5
9.6 Use of Chemical Stabilisation	3.4.4			
• Authorisation given	3.4.4		Each section	Authorised
• Foundation stabilised	3.4.4	RMS R50	RMS R50	RMS R50
• Trimming of working platform	3.4.4	Survey	RMS G71	7.5
9.7 Use of Geotextile or Geogrid	3.4.5			
• Authorisation given	3.4.5		Each section	Authorised
• Material suitability	3.4.5	RMS R63, R67	RMS R63, R67	RMS R63, R67
• Geotextile or geogrid installation	3.4.5	RMS R63, R67	RMS R63, R67	RMS R63, R67
9.8 Use of Other Foundation Treatment	3.4.6			
10. Embankments	5			
10.1 Embankment Materials	2.2 ,5			

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Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
<ul style="list-style-type: none"> • Site won Earth Fill material <ul style="list-style-type: none"> - Deleterious materials and homogeneity - Particle dimensions • Rock fill material <ul style="list-style-type: none"> - Maximum particle dimension - Point load strength - Wet/Dry strength variation • Rock fill capping layer material <ul style="list-style-type: none"> - Maximum particle dimension - Point load strength - Wet/Dry strength variation 	5.1.1 5.1.1 5.1.1 5.1.2 5.1.2.2 5.1.2.2 5.1.2.2 5.1.2.3 5.1.2.3 5.1.2.3 5.1.2.3	Inspection AS Sieve AS Sieve RMS T223 RMS T215 AS Sieve RMS T223 RMS T215	Each lot 1000 m ³ 500 m ³ Each source 500 m ³ Each source	5.1.1 5.1.1 5.1.2.2 R44/A4.2 R44/A4.2 5.1.2.3 R44/A4.2 R44/A4.2
10.2 Borrow Sites and Imported Materials <ul style="list-style-type: none"> • Source of imported fill • Delivery of imported materials Hold Point • Survey to determine quantity of imported materials placed in the Works • Site preparation of borrow sites • Location and shape of borrow sites • Restoration of borrow sites 	2.6, 2.8, 6 2.6.3 6.1.1, 6.2 1.6.3, 6.1.1, 6.3 2.6.1 2.6.2 2.6.1	Identify source(s) 6.1.1, 6.3 Survey Inspection Inspection Inspection	10 days prior to commencing work at each source Each source Each site for imported materials Each borrow site Each borrow site Each borrow site	Approvals for source R44/A4 RMS G71 2.7.1, RMS G40 2.6.2, R44/A4.1 RMS R178
10.3 Earth Fill Construction <ul style="list-style-type: none"> • Placing earth fill for embankment construction <ul style="list-style-type: none"> - Layer thickness - Lot homogeneity - Compaction - Moisture • Hillside embankment foundations • Protection of earthworks • Placing earth fill at "spill-through" bridge abutment zone <ul style="list-style-type: none"> - Width and height of zone - Earth fill material: <ul style="list-style-type: none"> ^ Grading ^ CBR ^ PI ^ Emerson Class - Layer thickness - Lot homogeneity - Compaction 	5.1.1. 5.1.1 5.1 3.3 1.5 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 5.1	Measure Inspection RMS T111, T119, T162, T166, T173 RMS T120, T121, T180 Inspection Inspection Measure AS sieve R44/A4.2 R44/A4.2 AS1289.3.8.1 Measure Inspection RMS T111, T119, T162, T166, T173	Each lot Each lot RMS Q RMS Q Each earthworks lot Daily Each lot 400 m ³ 400 m ³ 400 m ³ 400 m ³ Each lot Each lot RMS Q	5.1.1 5.1.1 Table R44.5 R44/A5 Terraced as per 3.3 1.5 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 5.1.1.1 Table R44.5

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
- Moisture		RMS T120, T121, T180	RMS Q	R44/A5
10.4 Rock Fill Construction				
• Placing rock fill for embankment construction				
- Trial sections	7.3	7.3	Each trial section	7.3
Witness Point / Hold Point				
- Layer thickness	5.1.2	Measure	Each lot	5.1.2
- Lot homogeneity	5.1	Inspection	Each lot	5.1.2.1
- Compaction	7.3	Inspection & Proof Roll	Each lot	7.3, 7.4.1
Witness Point				
• Hillside embankment foundations	3.3	Inspection	Each earthworks lot	Terraced as per 3.3
• Placing rock fill capping layer for embankment construction				
- Trial sections	7.3	7.3	Each trial section	7.3
Witness Point / Hold Point				
- Layer thickness	5.1.3	Measure	Each lot	5.1.2.3
- Lot homogeneity	5.1	Inspection	Each lot	5.1.2.3
- Compaction	7.3	Inspection & Proof Roll	Each lot	7.3, 7.4.1
Witness Point				
• Geotextiles				
- Material suitability	5.1.2.5	RMS R63	RMS R63	RMS R63
- Geotextile or geogrid installation	5.1.2.5	RMS R63	RMS R63	RMS R63
• Protection of earthworks	1.5	Inspection	Daily	1.5
10.5 Embankment Batters	5.2			
• Batters conform to specification tolerances	5.2	Survey	Each batter	5.2
• Batters free of loose material	5.2	Inspection	Each batter	5.2
• Treatment of batters	5.2	As directed	As directed	5.2
10.6 Rock Facing	5.3			
• Rock facing material	5.3			
- Maximum particle dimension	5.3	AS Sieve		5.3
- Point load strength	5.3	RMS T223	500 m ³	R44/A4.2
- Wet/Dry strength variation	5.3	RMS T215	Each source	R44/A4.2
• Placing Rock Facing for embankment construction	5.3	Inspection	Each section	5.3
10.7 Fill adjacent to Structures	5.4			
• Materials	5.4.1	RMS R11, R22, B30	RMS R11, R22, B30	RMS R11, R22, B30
• Placing fill adjacent to structures	5.4.3			
- Width & height	5.4.3	Measure	Each lot	Table R44.3
- Layer thickness	5.4.3	Measure	Each lot	5.4.3
- Lot homogeneity	5.4.3	Inspection	Each lot	5.4.3
- Compaction	5.4.3	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
- Moisture	5.4.3	RMS T120, T121, T180	RMS Q	R44/A5
• Treatment at weepholes				
- Materials	5.4.2	AS Sieve	10 m ³	5.4.2
- Placement	5.4.2	Measure	Each lot	5.4.2

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Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
- Synthetic membrane	5.4.2	Inspection	Each lot	Manufacturer's Spec
11. Structural Treatments				
11.1 Material in the Upper Zones of Formation other than Selected Material Zone	2.8.2			
• Site won	2.8.2.1			
- Maximum particle dimension (where applicable)	2.8.2.1	AS Sieve	1000 m ³	2.8.2.1
- Minimum CBR value	2.8.2.1	R44/A4.2	1000 m ³	R44/A4.2
- Maximum Plasticity Index (PI)	2.8.2.1	R44/A4.2	1000 m ³	R44/A4.2
• Imported	2.8.2.2			
- Maximum particle dimension (where applicable)	2.8.2.1	AS Sieve	1000 m ³	2.8.2.1
- Minimum CBR value	2.8.2.2	R44/A4.2	1000 m ³	R44/A4.2
- Maximum Plasticity Index (PI)	2.8.2.2	R44/A4.2	1000 m ³	R44/A4.2
11.2 Material in the Selected Material Zone	2.8.3			
• Site won	2.8.3.1			
- Maximum particle dimension (where applicable)	2.8.3.1	AS Sieve	1000 m ³	2.8.3.1
- Minimum CBR value	2.8.3.1	R44/A4.2	1000 m ³	R44/A4.2
- Maximum Plasticity Index (PI)	2.8.3.1	R44/A4.2	1000 m ³	R44/A4.2
• Imported	2.8.3.2	RMS 3071	RMS 3071	RMS 3071
11.3 Material in Verges	2.8.4			
• Site won	2.8.4.1			
- Maximum particle dimension and grading	2.8.4.1	AS Sieve	1000 m ³	2.8.4.1
- Minimum CBR value	2.8.4.1	R44/A4.2	1000 m ³	R44/A4.2
- Maximum Plasticity Index (PI)	2.8.4.1	R44/A4.2	1000 m ³	R44/A4.2
• Imported	2.8.4.2	RMS 3071	RMS 3071	RMS 3071 (Type B) & R44/A4.2
11.4 Placing Material for Upper Zone of Formation Hold Point	6.1.1			
• Layer thickness	5.1.1	Measure	Each lot	5.1.1
• Compaction	6.1.1	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
• Moisture	6.1.1	RMS T120, T121, T180	RMS Q	R44/A5
11.6 Placing Material in the Selected Material Zone	6.1.2			
• Layer thickness	6.1.2	Measure	Each lot	R44/A6
• Compaction	6.1.2	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5
• Moisture	6.1.2	RMS T120, T121, T180	RMS Q	R44/A5
• Verification of conformity for covering Hold Point	6.1.2	Reports	Each lot, Table R44.4	6.1.2
11.7 Placing Fill for Verges	6.2			
• Layer thickness	6.2	Measure	Each lot	R44/A6
• Compaction	6.2	RMS T111, T119, T162, T166, T173	RMS Q	Table R44.5

Work Sequence	Reference Clause	Test Method	Minimum Frequency	Acceptance Criteria
<ul style="list-style-type: none"> Moisture 	6.2	RMS T120, T121, T180	RMS Q	R44/A5
11.8 Other Treatments <ul style="list-style-type: none"> 	6.3			
12. Deflection Testing <ul style="list-style-type: none"> Proof rolling Witness Point Benkelman Beam testing at underside of the Selected Material Zone. Hold Point Deflection testing at top of the Selected Material Zone. Witness Point / Hold Point 	7.4 7.4.1 7.4.2 7.4.2	RMS T198 RMS T199 RMS T199	7.4.1 R44/A6 R44/A6	7.4.1 7.4.2, R44/A6 7.4.2, R44/A6
13. Level Control <ul style="list-style-type: none"> Surface levels of Selected Material Zone, formation, floor of cutting, drainage blanket, working platform, cut/fill transitions, benches in cuttings, rock fill and verges Median areas 	7.5 7.5.1 7.5.3	Survey Survey	RMS G71 RMS G71	7.5.1 7.5.3
14 Spoil	2.5			
14.1 Non-contaminated Materials <ul style="list-style-type: none"> Authorisation given within the site Authorisation given for off site Compaction 	2.5.1 2.5.1 2.5.1	RMS T111, T119, T162, T166, T173	Each location 10 days prior to commencing work at each location RMS Q	Authorised Approvals provided & authorised Table R44.5
14.2 Contaminated Materials <ul style="list-style-type: none"> Method & location of disposal 	2.5.2 2.5.2	Submission	Each source/ location	RMS G35 or G36

ANNEXURE R44/A – PROJECT SPECIFIC INFORMATION**A1 SURVEYS** (Clause 1.6)

Surveys and Joint Surveys (in accordance with RMS G71), must be carried out and reported using MX software, as shown in the following table:

Tender Document preparers must review and confirm/amend all values etc contained in Annexure A for their suitability for the proposed work. This must be done in conjunction with the geotechnical information and the pavement design for the work.

This note must be deleted before issue of the Tender Documents.

Clause	Location	Survey	MX File	Joint Survey
2.4	Before removal of unsuitable material	Yes	Yes/No	No
2.4	After removal of unsuitable material	Yes	Yes/No	No
2.7.2	Topsoil stockpile site before stockpiling	Yes	Yes/No	Yes
2.7.3	Surfaces of each cutting and embankment after stripping of topsoil	Yes	Yes/No	Yes
4.3, 5.2	Completed cut and fill batters prior to topsoiling, vegetation or other treatments	Yes	Yes/No	No
5.1, 6.1.1	Surfaces prior to placing imported material	Yes	Yes/No	Yes
6.1.2	Surfaces prior to placing Selected Material	Yes	Yes/No	No
6.2	Before placing verge material	Yes	Yes/No	No
7.5.1	Floor of cutting before placing foundation treatment materials or formation	Yes	Yes/No	No
7.5.1	Top of finished Formation	Yes	Yes/No	Yes
7.5.3	Finished surface of median	Yes	Yes/No	No

A2 BLASTING (Clause 4.5)

Permitted under Contract? Yes/No

Limiting Peak Particle Velocity and Blast Overpressure

Point of Potential Damage (within 1 km from the proposed blast site)	Blast Overpressure Level (dB[linear])	Peak Particle Velocity ⁽¹⁾ (mm/s)
Completed and cured bridge structures or sub-structures (e.g. completed abutment)	–	10 mm/s
Bridgeworks and structural retaining walls under construction	–	10 mm/s
Residential premises, schools, hospitals and other buildings	115 dB ⁽²⁾	5 mm/s ⁽²⁾
Building or monument of historical significance	115 dB	2 mm/s

Notes:

- ⁽¹⁾ Peak Particle Velocity is the vector peak particle velocity, defined as the maximum of the resultant vector particle velocity v_p and is the amplitude of the vector sum of three time-synchronised velocity components directly measured by an instrument.
When not measured directly, v_p may be determined by the equation $v_p = \sqrt{v_x^2 + v_y^2 + v_z^2}$, where v_x , v_y and v_z are the synchronized instantaneous velocity components in the x, y and z axes respectively.
- ⁽²⁾ 5% of readings may exceed 115 dB and 5 mm/s but must not exceed 120 dB and 10 mm/s.

A3 TOPSOIL REMOVAL, CUT BATTER TREATMENT & UPPER ZONE OF FORMATION

Clause	Description	Requirement
2.7.1	Place topsoil:	
2.7.1(i)	Stockpile within the work site	Yes/No
2.7.1(ii)	Stockpile as a windrow	Yes/No
2.7.1(iii)	Spoil outside the work site	Yes/No
2.7.1(iv)	Spoil as contaminated material	Yes/No
3.5	Cut/fill transition thickness:	900 mm
4.2	Cut batters must be treated in accordance with Drawing No:
6.1	Upper Zone of Formation thickness (including Selected Material Zone) for:	
	Cuttings	300 mm
	Cut/fill transitions	1,200 mm
	Embankments	600 mm
	Shallow embankments	1,200 mm

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6.1.2, 2.8.3.1	Selected Material Zone: Thickness Depth for stabilisation of material, other than to only meet specified CBR requirements	300 mm
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A4 MATERIALS**A4.1 Sources**

Clause	Description	Requirement
2.6.2	Borrow site excavations Specified location: Maximum batter slope:	
2.8.1 3.2.3, 3.4.4	The following materials must only be from imported sources: Selected Material: Upper Zone of Formation material other than Selected Material: Verge material: Working Platform stabilized material:	 Yes/No Yes/No Yes/No Yes/No
2.8.2.2	Sources of imported Upper Zone of Formation material other than Selected Material must be:
2.8.3.2	Sources of imported Selected Material Zone material must be:
2.8.4.2	Sources of imported verge material must be:
5.1	Source(s) of imported fill must be:
3.2.3, 3.4.4	Source(s) of imported stabilized material must be:
6.1.2	Material in the Selected Material Zone at any location must be from the same source (refer NOTE 1)	Yes/No

Note 1: If this requirement is “Yes”, the material placed in the upper layer of the Selected Material Zone at any particular location must be from the same source, produced using the same process and exhibit similar properties prior to any chemical modification which may be required, as that placed in the lower layer at that same location.

A4.2 Properties

Clause	Location	Value	Test	Pre-Treatment	Test Condition
2.8.2	Material for Upper Zone of Formation other than Selected Material: a) CBR _{10 day} b) Plasticity Index	8 min 25 max	T117 T109	T102/T103 T102/T103	100% Compaction
2.8.3.1	Site won Selected Material: a) Selected Material Zone top 150 mm layer CBR _{4 day} – characteristic value (Q) Refer NOTES 3 and 4	30 min	T117	T102/T103	100% Compaction

Clause	Location	Value	Test	Pre-Treatment	Test Condition
	b) rest of Selected Material Zone CBR _{4 day} – characteristic value (Q) Refer NOTE 4	15 min	T117	T102/T103	100% Compaction
	c) Plasticity Index	15 max	T109	T102/T103	NA
2.8.4	Verge material - CBR _{4 day} - Plasticity Index	15 min ≥ 6 and ≤ 12	T117 T109	T102/T103 T102/T103	100% Compaction
3.2	Shallow Embankments - CBR _{10 day} - Plasticity Index	8 min 25 max	T117 T109	T102/T103 T102/T103	100% Compaction
3.4	Cutting Floors a) CBR _{10 day} b) Plasticity Index	8 min 25 max	T117 T109	T102/T103 T102/T103	100% Compaction
3.2.5 & 3.4.2	Drainage Blanket: a) Point Load Strength Index I _{s(50)} b) Wet/Dry Strength Variation	1 MPa min 35% max	T223 T215	NA T102	NA NA
3.4.3	Type C3 Foundations in cuttings – backfill - CBR _{10 day} - Plasticity Index	8 min 25 max	T117 T109	T102/T103 T102/T103	100% Compaction
5.1.1.1	Earth fill at “spill-through” bridge abutment zone - CBR _{10 day} - characteristic value (Q) Refer NOTE 4 - Plasticity Index - Emerson Class	15 min 15 max 5 min	T117 T109 AS 1289.3.8.1	T102/T103 T102/T103	100% Compaction
5.1.2.2	Rock Fill: a) Point Load Strength Index I _{s(50)} b) Wet/Dry Strength Variation	1 MPa min 35% max	T223 T215	NA T102	NA NA
5.3	Rock Facing: a) Point Load Strength Index I _{s(50)} b) Wet/Dry Strength Variation	1 MPa min 35% max	T223 T215	NA T102	NA NA

LEGEND: NA = not applicable max = maximum min = minimum

Note 1: Pre-treatment is not required where samples are taken from the compacted formation. Compaction for CBR test must be (% of MDD for Standard Compaction) shown in right column.

Note 2: Where pre-treatment is shown as “T102/T103”, determine the appropriate pre-treatment regime for the material in accordance with Clause 2.8.1.

Note 3: (Refer Clause 2.8.3.1.) If any lot of Selected Material in the top 150mm layer has a CBR less than the value specified above, the material must be modified with hydrated lime at a application rate of 2% by mass. The modified material must have a UCS of less than 1.5MPa, when tested in accordance with RMS T131 using 7 days accelerated curing. Other suitable binders may be used where approved by the Principal. However, do not use binders which are prone to give rise to rapid or uneven strength gain or excessive shrinkage.

Note 4: For the purpose of calculating characteristic values, report CBR to the nearest 1%.

A5 COMPACTION MOISTURE REQUIREMENTS (Clause 7.2)

Material Description ⁽¹⁾	Source / Location	Moisture Range ⁽²⁾
Earthworks Material		60 – 90%

Note 1 Material types above are project specific.

Note 2 The Moisture Range is expressed as the ratio of Field Moisture Content to Optimum Moisture Content at standard compactive effort and is reported as a percentage.

A6 CONSTRUCTION OF UPPER ZONE OF FORMATION AND VERGES

Clause	Description	Requirement
3.2, 5.1.3	A Shallow Embankment exists where the depth to the Stripped Surface Level from the top of formation is less than:	1,200 mm
5.1.3	A Shallow Embankment beyond the cut/fill transition must have a height from the foundation to the top of formation of not less than:	1,200 mm
6.1.2	Maximum compacted thickness of each layer in the Selected Material Zone:	150 mm
6.2	Compacted layer thickness of each layer of Verge material	100 mm – 200 mm
7.4.2	Monitor deflection at underside and top of Selected Material Zone with Benkelman Beam. Obtain the Characteristic Deflection for each lot from the equation: $CD = u + f \times s$ where CD = Characteristic Deflection u = average maximum deflection f = value as shown in Annexure R44/A6 s = standard deviation	Yes/No
	Maximum Characteristic Deflection (CD) recorded for any lot must not exceed: Top of Selected Material Zone Underside of Selected Material Zone Factor f to be used in determining CD	1.0 mm 1.2 mm 1.65
7.5.2	The deduction for out of tolerance surface level where the overlying layer is to be provided by others:	\$150.00/m ³

A7 OTHER DATA

Clause	Description	Requirement
3.2.2	Type E2 foundation - Bridging layers - Minimum depth from underside of pavement to top of bridging	600.mm

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	layer - Maximum thickness of bridging layer	800 mm
3.2, 3.4	Specified Foundation Treatments - Location 'A' - Location 'B'	Type: Type:

ANNEXURE R44/B – MEASUREMENT AND PAYMENT

Payment will be made for all activities associated with completing the work detailed in RMS R44 in accordance with Pay Items below.

Unless otherwise specified, 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 you, it will be deemed that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Pay Item R44P1 - Topsoil

Pay Item R44P1.1 - Removal and Stockpiling of Non-contaminated Topsoil

The schedule rate for Pay Item R44P1.1 is an average rate to cover the removal, loading, handling, transporting and stockpiling of all non-contaminated topsoil within the limits of Works.

The unit of measurement is the cubic metre measured in the stockpile of topsoil removed in accordance with Clause 2.3.

The volume must be determined by measurement or survey, and calculation.

Pay Item R44P1.2 - Removal and Disposal Off-Site of Topsoil

The schedule rate for Pay Item R44P1.2 is an average rate to cover the removal, loading, handling, transporting and disposal of topsoil off-site, including tipping fees and any other disposal costs.

Topsoil removed as contaminated material in accordance with Clause 2.5.2 will be measured and paid in accordance with Pay Item R44P8 and Pay Item R44P1.2.

The unit of measurement of topsoil directed to be removed and disposed of off-site in accordance with Clause 2.3.1 items (iii) and (iv) is the cubic metre measured as bank volume of excavation.

The volume must be determined by measurement or survey, and calculation.

Pay Item R44P2 - General Earthworks (Cut/Fill)

The schedule rate for Pay Item R44P2 is an average rate to cover all types of material encountered during excavation and placed in embankments, including both earth and rock, and disposed of otherwise than in embankments.

The unit of measurement is the cubic metre measured as bank volume of excavation. Payment for General Earthworks includes all activities associated with the excavation of material from cuttings (including table drains, and gutters where designed), the excavation of material in/under Shallow Embankments, excavation of material in Foundation Treatment Types C2, C3 and C4 and the construction of embankments, including:

- (a) preparation of the foundation areas
- (b) placing and compacting conforming material to replace unsuitable material, contaminated material, and that required in Foundation Treatment Types C3 and C4, that has been removed

- (c) placing and compacting formation material and materials of specified quality in the Upper Zone of Formation
- (d) placing and compacting earth fills and rock fills
- (e) rock facing of embankments
- (f) rounding of the tops of batters
- (g) haulage of material and any pre-treatment such as breaking down or blending material for purposes such as free draining material for treatment of floors of rock cuttings or rock fill
- (h) restoring, stabilising or reforming over-excavation
- (i) placing and compacting verge material
- (j) working General Fill, Upper Zone and verge materials to bring moisture content of the lot to within the specified range including drying out material containing excess moisture
- (k) deflection testing and proof rolling
- (l) addressing any deficiency in sites for stockpiling, including disposal of unsuitable materials and supplying their replacement
- (m) double handling of materials excavated from the site that are stored temporarily in stockpiles before being returned for incorporation into the Works due to any staging of the Works

except that:

- (i) supply and placing of imported or borrowed General Fill material and Upper Zone Material will be paid under Pay Item R44P3
- (ii) removal of unsuitable material will be paid under Pay Item R44P4
- (iii) additional costs of disposal of non-contaminated spoil off site will be paid under Pay Item R44P6
- (iv) materials from excavations for drainage and drainage structures (other than materials from excavation for table drains and gutters) must not be included in the measurement for this Pay Item as this is paid for under RMS R11
- (v) additional costs for identification, treatment and disposal of contaminated material will be paid under Pay Item R44P8.
- (vi) additional costs for foundation treatments will be paid under Pay Items R44P7.1 to R44P7.4
- (vii) additional costs for stabilisation and imported material required in Foundation Treatment Types E3 and C4 will be paid under RMS R50 and Pay Item R44P3
- (viii) additional costs for placing materials from excavations as Selected Material will be paid under Pay Item R44P5.1
- (ix) additional costs for placing materials from excavation as verge material will be paid under Pay Item R44P5.3
- (x) payment for incorporation into embankments of surplus material from other works under the Contract will be included in the relevant pay items for excavation in the specifications for those other works.

For the purposes of measurement and payment, the base of the excavation is the Foundation Level in accordance with Clause 3.4 or as specified on the Drawings, before the removal of unsuitable material. The sides of the excavation are the design cut batters as shown on the Drawings or as determined by the Principal. No account will be taken of level or batter tolerances.

The volume is determined by calculation of the difference between the base of the excavation defined in the above paragraph and the stripped surface surveyed under Clause 2.7.3. When measuring the volume of excavations for payment, no account will be taken of the volume involved in:

- (a) ripping and loosening the floor of the cutting (Foundation Treatment Type C1)
- (b) loosening embankment floor (Foundation Treatment Type E1)
- (c) material removed in terracing (Clause 3.3)
- (d) in-situ stabilising material in Treatment C4.

Pay Item R44P3 - Imported or Borrowed Material

This Pay Item covers all activities associated with supply and placing of borrowed or imported material in the formation except for Selected Material, verge material and imported or borrowed material for fill above and behind reinforced soil block (refer to RMS R58 and RMS R59).

The unit of measurement is the compacted volume of imported fill in cubic metres measured in place. The volume is determined by calculation from the Drawings and survey. The calculation must exclude the volumes in the Selected Material Zone, verges and zone of imported or borrowed material for fill above and behind reinforced soil block.

Payment will include all activities associated with the opening up of the borrow site, excavation of material from the borrow site and the construction of embankments, the supply, haulage and placement of imported or borrowed material and any pre-treatment such as breaking down or blending material or drying out material containing excess moisture, maintenance of the borrow site, and restoration of the borrow site.

Payment will not be made for excess widening of embankments or wastage by you.

Pay Item R44P4 - Unsuitable Material

This Pay Item refers only to unsuitable material as defined in Clause 1.4 and described in Clause 2.4.

The unit of measurement is the cubic metre measured as bank volume of excavation. If the material is such that the bank volume of excavation cannot be measured, the Principal will determine the conversion factors to be applied to the loose volumes measured in haulage units or to the measured stockpile volumes.

The schedule rate(s) under Pay Item R44P4 will include all operations involved in the excavation, temporary stockpiling, drying out, haulage, compaction or other activity required under Clause 2.4 for the incorporation of unsuitable material in embankments or all activities required for disposal within the Site in accordance with clause 2.5.1.

Where the Principal directs that non-contaminated unsuitable material be disposed of off-site, additional payment will be made for disposal under Pay Item R44P6.

Additional payment will be made under Pay Item R44P8 for identification, treatment and disposal of contaminated unsuitable material.

When the schedule of quantities under Pay Item R44P4 provides for ranges of provisional quantities, the rates must be applied successively, but not cumulatively, as the volume of unsuitable material increases from one provisional quantity range to the next higher range.

Each rate must be applied for all unsuitable material removed within each quantity range, irrespective of the nature of the material removed.

Pay Item R44P5 - Selected Material in the Selected Material Zone and Verge Material

This pay item covers all activities associated with the identification, winning/purchasing, processing (including blending), stockpiling (including double handling to suit you), testing, transportation, placement, compaction and trimming of material in the Selected Material Zone and material in the verges.

This pay item covers the costs of modification of materials necessary to meet the CBR requirements of RMS 3071. Should stabilisation/modification of the material be specified, other than only to meet specified CBR requirements of imported Selected Material, payment for stabilisation will be made under RMS R50.

The unit of measurement is the cubic metre measured in place in the Selected Material Zone and verges. The width, depth and length must be taken as shown on the Drawings, and no account is taken of the allowable placement tolerances. Where additional areas or volumes are directed by the Principal, the volume must be determined by measurement or survey, and calculation.

Pay Item R44P5.1 - Selected Material from cuttings within the Limits of Works area

Where the material is obtained from cuttings within the Limits of Works area, the rate is an “extra over” rate to cover any extra costs over and above those costs allowed for under Pay Item R44P2.

Pay Item R44P5.2 - Selected Material Imported from beyond the Limits of Works area

Where the material is imported from beyond the Limits of Works area, the rate must cover all costs (including any stabilisation required to conform with RMS 3071).

Pay Item R44P5.3 - Verge Material from cuttings within the Limits of Works area

Where the material is obtained from cuttings within the Limits of Works area, the rate is an “extra over” rate to cover any extra costs over and above those costs allowed for under Pay Item R44P2.

Pay Item R44P5.4 - Verge Material Imported from beyond the Limits of Works area

Where the material is imported from beyond the Limits of Works area, the rate must cover all costs.

Pay Item R44P6 - Disposal of Non-Contaminated Spoil Off Site

The schedule rate is an average rate to cover all additional costs associated with the disposal of all types of non-contaminated material off site, except for topsoil encountered during excavation in accordance with clause 2.5.1.

Payment under Pay Item R44P6 is additional to payment under R44P2 or R44P4.

Payment for disposal of non-contaminated topsoil off-site will be made under Pay Item R44P1.2.

The unit of measurement is the bank cubic metre. The volume must be determined by measurement or survey and calculation using a bulking factor proposed by you and agreed by the Principal or otherwise determined by the Principal.

Pay Item R44P7 - Foundation Treatments

Pay Item R44P7.1 - Treatment Type E1 and Cutting Type C1 - Loosen and Recompact

The schedule rate for this Pay Item is an average rate to cover loosening the floor, terracing, adjusting the moisture content, processing the material to achieve the specified quality requirements, and compacting as specified. The Pay Item covers over and above those costs allowed for under Pay Item R44P2.

The unit of measurement is the square metre.

The area must be determined by measurement, or survey, and calculation. The area must exclude changes in designed quantities resulting from over-clearing or over-excavation, and changes to suit you.

Pay Item R44P7.2 – Treatment Type E2 – Bridging Layer

The measured quantity of bridging layer material must exclude changes in designed quantities resulting from excess widening of the bridging layer, and wastage or changes to suit you.

Geotextile is measured and paid in accordance with the Pay Item for Treatment Type E4 R44P7.3(a).

Pay Item R44P7.2(a) – Material obtained from excavations within the Works.

The unit of measurement must be the cubic metre in place. The quantity must be determined by measurement, or survey, and calculation.

This Pay Item covers all activities associated with the identification, selection, winning, processing (including breaking down), stockpiling (including double-handling to suit you) and placing of won-on-site material in the bridging layer, over and above those costs allowed for under Pay Item R44P2.

Pay Item R44P7.2(b) – Imported Material

The unit of measurement is the tonnes of material placed.

This Pay Item covers all activities associated with the identification, winning/purchasing, processing (including breaking down), stockpiling (including double-handling to suit you), testing, transportation and placing of imported material in the bridging layer.

Pay Item R44P7.3 – Treatment Type E4 and Cutting Type C5 – Geotextile and Geogrid

This Pay Item covers payment for all works associated with the use of geotextile and geogrids in earthworks operations, including use in rock fills, and foundation treatments.

Pay Item R44P7.3(a) Geotextile

Pay Item R44P7.3(b) Geogrid

The unit of measurement is the plan square metre of each type of geotextile or geogrid installed.

The area of geotextile or geogrid must be based on the theoretical cross-section shown on the Drawings and the length measured in place to provide a continuous length or width of geotextile or geogrid.

Measurement must not include the areas of laps required to provide a continuous length or width of geotextile or geogrid.

The rate will include all specific activities required to procure and place geotextile or geogrid.

Pay Item R44P7.4 – Treatment Type E5 and Cutting Type C2 – Drainage Blanket

The costs of excavation will be included in Pay Item R44P2.

Geotextile is measured and paid in accordance with the Pay Item for Type E4 Embankment R44P7.3(a).

The volume of drainage blanket material will be included in the following rates.

Pay Item R44P7.4(a) Drainage Blanket Material obtained from excavations within the Works

This Pay Item covers all activities associated with the identification, selection, winning, processing (including breaking down), stockpiling (including double-handling to suit you) and placing of won-on-site material in the drainage blanket, over and above those costs allowed for under Pay Item R44P2.

The unit of measurement is the cubic metre of drainage blanket material placed. The volume must be determined by specified thickness, measured area, and calculation. The volume must exclude changes in designed quantities resulting from excess widening of the layer, wastage, local depressions, settlement, or changes to suit you.

Pay Item R44P7.4(b) Imported Drainage Blanket Material

This Pay Item covers all activities associated with the identification, winning/purchasing, processing (including breaking down), stockpiling (including double-handling to suit you), testing, transportation and placing of imported material in the drainage blanket.

The unit of measurement is the cubic metre of drainage blanket material placed. The volume must be determined by specified thickness, measured area, and calculation. The volume must exclude changes in designed quantities resulting from excess widening of the layer, wastage, local depressions, settlement, or changes to suit you.

Pay Item R44P8 - Identification, Treatment and Disposal Off Site of Contaminated Material

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising R44)

Use Pay Item R44P8.1 where the presence of specific types of contaminated materials has been identified during site investigation. Provide separate sub-pay items R44P8.1(a), R44P8.1(b), etc for each type of identified contaminated material, with descriptions of the contaminated material.

Use Pay Item R44P8.2 for any potential contaminated material which have not been identified at time of tender.

This Pay Item covers additional costs of all activities associated with the identification, classification in accordance with OEH Waste Classification Guidelines, treatment, loading, haulage and disposal of contaminated material at sites legally authorised to accept the contaminated material, whether the contaminated material is topsoil, general fill or unsuitable material.

Payment under Pay Item R44P8 is additional to payment made under Pay Items R44P1.2, R44P2 or R44P4 as applicable.

Pay Item R44P8.1 – Identified Contaminated Material

The unit of measurement is the tonne of disposed material. The quantity must be determined using weighbridge dockets or invoices issued by the disposal facility.

Pay Item R44P8.2 – Other Contaminated Material

The Pay Item is a Provisional Sum.

Payment will be made for the costs of the activities required by Clause 2.5.2 for any contaminated material other than those provided in Pay Item R44P8.1 plus the provisional sum margin added in accordance with Clause 59.6 of the General Conditions of Contract.

ANNEXURE R44/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

C1 SCHEDULE OF HOLD POINTS

Clause	Description
RMS G71 Clause 3.2	Notification of Joint Survey.
2.7.3 & RMS G71 Clause 3.2	Submission of Joint Survey results.
2.4	Inspection after removal of unsuitable material and prior to backfilling.
3.2	Presentation of embankment foundation after removal of topsoil.
3.2	Presentation of CBR and PI of materials in the foundation of Shallow Embankments.
3.4	Presentation of each lot of floor of cuttings.
4.2.1	Presentation of cleaned batter and bench/floor surfaces for Geotechnical inspection.
4.5.1	Submission of blasting procedure details. Submission of altered blasting procedure details.
6.1.1	Details of material for Upper Zone of Formation (including Selected Material) arranged by you. Submission of details of location, quantities, type and verification of conformity. Verification that all possible onsite sources of material have been exhausted.
6.1.2	Verification of conformity of Selected Material.
6.1.2	Verification of conformity of each lot of Selected Material Zone with test and survey reports.
6.2	Details of imported verge material arranged by you.
7.3	Compaction of rock fills – verification of conformity of each trial section including submission of Compaction Routine, test results and survey reports.
7.4.2	Placing Selected Material Zone (or pavement where no Selected Material Zone is specified) – deflection testing results, finished surface levels and verification of conformity of the formation.

C2 SCHEDULE OF WITNESS POINTS

Clause	Description
7.3	Construction of each trial section of rock fill.
7.4.1	Proof rolling of embankment layers and other surfaces within 1.5 m of the underside of the Selected Material Zone.
7.4.2	Benkelman Beam testing of Selected Material Zone.

C3 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS Q Annexure Q/E.

Clause	Description of Identified Record
2.4	Notification that unsuitable material has been removed as directed
2.7.2	Survey report of surface levels after removal of topsoil
2.7.3	Submission or survey report and notification that topsoil has been removed from foundation for embankment
2.8.1	Details of source, location, quantities and type of Selected Material. Verification, with test results, of conformity of material
3.2	CBR and PI test results and notification that topsoil has been removed from each Shallow Embankment foundation
3.4.1	CBR and PI test results and notification that floor of cutting has been ripped or loosened
4.5.1	Report of Buildings Conditions Inspection of all structures likely to be affected by any blast
4.5.1	Blasting procedure, including quantity and type of explosives and pattern and certification of the proposed structural survey
4.5.3	Blasting records
6.1	Proposed location, quantities and type of imported Upper Zone of Formation materials
6.1.2	Test reports of each lot of stockpiled material for use in Selected Material Zone. Verification of conformity of each lot of Selected Material Zone with relevant test and survey reports
7.4	Deflection testing results of each lot of formation

ANNEXURES R44/D TO R44/L – (NOT USED)

ANNEXURE R44/M – REFERENCED DOCUMENTS**RMS Specifications**

RMS G1	Site Specific Requirements
RMS G10	Traffic Management
RMS G35 or G36	Environmental Protection
RMS G38 or G39	Soil and Water Management
RMS G40	Clearing and Grubbing
RMS G71	Construction Surveys
RMS Q	Quality Management System
RMS B30	Excavation and Backfill for Bridgeworks
RMS R11	Stormwater Drainage
RMS R22	Corrugated Metal Structures
RMS R33	Trench Drains
RMS R50	Stabilisation of Earthworks
RMS R58	Construction of Reinforced Soil Walls (Contractor's Design)
RMS R59	Construction of Reinforced Soil Walls (Principal's Design)
RMS R63	Geotextiles (Separation and Filtration)
RMS R67	High Strength Geosynthetic Reinforcement
RMS R178	Vegetation
RMS 3071	Selected Material for Formation

RMS Test Methods

RMS T102	Pretreatment of Samples of Road Materials by Compaction
RMS T103	Pretreatment of Road Materials by Artificial Weathering
RMS T105	Preparation and Division of Samples for Testing
RMS T108	Liquid Limit of Road Materials
RMS T109	Plastic Limit and Plasticity Index of Road Materials
RMS T111	Dry Density/Moisture Relations of Road Materials (Standard Compaction)
RMS T117	California Bearing Ratio of Remoulded Specimens of Road Materials
RMS T119	Determination of Density of Road Materials in situ using the Sand Replacement Method
RMS T120	Determination of Moisture Content of Road Materials (Standard Method)
RMS T121	Determination of Moisture Content of Road Materials (Sand Bath or Hot Plate Method)
RMS T131	Determination of Unconfined Compressive Strength of Road Materials Stabilised or modified with Proportions of Cement Lime or Other Cementitious Materials

Earthworks

R44

RMS T160	Benkelman Beam Deflection Test
RMS T162	Compaction Control Test (Rapid Method)
RMS T166	Determination of Relative Compaction
RMS T173	Determination of Field Wet Density of Pavement Materials using a Nuclear Gauge in Direct Transmission Mode
RMS T180	Determination of Moisture Content of Road Materials (Microwave Oven Method)
RMS T198	Proof Rolling Test
RMS T199	Deflection Monitoring Test
RMS T223	Point Load Strength of Rock Specimens, Field Method

Australian Standards

AS 2187	Parts 1 and 2. Explosives – Storage, transport and use
AS 3725	Loads on buried concrete pipes

Other References

- NAASRA Explosives in Roadworks Users Guide 1982
- ANZECC Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration

(Note: Next 2 clauses to be added as an amendment to this Specification only in appropriate situations)

4.5.4 Control of Airblast

This Clause will apply only where a noise sensitive location exists within 1 km of the blasting site.

Comply with the criteria recommended in the “ANZECC Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC)”. The Measurement process for determining verification of compliance with the ANZECC criteria is to be in accordance with "AS 2187.2 Explosives - Storage, Transport and Use, Appendix J - Ground Vibration and Airblast (Informative)".

The noise emanating from blasting operations must not exceed the limits in Annexure R44/A2 at any noise sensitive location, measured at the noise monitoring location nearest to the noise sensitive location.

Provide and operate equipment for the monitoring of airblast to ensure compliance with the specified limits. All monitoring must be carried out by personnel possessing current NATA accreditation for such monitoring unless approved otherwise by the Principal. Equipment used for monitoring must be calibrated annually by a recognised testing facility. All test results must be reported on test certificates which must include a clear statement as to compliance or non-compliance with the requirements of this Specification. In general, a monitoring location will be near the perimeter of the noise sensitive location at the point closest to the maximum charge. Provide a copy of the monitoring record to the Principal.

In the event that the measured airblast exceeds the specified limits, suspend further blasting work and take additional steps and precautions to ensure that, for any future blast, the limiting airblast must not be exceeded. Do not resume any blasting until details of the additional steps and precautions have been provided to the Principal.

4.5.5 Control of Ground Vibration

Provide and operate equipment for the monitoring of ground vibrations to ensure compliance with Annexure R44/A2. All monitoring must be carried out by personnel possessing current NATA accreditation for such monitoring unless approved otherwise by the Principal. The measurement process for determining verification of compliance with the ANZECC criteria is to be in accordance with AS 2187.2.

Equipment used for monitoring must be calibrated annually by a NATA accredited testing facility or manufacturer’s facility approved by the Principal. All test results must be reported on test certificates, which must include a clear statement as to compliance or non-compliance with the requirements of this Specification. In general, a monitoring location will be near the perimeter of the structure or building at the point closest to the maximum charge. Provide a copy of the monitoring record to the Principal.

To minimise the risk of peak particle velocity limits being exceeded, develop a blasting site relationship between peak particle velocity, distance and blasting charge.

For the first blast, monitors must be set up at not less than five points at varying distances away from the blasting site. The Maximum Instantaneous Charge for the first blast must not exceed that calculated from the following formula:

$$\text{MIC} = 0.5 \left[\frac{D}{\left[\frac{p.p.v.}{1140} \right]^{-0.625}} \right]^2$$

where MIC = Maximum Instantaneous Charge in kilograms

D = Distance in metres from charge to the point of potential damage

p.p.v. = limiting peak particle velocity from Annexure R44/A2

For subsequent blasts, the charge weight and other aspects of blast design may be adjusted provided that further ground vibration monitoring is undertaken and the blasting site relationship re-determined to demonstrate that charge weight limits are not exceeded. Make the graphs available to the Principal, if so requested.