

DEVELOPMENT
CONSTRUCTION
SPECIFICATION

C213

EARTHWORKS

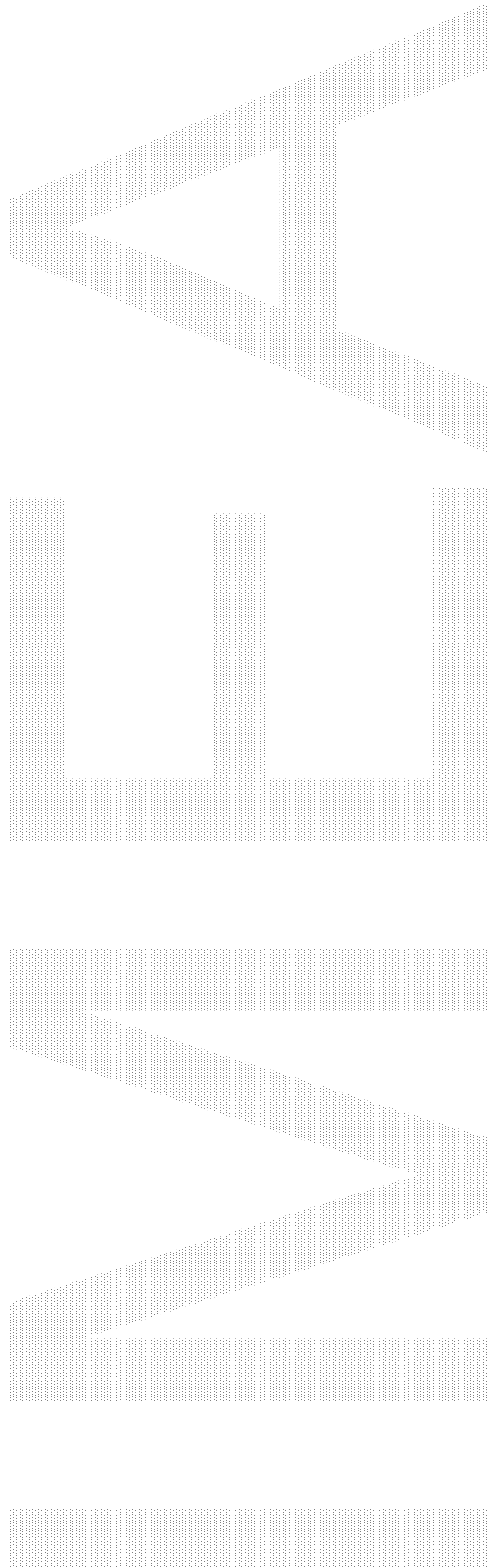
Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>EXAMPLE 1</i>	<i>Provision for acceptance of nonconformance with deduction in Payment</i>	<i>XYZ.00</i>	<i>AP</i>	<i>KP</i>	<i>2/6/97</i>
A	AS 3798 – 2007 year review Noise Guide for Local Government Material added – 2a	C213.02 C213.26	M	MD	11/12/2013
B	Superintendent to Council's authorised officer	C213.14	M	MD	30/10/2014



SPECIFICATION C213: EARTHWORKS

GENERAL

C213.01 SCOPE

1. The work to be executed under this Specification consists of:- **Scope**
- (a) removal of topsoil
 - (b) all activities and quality requirements associated with site regrading, the excavation of cuttings, the haulage of material and the construction of embankments to the extent defined in the Drawings and Specification.
 - (c) removal and replacement of any unsuitable material,
 - (d) any spoil or borrow activities associated with earthworks, and
 - (e) any additional processing of selected material for the selected material zone.

C213.02 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. **Documents
Standards Test
Methods**
- (a) Council Specifications**
- | | | |
|------|---|--------------------------------------|
| C201 | - | Control of Traffic |
| C211 | - | Control of Erosion and Sedimentation |
| C212 | - | Clearing and Grubbing |
| C220 | - | Stormwater Drainage - General |
| C273 | - | Landscaping |
- (b) Australian Standards**
- | | | |
|---------------|---|--|
| AS 1289.F1.1 | - | Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen. |
| AS 1289.3.3.1 | - | Calculation of the plasticity index of a soil. |
| AS 1289.5.1.1 | - | Determination of the dry density/moisture content relation of a soil using standard compactive effort. |
| AS 1289.5.4.1 | - | Compaction control test - Dry density ratio, moisture variation and moisture ratio. |
| AS 1289.5.7.1 | - | Compaction Control Test (Rapid Method). |
| AS 3798-2007 | | Earthworks for Residential and Commercial Developments |
- (c) Other**
- | | | |
|-----|---|-----------------------------------|
| EPA | - | Noise Guide for Local Government. |
|-----|---|-----------------------------------|

C213.04 PROTECTION OF EARTHWORKS

1. It is the Contractor's responsibility for the care of all Works. **Contractor's
Responsibility**
2. The Contractor shall install soil and water management control measures in **Soil and Water**

EARTHWORKS

- | | |
|---|----------------------------------|
| accordance with the SOIL AND WATER MANAGEMENT Plan, prior to commencing vegetation clearing and/or earthworks, and shall maintain these control measures for the duration of the work on site. | Management |
| 3. Adequate drainage of all working areas shall be maintained throughout the period of construction. | Drainage of Working Areas |
| 4. The Contractor shall program and protect the works to minimise ingress of excess water into earthworks material. Particular attention shall be paid to ripped material remaining in cuttings and material placed on embankments. | Wet Weather Precautions |

REMOVAL OF TOPSOIL

C213.07 SCOPE

- | | |
|--|-----------------------|
| 1. Topsoil is surface soil which is reasonably free from subsoil, refuse, clay lumps and stones. | Definition |
| 2. Removal of topsoil from any section of the Works shall only commence after soil and water management controls have been implemented. Topsoil throughout the length of the work shall be removed and stockpiled separately clear of the work with care taken to avoid contamination by other materials. | Prerequisites |
| 3. The work shall include the following:-

(a) Cuttings
Removal of the topsoil to the depth indicated on the approved engineering plans or as directed by the Geotechnical Engineer.

(b) Embankments
Removal of topsoil from the base of embankments to the depth indicated on the approved engineering plans, or as directed by the Geotechnical Engineer.

(c) Other Locations
Removal of topsoil as directed by the Geotechnical Engineer. | Extent of Work |

C213.09 TOPSOIL STOCKPILES

- | | |
|---|---------------------------|
| 1. Unless otherwise agreed to in writing by Council, the maximum height of stockpiles shall not exceed 2.5 m and the maximum batter slope shall not exceed 2:1. | Height and Batter |
| 2. Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape. | Stockpiles Trimmed |
| 3. To minimise erosion, stockpile batters shall be stabilised means acceptable to the Principal Certifying Authority. | Erosion Control |
| 4. Where seeding of stockpiles to encourage vegetation cover is specified, such work shall be carried out in accordance with the Specification for LANDSCAPING. | Seeding Stockpile |

CUTTINGS

C213.10 SCOPE

- | | | |
|----|--|------------------------------|
| 1. | Construction of cuttings shall include all operations associated with the excavation of material within the limits of the batters including benching, treatment of cutting floors and transition from cut to fill. | <i>Extent of Work</i> |
|----|--|------------------------------|

C213.11 EXCAVATION

- | | | |
|----|--|----------------------------------|
| 1. | Materials encountered in cuttings shall be loosened and broken down as required so that they are acceptable for incorporation in the Works. | |
| 2. | Cuttings shall have batter slopes as shown on the approved plans. | <i>Batter Slopes</i> |
| 3. | The tops of all cuttings shall be neatly "rounded". | |
| 4. | Batters shall be trimmed to present a regular and even surface and shall be free from abrupt surface variations. Batters may require progressive flattening at the ends of cuttings due to the presence of less stable material. | <i>Batters to be Even</i> |
| 5. | Cut faces shall be cleaned of loose or unstable material progressively as the excavation proceeds. | <i>Unstable Material</i> |
| 6. | Where material of variable quality or moisture content is encountered, the Contractor shall adjust his excavation methods to ensure blending of the materials, to obtain material meeting the quality and compaction requirements of this Specification. | <i>Blending Material</i> |

C213.12 BATTER TOLERANCES

- | | | |
|----|---|---|
| 1. | The tolerances for the excavation of batters, measured at right angles to the design grade line, shall be ± 150 mm. | <i>Batter Tolerances</i> |
| 2. | Reserved. | |
| 3. | If restoration works are required for batters steeper than 1:1, the batter shall be restored to the average batter slope using randomly mortared stone. The stone shall be similar to the sound rock in the cutting and the mortar shall be coloured to match the colour of the rock. | <i>Restoration of Batter Slope</i> |

C213.13 BENCHING IN CUTTINGS

- | | | |
|----|--|----------------------------------|
| 1. | Cut batters shall be benched as shown on the Approved Drawings to provide drainage and erosion control. Notwithstanding the tolerances permitted under Clause C213.12, bench widths shall not be less than those shown on the Approved Drawings. | <i>Bench Construction</i> |
| 2. | Benches shall be maintained and cleaned of loose stones and boulders regularly throughout the construction and maintenance period. | <i>Bench Maintenance</i> |

C213.14 TREATMENT OF FLOORS OF CUTTINGS

- | | | |
|----|---|--|
| 1. | The floors of cuttings shall be excavated to the design floor level which shall be at the underside of the selected material zone or at the underside of the pavement subbase. The floors shall then be trimmed to a level of not more than 10 mm above or 30 mm below the designed floor level. | <i>Excavation Level</i> |
| 2. | Where the floor of the cutting is in rock, the Contractor shall rip or loosen all material in the floor to a minimum depth of 200 mm below the design floor level for the width of the selected material zone or subbase layer. The maximum dimension of any particles in the ripped or loosened zone shall not exceed 150mm. | <i>Floor Material Ripped</i> |
| 3. | Prior to ripping or loosening the cutting floor the Contractor shall determine the CBR of the material in the floor by AS 1289.F1.1. Sufficient tests shall be taken to represent all the various materials which may exist in the cutting floor. | <i>CBR Testing</i> |
| 4. | Ripped or loosened material shall be made available for inspection by the Geotechnical Engineer and the Principal Certifying Authority before re-compaction commences. It shall be re-compacted in accordance with Clause C213.36. | <i>Inspection by Council's authorised officer</i> |
| 5. | After re-compaction, the floors of cuttings shall be re-trimmed so that the constructed levels do not vary by more than 10 mm above nor 30 mm below the design floor levels. | <i>Level Tolerances</i> |

C213.15 TRANSITION FROM CUT TO FILL

- | | |
|----|--|
| 1. | The transition from cut to fill shall be in accordance with the instructions issued by the Geotechnical Engineer controlling the earthworks. |
|----|--|

UNSUITABLE MATERIAL**C213.21 GENERAL**

- | | | |
|----|---|------------------------------------|
| 1. | Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth for stripping topsoil beneath embankments, which the Geotechnical Engineer and/or the Principal Certifying Authority deems to be unsuitable for embankment or pavement support in its present condition. Unsuitable material also includes material which the Geotechnical Engineer and/or the Principal Certifying Authority deem to be unsuitable for embankment construction. | <i>Definition</i> |
| 2. | Such material shall be excavated to the extent directed by the Geotechnical Engineer and/or the Principal Certifying Authority and removed from the works. | <i>Extent of Excavation</i> |
| 3. | After removal of the unsuitable material, the floor of the excavation shall be represented to the Geotechnical Engineer and/or the Principal Certifying Authority for inspection, prior to backfilling with replacement material, to determine whether a sufficient depth of unsuitable material has been removed. Prior to placing replacement material the excavated surface shall be compacted in accordance with Clause C213.36. | <i>Floor Inspection</i> |

- | | | |
|----|---|------------------------------------|
| 4. | The unsuitable material which has been removed shall be replaced with suitable material placed in accordance with Clause C213.26 and compacted in accordance with Clause C213.36. | <i>Replacement Material</i> |
|----|---|------------------------------------|

EMBANKMENT CONSTRUCTION

C213.22 SCOPE

- | | | |
|----|---|------------------------------|
| 1. | Embankment construction includes all operations associated with the preparation of the foundation areas on which fill material is to be placed, the placing and compacting of approved material within areas from which unsuitable material has been removed in accordance with Clause C213.21, the placing and compacting of fill material and of materials of specified quality in nominated zones throughout the Works and all other activities required to produce embankments as specified to the alignment, grading and dimensions shown on the Drawings. It also includes any pretreatment such as breaking down or blending material or drying out material containing excess moisture. | <i>Extent of Work</i> |
|----|---|------------------------------|

C213.24 FOUNDATIONS FOR EMBANKMENTS

- | | | |
|-----------|---|--|
| 1. | Following removal of topsoil in accordance with Clause C213.07, the embankment foundation area shall be made available for inspection by the Geotechnical Engineer. | <i>Inspection</i> |
| 2. | Where the Geotechnical Engineer considers that any underlying material is unsuitable, he may direct that it be removed and replaced in accordance with Clause C213.21. | <i>Unsuitable Material</i> |
| a) | Foundations for Shallow Embankments | <i>Shallow Embankments</i> |
| 1. | Shallow embankments are those embankments of a depth less than 1.0 metre from the top of pavement to natural surface. | |
| 2. | Material in the foundations for shallow embankments which does not meet the requirements specified in Annexure C213A, shall be deemed unsuitable in accordance with Clause C213.21 and shall be replaced by material of the specified quality. | <i>Unsuitable Material</i> |
| 3. | Foundations for shallow embankments shall be prepared for embankment construction after removing topsoil and unsuitable material, by loosening the material exposed to a depth of 200mm, adjusting the moisture content of the loosened material and compacting as specified in Clause C213.36. The Contractor shall use equipment and techniques to minimise surface heaving or other foundation damage. | <i>Preparation of Foundations</i> |
| b) | Other Embankments | |
| 1. | For all other embankments the foundation shall be prepared by grading and levelling the general area, adjusting the moisture content where necessary and compacting the top 200mm as specified in Clause C213.36. | <i>Preparation</i> |
| 2. | Where a bridging layer has been specified as a foundation treatment it shall be supplied and placed as part of General Earthworks. The bridging layer shall consist of free-draining granular material with or without geofabric interlayer as specified on the Drawings or as approved by the Geotechnical Engineer. The granular material shall be end-dumped and spread in a single layer and in | <i>Bridging Layer</i> |

sufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Clause C213.36 shall not apply to the bridging layer.

3. A bridging layer may also be employed, subject to the approval of the Geotechnical Engineer, where ground water or seepage is encountered in the foundation area or where the Contractor demonstrates that it is impracticable to achieve the degree of compaction specified for the foundation in Clause C213.36. A bridging layer shall not be acceptable if its proximity to the pavement is likely to affect the pavement design.

Seepage from Foundations

C213.25 HILLSIDE EMBANKMENTS

1. Where embankments are to be constructed on or against any natural slopes or the batters of existing embankments, the existing slope or batter, if it is steeper than 4 horizontal to 1 vertical in any direction shall be cut in the form of horizontal terraces over the whole area to be covered by new filling. The existing slope or batter shall be stepped in successive terraces, each at least 1 metre in width, the terraces to be cut progressively as the embankment is placed. Wherever possible terraces shall coincide with natural discontinuities. Subsoil drainage may be required in some instances. Material thus excavated shall be compacted as part of the new embankment material.

Horizontal Terraces

C213.26 PLACING FILL FOR EMBANKMENT CONSTRUCTION

1. All work shall be under Level 1 Geotechnical Control in accordance with AS 3798.
2. In the absence of a specific geotechnical engineer's specification, embankments shall be constructed in accordance with the following paragraphs:
 - a. The material shall be approved by the Principal Certifying Authority.
 - b. The methods of excavation, transport, depositing and spreading of the fill material shall be selected so as to ensure that the placed material is uniformly mixed.
 - c. The embankment shall be constructed so as to derive its stability from the adequate compaction of the fine material embedding the large rock pieces rather than mechanical interlock of the rock pieces. The fine material shall be compacted to meet the requirements of Clause C213.36.
 - d. Fill material for embankment construction shall be free of tree stumps, roots and other organic matter and shall be placed in layers parallel to the grade line and compacted in accordance with Clause C213.36. The layers shall be of uniform compacted thickness not exceeding 200 mm.
 - e. The maximum dimension, measured in any direction, of rock pieces in the fill material for embankment construction shall not exceed 150 mm. Any larger rock pieces shall be reduced in size for incorporation in the embankment layers.
 - f. Rock material shall be broken down and evenly distributed through the fill material, and sufficient fine material shall be placed around the larger material as it is deposited to fill the voids and produce a dense, compact embankment. Where the Geotechnical Engineer considers insufficient fine material is present to fill the voids, additional fine material shall be obtained from other places in the work or by a change in the method of winning fill material.
 - g. Areas with insufficient fine material to fill the voids shall be reworked with additional fine material being blended in to achieve a dense, compact layer.

Uniformity of Material

Embankment Stability

Layer Thickness

Maximum Size Rock Pieces

Grading of Fill Material

Reworking

- | | | |
|----|--|---|
| h. | In placing embankment layers, the Contractor shall use equipment and techniques to avoid surface heaving or other damage to the foundations and underlying embankment layers. | <i>Equipment Selection for Placement</i> |
| i. | After compaction, embankment material in the zone(s) below the selected material zone (or subbase layer, where no selected material zone) shall have a CBR value not less than that quoted in Annexure C213A for the depth(s) specified in Annexure C213A. | <i>CBR Value</i> |
| j. | For the purpose of this Clause, the CBR value of the material shall be determined by Test Method AS 1289.F1.1. | <i>Test Methods</i> |

C213.27 EMBANKMENT BATTERS

- | | | |
|----|--|---------------------------------|
| 1. | When completed, the average planes of the batters of embankments shall conform to those shown on the Drawings or as approved by the Principal Certifying Authority. No point on the completed batter shall vary from the specified slope line by more than $\pm 300\text{mm}$ when measured at right angles to the grade line. However, in no case shall the edge of the formation at the underside of the pavement be nearer to the roadway than shown on the Drawings. | <i>Slope Tolerances</i> |
| 2. | Undulations in the general plane of the batter shall not be permitted. | <i>Slope Undulations</i> |

C213.28 ROCK FACING OF EMBANKMENTS

- | | | |
|----|--|------------------------------------|
| 1. | Where shown on the Drawings, embankment batters (including embankments at bridge abutments) shall be provided with a facing of clean, hard, durable rock. | <i>Extent</i> |
| 2. | The rock facing shall be built up in layers ahead of each layer of filling. Rock may be placed by hand or plant but shall be placed in such a manner that its least dimension is vertical and that mechanical interlock between the larger stones occurs. Any rock deposited in the rock facing which has an excess of fine material surrounding it shall be removed together with the excess fine material and replaced. | <i>Mechanical Interlock</i> |
| 3. | The Contractor shall adjust his working methods and programme the work so as to obtain hard and durable rock of the specified dimensions as it is required. The space between larger batter rocks shall be filled 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. Fine material shall not cover the outside of the rocks on the face of the batter. | <i>Graded Filter</i> |
| 4. | The Contractor shall exercise extreme caution whilst placing the rock facing. Where embankment material is placed above other roads in use the outer rock layer shall be placed in such a manner as to prevent spillage down the batter. The Contractor shall ensure that, under no circumstances, could any rock be dislodged and roll onto any adjacent roadway or track in use. | <i>Caution in Placement</i> |

C213.29 TRIMMING TOPS OF EMBANKMENTS

- | | | |
|----|---|--------------------------|
| 1. | The tops of embankments at these levels shall be compacted to meet the requirements of Clause C213.36 and trimmed so that they do not vary more than 10 mm above or 30 mm below the levels as calculated above. | <i>Tolerances</i> |
|----|---|--------------------------|

C213.30 SELECTED MATERIAL ZONE (Includes Subgrade)

- | | | |
|----|--|-------------------------------------|
| 1. | A selected material zone may be indicated on the Approved Drawings as a zone below the subbase layer and in accordance with the following quality requirements:

(a) it shall be free from stone larger than 100 mm maximum dimension
(b) the fraction passing 19.0mm AS sieve shall have a CBR value of not less than 3. | <i>Dimension and Quality</i> |
| 2. | The selected material zone shall be placed and compacted in layers with the compacted thickness of each layer not exceeding 150mm. Compaction shall be 100% standard compactive effort. | <i>Layer Thickness</i> |
| 3. | After placement the selected material shall be homogeneous and free from patches containing segregated stone or excess fines. | <i>Homogeneous Layers</i> |
| 4. | The top of the selected material zone shall be compacted and trimmed parallel with the designed grade line at a level equal to the finished surface level minus the thickness of pavement layers adopted. The top of the selected material zone shall not vary by more than 10 mm above nor 30 mm below the design level. | <i>Tolerances</i> |

C213.31 FILL ADJACENT TO STRUCTURES

- | | | |
|----|--|---------------------------------|
| 1. | For the purpose of this Clause, structures shall include bridges, precast and cast-in-place box culverts and retaining walls. Fill adjacent to other culverts and drainage structures shall be provided in accordance with the particular Specifications for STORMWATER DRAINAGE as appropriate. | <i>Structure Types</i> |
| 2. | No filling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts or the Contractor can demonstrate that 85 per cent of the design strength of the concrete has been achieved. | <i>Time of Placement</i> |

C213.32 TREATMENT AT WEEPHOLES

- | | | |
|----|--|----------------------------------|
| 1. | Drainage adjacent to weepholes shall be provided by either a layer of hard broken stone or river gravel consisting of clean, hard, durable particles graded from 50mm to 10mm such that:

(a) The maximum particle dimension shall not exceed 50mm
(b) No more than 5 per cent by mass shall pass the 9.5mm A.S. sieve. | <i>Grading</i> |
| 2. | The broken stone or river gravel shall be continuous in the line of the weepholes, extend at least 300mm horizontally into the fill and extend to a point 300mm below finished surface level. | <i>Extent</i> |
| 3. | Alternatively the Contractor may provide a synthetic membrane of equivalent drainage characteristics. It shall be stored and installed in accordance with Manufacturer's instructions. The use of a synthetic membrane shall be subject to approval by Council. | <i>Synthetic Membrane</i> |

C213.33 SELECTED BACKFILL

- | | | |
|----|---|-----------------------|
| 1. | Selected backfill shall be placed adjacent to structures in accordance with | <i>Quality</i> |
|----|---|-----------------------|

Table C213.2. The selected backfill shall consist of a granular material having a maximum dimension not exceeding 50mm and a Plasticity Index, determined by AS 1289.3.3.1, neither less than 2 nor more than 12.

Structure Type	Selected Backfill	
	Width	Height
Bridge abutments	2m	H
Cast-in-place Box Culverts	H/3	H + 300mm
Corrugated Steel Pipes and Arches	0.5m	H + 500mm
Retaining walls	H/3	H

(Where H = height of structure)

Table C213.2 - Selected Backfill, Width and Height

- | | | |
|----|---|----------------------------------|
| 2. | The selected backfill shall be placed in layers, with a maximum compacted thickness of 150mm. Layers shall be placed simultaneously on both sides of box culverts to avoid differential loading. Compaction shall start at the wall and proceed away from it. | Placement in Layers |
| 3. | The backfill material shall be compacted to 100% standard compactive effort within 150mm of the subgrade level and 95% standard compactive effort below this zone. | Compaction |
| 4. | The existing embankment slope behind the structure shall be cut in the form of successive horizontal terraces, each terrace being at least 1 metre in width, and the selected backfill shall be placed in accordance with Clause C213.26. | Horizontal Terraces |
| 5. | No selected backfilling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts to the satisfaction of the Principal Certifying Authority, or when the Contractor can demonstrate that 85 per cent of the design strength of the concrete has been achieved. | Time of Placement |
| 6. | Where a bridge deck is being concreted adjacent to an abutment, no filling shall be placed against the abutment within twenty-one days after placing concrete in the bridge deck. | Adjacent to Concrete Deck |
| 7. | In the case of spill-through abutments, rocks shall not be dumped against the columns or retaining walls but shall be built up evenly by individual placement around or against such structures. | Spill through Abutments |
| 8. | In the case of framed structures, embankments at both ends of the structure shall be brought up simultaneously, the difference between the levels of the embankments at the respective abutments, shall not exceed 500mm. | Framed Structures |

COMPACTION AND QUALITY CONTROL

C213.36 COMPACTION AND MOISTURE REQUIREMENTS

- | | | |
|----|--|--------------------------------|
| 1. | All layers shall be uniformly compacted to not less than the relative compaction specified before the next layer is commenced. Each layer of material shall be trimmed prior to and during compaction to avoid bridging over low areas. An evenly trimmed surface shall be presented at the top of each layer. | Trimming and Compaction |
|----|--|--------------------------------|

- | | | |
|----|---|--|
| 2. | The following areas shall be compacted to not less than 95% standard compaction in accordance with AS 1289.5.7.1: | 95% (standard)
Compaction
Requirements |
| a. | Each layer of material replacing unsuitable material as detailed in Clause C213.21. | |
| b. | Each layer of material placed in embankments, up to the subgrade level. | |
| c. | The whole area on the floors of cuttings. | |
| d. | Fill placed adjacent to structures up to 1.0 metre from the top of pavement. | |
| e. | Material in unsealed verges and within medians up to the level at which topsoil is placed. | |
| 3. | The following areas shall be compacted to not less than 100% standard compaction in accordance with AS 1289.5.7.1: | 100%
(standard)
Compaction
Requirements |
| a. | Foundations for shallow embankments. | |
| b. | Foundations other than shallow embankments. | |
| c. | Each layer of the embankment within 150 mm from the subgrade level. | |
| d. | Each layer of the selected material zone as specified in Clause C213.30. | |
| e. | The fill material placed adjacent to structures as specified in Clauses C213.31 and C213.33 in each layer within 1.0 metre from the top of the pavement. | |
| 4. | Prior to the commencement of placing embankment material, the Contractor shall engage a qualified geotechnical engineer to determine the optimum moisture content (OMC) for the materials to be used. | |
| 5. | At the time of compaction the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which is within the range of the optimum moisture content (OMC) as determined by AS 1289.5.1.1 or AS 1289.5.7.1. Material which becomes wetted up after placement shall not be compacted until it has dried out so that the moisture content is within this range. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. The added water shall be applied uniformly and thoroughly mixed with the material until a homogeneous mixture is obtained. | Moisture
Content |
| 6. | Compaction shall be undertaken to obtain the specified relative compaction for the full depth of each layer in embankments and for the full width of the formation over the entire length of the work. Compaction shall be completed promptly to minimise the possibility of rain damage. | Prompt
Compaction |
| 7. | Any material placed by the Contractor that has attained the specified relative compaction but subsequently becomes wetted up so that the moisture content is greater than the apparent optimum, determined by AS 1289.5.7.1, shall be dried out and uniformly recompacted to the required relative compaction in accordance with this Clause before the next layer of material is placed. Alternatively, the Contractor may remove the layer of wetted material to a stockpile site for drying and later re-use. | Moisture
Content above
Optimum |
| 8. | Prior to placing pavement material, the Proof Roll test shall be passed. | Proof Rolling |

C213.37 TEST LOCATIONS

- | | | |
|----|--|---|
| 1. | The specified compaction and moisture tests shall be performed in accordance with Annexure CQC - B1. | <i>Testing</i> |
| 2. | If testing confirms that the material does not conform to the Specification, the Contractor shall carry out remedial work as necessary to achieve conformance to the requirements of Clause C213.36. | <i>Non Compliance with Specification</i> |

C213.39 WIDENING OF FORMATION

- | | | |
|----|---|--------------------------------------|
| 1. | Road shoulders and formation shall be widened to accommodate footpaths, guardfence, streetlight plinths, emergency telephone bays and vehicle standing areas as shown on the Approved Drawings. | <i>Provision for Services</i> |
|----|---|--------------------------------------|

C213.40 STANDARD OF FILL FOR LOTS

- | | | |
|----|--|--|
| 1. | Lot filling material shall conform to the following:

a. is to be clean material free from large rock, organic matter, builders refuse and other debris , and

b. Maximum particle size shall be 100 mm. | |
|----|--|--|

Placing of filling shall not commence until the proposed fill material and the prepared area has been inspected and approved by a qualified geotechnical engineer.

- | | | |
|----|--|----------------------------|
| 2. | All work shall be under Level 1 Geotechnical Control in accordance with AS 3798. Fill is to be placed in layers not exceeding 150mm compacted thickness. All fill is to be compacted to 95% standard maximum dry density. Maximum particle size shall be 2/3 of the layer thickness. | <i>Fill Quality</i> |
| 3. | All areas where filling has been placed are to be topdressed with a layer of clean arable topsoil, fertilised and sown with suitable grasses. The topsoil layer shall be between 75 mm (min) and 300 mm (max). | <i>Top Dressing</i> |

LIMITS AND TOLERANCES**C213.45 SUMMARY OF TOLERANCES**

1. The tolerances applicable to the various clauses in this Specification are summarized in the Table below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Batter Slopes		
	a) Excavation	± 150mm	C213.12
	b) Embankment	± 150mm	C213.27
2.	Floors		
	a) Floor of Cutting	Parallel to the designed grade line and ± 50mm of the designed floor level	C213.14
3.	Tops of Embankments		
	Trimming tops of Embankments	Parallel to the designed grade line, +10mm or -30mm of the levels specified	C213.29
4.	Selected Material (includes subgrade)	Parallel to the designed grade line, +10mm or -30mm of the levels specified	C213.30

NOTE: Plus (+) is towards the roadway/surface and minus (-) is away from the roadway/surface. Tolerances are measured at right angles to design surfaces.

Table C213.3 - Limits and Tolerances

SPECIFICATION C213 - EARTHWORKS

CLAUSE	CONTENTS	PAGE
GENERAL		1
C213.01	SCOPE	1
C213.02	REFERENCE DOCUMENTS	1
C213.04	PROTECTION OF EARTHWORKS.....	1
REMOVAL OF TOPSOIL		2
C213.07	SCOPE	2
C213.09	TOPSOIL STOCKPILES.....	2
CUTTINGS		3
C213.10	SCOPE	3
C213.11	EXCAVATION.....	3
C213.12	BATTER TOLERANCES	3
C213.13	BENCHING IN CUTTINGS.....	3
C213.14	TREATMENT OF FLOORS OF CUTTINGS	4
C213.15	TRANSITION FROM CUT TO FILL	4
UNSUITABLE MATERIAL		4
C213.21	GENERAL.....	4
EMBANKMENT CONSTRUCTION		5
C213.22	SCOPE	5
C213.24	FOUNDATIONS FOR EMBANKMENTS	5
C213.25	HILLSIDE EMBANKMENTS	6
C213.26	PLACING FILL FOR EMBANKMENT CONSTRUCTION.....	6
C213.27	EMBANKMENT BATTERS.....	7
C213.28	ROCK FACING OF EMBANKMENTS	7

EARTHWORKS

C213.29	TRIMMING TOPS OF EMBANKMENTS.....	7
C213.30	SELECTED MATERIAL ZONE.....	8
C213.31	FILL ADJACENT TO STRUCTURES.....	8
C213.32	TREATMENT AT WEEPHOLES.....	8
C213.33	SELECTED BACKFILL.....	8

COMPACTION AND QUALITY CONTROL9

C213.36	COMPACTION AND MOISTURE REQUIREMENTS.....	9
C213.37	TEST LOCATIONS.....	11
C213.39	WIDENING OF FORMATION	11

LIMITS AND TOLERANCES.....12

C213.45	SUMMARY OF TOLERANCES.....	12
---------	----------------------------	----