Development manual planning scheme policy (PSP)
SC6.4.7 Clearing, grubbing and earthworks

Index

SC6.4.7.7 Blasting

(1) General
(2) Presplitting
(3) Blasting records
(4) Control of air blast over-pressure
(5) Control of ground vibration

SC6.4.7.8 Unsuitable material

SC6.4.7.9 Embankment construction

(1) Scope
(2) Embankment material
(3) Foundations and embankments
(4) Hillside embankments
(5) Placing fill for embankment construction
(6) Embankment batters
(7) Rock facing to embankments
(8) Trimming tops of embankments
(9) Select material zones
(10) Fill adjacent to structures
(11) Treatment at weep holes
(12) Selected backfill
(13) Spoil
(14) Borrow

SC6.4.7.10 Acid sulphate soils

(1) Objective
(2) References and source documents
(3) Safety requirements
(4) Environmental requirements
(5) Equipment and materials
(6) Method

SC6.4.7.11 Compaction and quality control

(1) Compaction and moisture requirements
(2) Test locations
(3) Deflection monitoring
(4) Widening of formation
(5) Subgrade testing and treatment

SC6.4.7.12 Summary of limits and tolerances

SC6.4.7.13 Clearing and grubbing hold points

SC6.4.7.14 Clearing and grubbing witness points

SC6.4.7.15 Earthworks hold points

SC6.4.7.16 Earthworks witness points

SC6.4.7.1 Clearing and grubbing

(1) Introduction

(a) Scope

This section provides standards, advice, and guidelines for the clearing of all vegetation, both living and dead, all minor man-made structures (such as fences and livestock yards), all rubbish and other materials, including the chipping of the crowns of trees and the branches of shrubs, and the grubbing of tree stumps from the area. The work also includes the disposal, in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation and Clause SC6.4.7.1 (3)(c) Disposal of materials, of all materials that have been cleared and grubbed.

(b) General requirements

Site works shall take all measures to prevent damage to existing underground and overhead utility services.

Before commencing earthworks, locate and mark existing underground services in the areas to be affected by the works including clearing, excavating, and trenching.

All existing utilities, natural landscape features, including natural rock outcrops, natural vegetation, trees to be preserved, soil and watercourses are to remain undisturbed.

Explosives shall not be permitted to be used in clearing, grubbing or other demolition activities.

BEFORE YOU DIG is a free service, from anywhere in Australia, through which underground pipe and cable locations can be reviewed. For more information go to the Before You Dig website www.byda.com.au.

(2) Clearing

(a) Clearing operations

The area within the limits of clearing shall be cleared of all vegetation, both living and dead, all minor man-made structures (such as fences and livestock yards), all rubbish and other materials, which are unsuitable for use in the works with the exception of certain trees marked for preservation. The Contractor shall plan clearing operations such that wherever possible, clearing is carried out progressively and only the minimum area of land is left disturbed at any time.

The contractor shall give the Superintendent written notice of seven days of the intention to clear any area of the work. The Superintendent shall mark or indicate to the Contractor the trees that shall be preserved. The contractor shall arrange for an inspection by an authorised Council officer and shall obtain Council's approval to proceed with clearing and grubbing. The Contractor must conform to the requirements of Section SC6.4.23 Construction management, quality management, inspect and testing, Clause SC6.4.23.1 (4)(s)(i) when protecting identified trees and bushland within or adjacent to the construction site.

The erection of structures, excavation and filling, changes to soil profiles, stockpiling of spoil, storage of other materials and driving or parking of any vehicle or machinery within 4 m of the trunks of trees to be retained shall not be permitted.

The Contractor shall plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified or directed by the Superintendent. No growing trees shall be destroyed or damaged by the Contractor other than those specified and those indicated by the Superintendent.

Any tree remaining within the road reserve but outside the limits of clearing which is, in the opinion of the Superintendent, unsound and likely to fall upon the roadway shall be

cleared and disposed of in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation, subject to prior approval of Council.

If directed by the Superintendent, any branch, which overhangs the road formation, shall be cut back to within 0.5 m of the tree trunk and disposed of in accordance with Clause SC6.4.7.1 (3)(b) Chipping of cleared vegetation.

Developers shall provide offset planting where required under the Council's Public Tree Management Policy and Public Tree Management Guidelines.

(b) Fallen timber and tree damage

Every precaution shall be taken to prevent timber from falling onto private property. The Contractor shall dispose of any timber that has fallen onto private property or produce written consent from the property owner to its remaining there.

The cost of disposal of such fallen timber shall be borne by the Contractor. Prior to entering the private property, the Contractor shall obtain consent from the Superintendent and the property owner. Damage of any kind, including damage to trees, fencing, etc, occurring during clearing operations shall be made good by the Contractor. The cost of making good such damage shall be borne by the Contractor. Any damage to trees or vegetation which in Council's opinion, will require its removal, is to be in rectified in accordance with Section SC6.4.23 Construction management, quality management, inspection and testing, Clause SC6.4.23 1(4)(s)(iv).

(3) Grubbing

(a) Grubbing

All trees and stumps, on or within the limits of clearing, unable to be felled and removed by the clearingmethods used by the Contractor shall be removed by grubbing.

Grubbing operations shall be carried out to a depth of 0.5 m below the natural surface or 1.5 m below the finished surface level, whichever is the lower.

Holes remaining after trees and stumps have been grubbed shall be backfilled promptly with sound material to prevent the infiltration and ponding of water. The backfilling material shall be compacted to at least the relative density of the material existing in the adjacent ground.

(b) Chipping of cleared vegetation

The Contractor shall produce a wood-chip mulch derived from crowns of trees and branches of shrubs cleared under this section. The wood-chip mulch produced shall be stockpiled for subsequent use or for use at other locations as appropriate, where a biosecurity risk has not been identified.

The wood-chip mulch shall be produced from branches having a maximum diameter of 100 mm and the chipped material produced shall not have two orthogonal dimensions exceeding 75 mm and 50 mm.

(c) Disposal of surplus material

Unless a biosecurity risk is identified, all surplus materials cleared and grubbed in accordance with this section shall either be removed from the site or used for landscaping within the site in accordance with the approved plans and any conditions set by Council.

(d) Burning of cleared vegetation

Unless otherwise approved by Council in writing, disposal of timber and other combustible materials by burning shall not be permitted.

(4) Biosecurity

Vehicle and machinery hygiene (washdown / blowdown) is the one of the best spread reduction measures for weed seeds and biosecurity risks (E.g., Yellow Crazy Ants). All machinery must be clean when entering a site and machines must be cleaned before leaving the site. Contractors shall keep a log of where the machine's next movements are. This will assist biosecurity tracing efforts for any weed or pest that may arise.

Machinery hygiene is relevant for Yellow Crazy Ants (YCAs), where nests can be in clumps of dirt that spread to the next site. In addition, if it is a known YCA site, a parking pad shall be created for vehicles to park outside of the infestation. YCAs start to nest in machines (or material) that has been sitting longer than 24hrs. As such, any vehicles and machinery kept onsite should be parked outside the YCA infestation when not in use for the day. Once a project finishes, spraying a general ant control product on the machine is required.

Developers and Contractors shall view Yellow Crazy Ant (YCA) hot spot mapping before commencing any works on a site.

SC6.4.7.2 Earthworks introduction

(1) Objectives

This section provides advice, guidelines, and standards for earthworks to ensure the:

(a) efficient, sustainable, and economical design;

(b) enhancement of the environmental character of the site whilst maintaining the natural features of the site;

(c) provision of safe conditions for construction commensurate with the proposed purpose of the development;

(d) equality of building conditions for residential development; and

(e) earthworks do not impact on adjoining properties and developments.

(2) Scope

(a) This section sets out requirements for earthworks involved in land development and subdivision.Conceptual requirements are presented as necessary considerations when preparing designs for earthworks.

(b) The scope of this section assumes that the designer is familiar with requirements cited in the various construction specifications, specifically those related to earthworks, clearing, and grubbing and erosion and sedimentation. Additionally, the designer is required to make reference to the associated design sections related to stormwater drainage design, geometric road design and stormwater quality management, and any other relevant best practice documents.

(3) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.8 Stormwater management.

Section SC6.4.12 Landscaping and open space.

Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design

Section SC6.4.9 Stormwater quantity.

(b) Australian Standards:

AS3798 *Guidelines on earthworks for commercial and residential developments*

AS2870.1 *Residential slabs and footings - construction.*

(c) Qld Government Legislation:

Work Health and Safety Act 2011

SC6.4.7.3 Earthworks design

(1) Purpose

(a) Areas of a site proposed for earthworks, building, or recreational purposes may not be suitable in their natural state for their intended function without improvement works to:

(i) alleviate flooding of low-lying ground;

(ii) fill gullies or create emergency flow paths after underground stormwater piping has been installed;

(iii) allow improved runoff from flat ground;

(iv) regrade excessively steep slopes that would preclude economical construction of dwelling foundations;and

(v) allow effective recreational use or give reasonable access.

The designer must review the natural surface contours as determined and identified on site and where necessary must design finished surface levels that ensure the land is suitably prepared.

(b) Areas should be regraded to minimise the necessity for underground drainage systems with surface inlet pits and allow surface water to flow naturally to roads or drainage reserves without excessive concentration.

(c) The designer must consider the implications of earthworks in relation to the existing natural environment.Generally, earthworks must be minimised in heavily treed areas.

(d) Care must be taken to provide depressions for overland flow from low points and over major drainage lines, to direct stormwater for storms up to a 1% annual exceedance probability (AEP).

(e) The design of earthworks areas in conjunction with the design of roadworks must be considered with the objective of balancing cut to fill and achieving both an economic development and minimising haulage of imported fill or spoil to and from the development site. Bulk haulage should always be considered as having an adverse effect on adjacent development and infrastructure.

(2) Lot grading and stormwater flows

(a) All lots must be regraded to a minimum level at the 1% AEP flood level. In doing so, the designer must ensure that other areas are then not affected by flooding. The site must be identified on the drawings with appropriate notation of site-specific requirements. As a guide, minimum lot grading should be 1:200 for residential development and 1:400 for commercial development. Minimum lot grading should be 1:400 for rural residential development if cut/filling is proposed over the entire development site, or if the applicant is to provide a building pad, the building pad must be above 1% AEP and the minimum grading for the building pad should be 1:200.

(b) Where an area is known to be affected by or inundated by local stormwater flows, the designer must investigate the existing conditions as they relate to the proposed development and advise the developer in the preliminary design report on all data obtained in the investigation and recommend appropriate contour adjustments. The report should be accompanied by sketch plans to clarify recommendations and any other relevant data.

(c) Site constraints, either natural or otherwise may be required to be identified as a burden on developed property. The designer must take this into account when preparing the design. The property may ultimately be affected by a "restriction as to user", which may be controlled by a legal Instrument placed on the title to the land and/or by a message advising

prospective purchasers of any restrictions affecting the land.

(d) The finished surface of filled areas must be designed to levels allowing an adequate cover depth over the pipeline (if piped) and permit surface stormwater flow to be guided to inlet pits if depressions are retained in the finished surface contouring.

(e) The location of such features must be clearly defined on the earthworks plans and defined by distance to corner boundaries etc. for purposes of relocation. A geotechnical report specifying the site-specific preparation and compaction requirements, must be incorporated in the earthworks plan. A description of the minimum acceptable quality of the fill must also be specified on the plans, supported by geotechnical recommendations. All documentation necessary from various authorities to support the filling of dams and water courses must be supplied with the drawings.

(f) The finished level of any building area must be designed to ensure a desirable surface grading of 1:200 minimum oriented in the direction of the drainage system designed to cater for its catchment.

(3) General standard of lot preparation

(a) Special requirements will apply where necessary but generally lots are to be cleared of low scrub, fallen timber,debris, stumps, large rocks, and any trees which in the opinion of Council are approaching the end of their functional life or are dangerous or will be hazardous to normal use of the development. Prior consultation with Council's officer responsible for tree preservation, or other authorised Council officer, is necessary. Such requirements must be shown on the drawings.

(b) All timber and other materials cleared from lots must be removed from the site. All roots, loose timber, etc. which may contribute to drain blockage must be removed. Such requirements must be shown on the drawings.

(c) Burning or burying of waste vegetation on site is not permitted unless otherwise approved by Council. Clearing and grubbing of the development site shall otherwise be undertaken in accordance with Clause SC6.4.7.1 Clearing and grubbing.

(d) Selected trees must be preserved by approved means to prevent destruction normally caused by placement of conventional filling or other action within the tree drip zone. The Tree Preservation Officer, or other authorised Council officer, must be consulted for advice and all specific requirements noted on the drawings.

(4) Standard of fill for lots

(a) The following notations are to be incorporated in the drawings. "Filling is to be of sound clean material, and be free from large rock, stumps, organic matter, and other debris". "Placing of filling on the prepared areas shall not commence until the authority to do so has been obtained from the Council".

(b) All work must be in accordance with AS3798. Fill must be placed in layers not exceeding 150 mm compacted thickness. All filling must be compacted to 95% standard maximum dry density. Maximum particle size is 2/3 of the layer thickness.

(c) Fill comprising of natural sands or industrial wastes, or by-products may only be used after the material type and location for its use is approved by Council and will be subject to specific requirements determined by prevailing conditions.

(d) It is essential that prior advice be given of intended use of such materials. It should be noted that failure to obtain Council's approval may lead to an order for removal of any material considered by Council or other relevant authorities as unsuitable or in any way unfit for filling.

(e) All areas where filling has been placed must be dressed with clean arable topsoil, fertilised and sown with suitable grasses. This work must be carried out in accordance with the Section SC6.4.12 Landscaping and open space.

(5) Temporary diversion drains

Where temporary drains are required to divert surface flows away from the earthworks area, the location and silt/erosion control treatment must be clearly identified on the drawings. The scale of such works must reflectthe volume of water to be diverted.

The objective will be to ensure minimal soil disturbances and material loss off the site.

The requirements identified in Section C6.4.8 Stormwater management, SC6.4.9 Stormwater quantity, and SC6.4.10 Stormwater quality must be addressed for technical details and any additional requirements.

(6) Compliance with the Department of Environment, Science and Innovation

The designer is recommended to refer to the Department of Environment, Science and Innovation regarding any items requiring specific consideration when preparing an earthworks plan. Such plans may need to incorporate sediment/siltation/erosion control devices with specific reference to the stage at which these are to be provided. The responsibility rests with the developer to make enquiries with the Department of Environment, Science and Innovation and to subsequently obtain Council approval to proposed measures.

(7) Cartage of soil

The designer must refer to Council for acceptable haul roads with applicable load limits. This detail must beshown on the earthworks plan. The payment of a bond, as determined by Council, may be required from the Contractor where Council has some concern about the ability of a haul road to sustain the loads without undue damage or maintenance requirements.

Unless specific application is made to Council and approval obtained, the plans must be annotated as follows:"All topsoil must be retained on the development site and utilised effectively to encourage appropriate revegetation."

No soil shall be removed from site where a biosecurity risk exists.

(8) Effect on adjoining properties

(a) Where it is proposed to divert or direct piped stormwater into adjoining properties, drainage easement rights must be created over the adjoining lots in accordance with the Section SC6.4.9 Stormwater quantity.

(b) A written agreement between the developer and adjoining property owners to carry out construction work on adjoining properties must be submitted to Council prior to works commencing.

(c) Works must not cause ponding of stormwater on adjacent allotments and no stormwater formerly flowing onto the site may be diverted onto other neighbouring allotments or reserves.

(d) Earthworks must be graded so that the new landforms are free draining and all stormwater naturally falling into the site is collected within the property boundaries and discharged to a lawful point of discharge as agreed with Council.

SC6.4.7.4 Earthworks construction

(1) Introduction

(a) This section provides standards, advice and guidelines for earthworks and associated construction, including:

(i) removal of topsoil;

(ii) 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 this section;

(iii) removal and replacement of any unsuitable material;

(iv) any spoil or borrow activities associated with earthworks; and

(v) any additional processing of selected material for the selected material zone.

(b) Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in Section SC6.4.23 Construction management, quality management, inspection and testing and in the inspection tables below.

(2) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(a) SC6.4 Development manual planning scheme policy sections:

Section SC6.4.6 Road works and traffic control

Section SC6.4.8 Stormwater management

Section SC6.4.9 Stormwater quantity,

Section SC6.4.10 Stormwater quality.

(b) Australian Standards:

AS1141.11.1	*Methods for sampling and testing aggregates - Method 11.1: Particle size distribution - Sieving method*
AS1141.11.2	*Methods for sampling and testing aggregates - Method 11.2: Particle size distribution for vision sizing systems*
AS1289.3.3.1	*Methods of testing soils for engineering purposes – Method 3.3.1: Soil classification test - Calculation of the plasticity index of a soil*
AS1289.5.1.1	*Methods of testing soils for engineering purposes - Method 5.1.1: Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standardcompactive effort*
AS1289.5.4.1	*Methods of testing soils for engineering purposes - Method 5.4.1: Soil compaction and density tests – Compaction control test - Dry density ratio, moisture variation and moisture ratio*
AS1289.5.7.1	*Methods of testing soils for engineering purposes - Method 5.7.1: Soil compaction and density tests—Compaction Control Test Hilf density ratio and Hilf moisture variation (Rapid Method)*
AS1289.6.1.1	*Methods of testing soils for engineering purposes - Method 6.1.1: Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method fora remoulded specimen*
AS1289.7.1.1	*Methods of testing soils for engineering purposes - Method 7.1.1: Soil reactivity tests – Determination of the shrinkage index of a soil*
AS2187.0	*Explosives - Storage, transport and use - Part 0: Terminology*
AS2187.1	*Explosives - Storage, transport and use - Part 1: Storage*
AS2187.1	*Explosives - Storage, transport and use - Part 2: Use of explosives*

(c) QLD Government Legislation:

Environmental Protection Act 1994

Environmental Protection (Noise) Policy 2019

Explosives Act 1999

Explosives Regulation 2017

Planning Act 2016

Work Health and SafetyAct 2011

(d) Other:

Department of Transport and Main Roads, Queensland	MRTS55	*Use of Explosives in Roadworks*
International Erosion Control Association (IECA)		*Best Practice Erosion and Sediment Control*
Workplace Relations Ministers' Council		*Australian Code for the Transport of Explosives by Road and Rail*

(3) Natural surface and earthworks materials

(a) Natural surfaces

The Contractor must verify the accuracy of the model by field surveys. If the Contractor considers anyareas of the model not to be representative of the approved plans, the Contractor shall give not less than seven days' notice, prior to commencement of works to the Superintendent to allow checking. If the subsequent check survey reveals the ground model to be incorrect, any plans that are affected are to beresubmitted for approval.

(b) Earthworks - materials

The Contractor shall be responsible for any assumptions made by the Contractor in relation to the nature and types of the materials encountered in excavations and the bulking and compaction characteristics of materials incorporated in embankments.

The estimated quantity for general earthworks at any cutting includes all types of materials which may beencountered in the cutting.

Where material from excavations is acceptable for use in embankments, but the Contractor elects to:

(i) spoil it; or

(ii) use it for the Contractor's own purposes; or

(iii) use it as a source of pavement materials; or

(iv) construct embankments with dimensions in excess of those specified.

and a deficiency of material for embankment construction is thereby created, the Contractor shall make good that deficiency from sources of material meeting the quality requirements specified in Clause SC6.4.7.9(2). The cost of making good such deficiency of material shall be borne by the Contractor.

(4) Protection of earthworks

The Contractor's responsibility for care of the works shall include the protection of earthworks.

The Contractor shall install effective erosion and sedimentation control measures in accordance with accepted *Best Practice Erosion and Sediment Control* procedures, prior to commencing the earthworks, and shall maintain these control measures for the duration of the works.

Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure run- off of water without ponding, except where ponding forms part of a planned

erosion and sedimentation control system.

When rain is likely or when work is not proposed to continue in a working area on the following day, precautionsshall be taken to minimise ingress of any excess water into earthworks material. Ripped material remaining in cuttings and material placed on embankments shall be sealed off by adequate compaction to provide a smooth tight surface.

Should in-situ or stockpiled material become wet as a result of the Contractor not providing adequate protectionof earthworks, the Contractor shall be responsible for replacing and/or drying out the material and for any consequent delays to the operations.

(5) Erosion and sediment control

During the construction phase and up until Council accepts the development works or at the end of the defectliability period the Contractor shall be responsible for the installation and maintenance of all erosion and sediment control measures on site.

Details of the proposed sediment and erosion control measures and procedures are to be documented by a suitably qualified person in accordance with Council's soil and sediment erosion control standards. The proposed measures and procedures are to be approved by Council prior to implementation on site.

The approved erosion and sediment control plan (ESCP) submitted as part of the operational works or compliance application must be presented during the pre-start meeting. This plan must be presented to Council's nominated representative for review and "fit-for-purpose" implementation on the site. If the ESCP requires revision to suit the current conditions of the development site, the plan must be amended to achieve the approved set of water quality outcomes required by Council. Work must not commence until the revised ESCP has been approved by Council. Upon approval of the ESCP, the procedures and guidelines outlined in the plan for establishing, managing (inspection and monitoring) and maintaining water quality across the development site shall be the responsibility of the Contractor.

The Developer/Superintendent must submit to Council the as constructed plans for ESCP, at least 5 days priorto requesting the on maintenance inspection.

At the end of the agreed period of implementation and maintenance, all identified temporary sediment control measures must be removed by the developer and the ground reinstated to Council's satisfaction.

(6) Setting out of earthworks

The Contractor is responsible for setting out of the earthworks including installing sufficient batter pegs or GPS data to enable the earthworks to be carried out.

(7) Stockpile sites

Temporary erosion and sedimentation control measures shall be taken in accordance with *Best Practice Erosion and Sediment Control.*

Restoration of stockpile sites following completion of the work shall be carried out in accordance with IECA *Best Practice Erosion and Sediment Control.*

(8) Suppression of dust

At all times the Contractor shall ensure that dust resulting from the proposed works, including excavation,backfilling, grading, and stockpiles is kept to an absolute minimum and to the satisfaction of Council, by approved methods.

SC6.4.7.5 Removal of topsoil

(1) Scope

Topsoil is surface soil which is reasonably free from subsoil, refuse, clay lumps and stones.

Removal of topsoil from any section of the works shall only commence after erosion and sedimentation controls have been implemented and when clearing, grubbing and disposal of materials have been completed onthat section of the works in accordance with relevant parts of

Best Practice Erosion and Sediment Control.

Topsoil throughout the length of the work shall be removed and stockpiled separately clear of the work withcare taken to avoid contamination by other materials. The work shall include the following:

(a) Cuttings

Removal of the topsoil to a depth of 75 mm, or as directed by the Superintendent.

(b) Embankments

Removal of topsoil over the base of embankments up to 75 mmbelow the natural surface or as directed by the Superintendent. For those embankments or sections of embankment where the height of embankment from natural surface to underside of pavement is less than two metres, topsoil which is deeper than 75 mm shall be removed to its full depth as directed by the Superintendent.

(c) Other locations

Removal of topsoil as directed by the Superintendent.

(2) Topsoil stockpiles

The maximum height of stockpiles shall not exceed 2.5 m and the maximum batter slope shall not exceed2h:1v.

Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape.

Keep topsoil and under burden stockpiles separate.

Stabilise stockpiles and batters that will remain bare for more than 28 days by covering with mulch or anchored fabrics or seeding with sterile grass.

Establish sediment controls around un-stabilised stockpiles and batters. Locate stockpiles away from drainage lines, at least 10 m away from natural waterways and where they will be least susceptible to wind erosion.

To minimise erosion, stockpile batters shall be track rolled or stabilised by other means acceptable to theSuperintendent.

Where seeding of stockpiles to encourage vegetation cover is specified, such work shall be carried out inaccordance with Section SC6.4.12 Landscaping and open space.

SC6.4.7.6 Cuttings

(1) Scope

Construction of cuttings shall include all operations associated with the excavation of material within the limitsof the batters including benching, treatment of cutting floors and transition from cut to fill.

(2) Excavation

Materials encountered in cuttings shall be loosened and broken down as required so that they are acceptablefor incorporation in the Works. In this regard, the Contractor's attention is drawn to Clauses SC6.4.7.8 Unsuitable material, SC6.4.7.9 (1) Scope, and SC6.4.7.9 (2) Embankment material.

Cuttings shall have batter slopes as shown on the drawings or as redetermined by the Superintendent on the basis of site inspection and investigation during the excavation.

The tops of all cuttings shall be neatly “rounded”.

In all cuttings, undulations in the general plane of the batter shall not be permitted, except that batters mayrequire progressive flattening at the ends of cuttings due to the presence of less stable material.

Cut faces shall be cleaned of loose or unstable material progressively as the excavation proceeds.

Where, after the removal of topsoil as specified in Clause SC6.4.7.5 (1) Scope, 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 requirements of Clause SC6.4.7.9 (2) Embankment material.

(3) Batter tolerances

If the Contractor excavates the batter beyond the batter slope line and the tolerance applicable thereto, theSuperintendent may authorise a minor change in the general slope of the batter to suit the convenience of the Contractor, but such a change shall not be regarded as a redetermination of the batter slope under ClauseSC6.4.7.9(3)(b) Excavation. Alternatively, the Contractor shall submit details of the material and/or methods proposed to restore the specified slope and stability of the batter for the Superintendent's approval.

For batters steeper than 1:1, if any section of the batter up to a height of 3 m above the table drain level has been over excavated beyond the tolerance limit specified, the Superintendent may direct that the batter be restored to the average batter slope using randomly mortared stone. The stone shall be similar to the soundrock in the cutting and the mortar shall be coloured to match the colour of the rock.

The tolerances for the excavation of batters, measured at right angles to the design grade line, are given in Table SC6.4.7.1 Excavation Tolerances for Batters.

Table SC6.4.7.1 - Excavation Tolerances for Batters

Location	**Tolerance (mm)**	
	Slope 1:1 or flatter	**Steeper than 1:1**
Toe of batter and level of table drain	+ 0 - 150	+ 0 - 200
2m above table drain and higher	+ 300 - 300	+ 300 - 600
Between level of table drain and 2m above table drain	pro rata basis	pro rata basis

Editor’s Note - Tolerances are measured normal to the batter surface with (+) measured towards the roadway.

(4) Benching in cuttings

Cut batters shall be benched as shown on the drawings to provide drainage and erosion control. Notwithstanding the tolerances permitted under Clause SC6.4.7.6 (3) Batter tolerances, bench widths shall not be less than those shown on the drawings.

Benches shall be maintained and cleaned of loose stones and boulders regularly throughout the Contractperiod. The cost of such maintenance and cleaning of benches shall be borne by the Contractor.

(5) Subgrade of cuttings

The subgrade of cuttings shall be excavated, parallel to the designed grade line, to a designed subgrade level. The subgrade must then be trimmed to a level of not more than +0 mm, -50 mm from the designed subgrade level. Prior to ripping or removal of the cut material, the Contractor shall determine the California Bearing Ratio (CBR) of the material at the subgrade level in accordance with AS1289.6.1.1, Plasticity Index AS1289.3.3.1 and Shrink Swell Index AS1289.7.1.1. Sufficient tests shall be taken to represent all the various materials which may exist within thesubgrade.

Adequate sampling and testing shall be undertaken to satisfy all necessary requirements to verify the intended pavement design. Where the Superintendent considers that any underlying material is unsuitable for pavement support, the Superintendent may direct that it be removed in accordance with Clause SC6.4.7.8 Unsuitable material.The minimum CBR value used at cutting floors for the design of pavements shall be 3%.

The Contractor shall rip or loosen all material in the subgrade to a minimum depth of 200 mm below the designed subgrade level for the width of the selected material zone (or subbase layer, where no selected material zone), including areas of rock. The maximum dimension of any particles in the ripped or loosened zoneshall not exceed 150 mm.

After re-compaction, the subgrade within cuttings shall be re-trimmed parallel with the finished wearing surfaceso that their levels do not vary more than +0 mm, -50 mm from the designed subgrade level. It shall be recompacted in accordance with Clause SC6.4.7.11(1).

Horizontal tolerance – the width of the cutting at subgrade level for support of the pavement shall not be less than that specified.

Prior to placing any subsequent layers over the completed subgrade level, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects to relevant specifications.

In placing subsequent layers, the Contractor shall use equipment and techniques to avoid surface heaving or other damage to the subgrade surface.

(6) Transition from cut to fill

The Contractor is to ensure that the transition from cut to fill is undertaken in accordance with best practice geotechnical procedures and guidelines.

SC6.4.7.7 Blasting

(1) General

When explosives are permitted to be used by Council, the Contractor shall obtain all necessary licences from the appropriate authorities and shall comply with all government and Council regulations relating to transport, storage, handling, and the use of explosives, and also to the rules set out in AS2187.1 and AS2187.2. The transport of explosives shall be in accordance with the *Australian Code for the Transport of Explosives by Railand Road. The requirements of the Explosives Act 1999* and *Explosives Regulation 2017* and Local laws, if applicable, shall be complied with.

The Contractor shall be liable for any accident, damage or injury to any person, property, or thing, resulting fromthe use of explosives.

Before the start of blasting operations, the Contractor, in the presence of the Superintendent, shall conduct a dilapidation survey to determine and record the existing condition of all structures likely to be affected by anyblast.

The survey shall include all structures including public utilities within 500 m of any blast but shall be extended where the maximum instantaneous charge proposed is likely to produce peak particle velocities greater than allowable at structures more remote from a blast site. A written report of the survey, supported by photographswhere necessary, together with a list of any existing defects in the structures, shall be submitted to the owner of each structure, to the Superintendent, and Council before blasting commences.

The Contractor shall advise the Superintendent of the proposed maximum instantaneous charge and the Contractor's validation of the adequacy of the proposed structural survey at least three working days before the survey is due to commence. The Superintendent may direct amendments to the scope of the survey as a resultof blast monitoring during the work. All costs associated with the surveys and reports shall be borne by the Contractor.

Before each blasting operation, the Contractor shall submit to the Superintendent 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.

Ground vibration caused by blasting shall not exceed the values of peak particle velocity listed in Table SC6.4.7.2 Limiting Peak Particle Velocity.

Table SC6.4.7.2 - Limiting Peak Particle Velocity

Point of Potential Damage (within 1 km of blasting site)	**Peak Particle Velocity**
Completed and cured bridge structures or sub-structures (E.g., completed abutment).	25 mm/sec
Bridgeworks and structural retaining walls under construction.	20 mm/sec
Residential premises, schools, hospitals, and other buildings.	5 mm/sec (with 10% not to exceed10 mm/sec)
Buildings or monuments of historical significance.	2 mm/sec

The Contractor shall advise all residents within a radius of 1 km, by letter drop before blasting operations commence, of the likely times, frequency, and duration of blasting, and precautions being taken to ensure thatdamage to property will not result.

Unless otherwise approved, blasting operations shall be confined to the periods Mondays to Fridays (excludingpublic holidays), 9am to 3pm.

When blasting operations are being carried out, precautions shall be taken relating to the safety of persons andanimals and the road shall be closed to traffic and the appropriate signs erected. A standard warning procedure such as that given in the AS2187.2 shall be established and observed at all times.

(2) Presplitting

Where presplitting is carried out the spacing of presplit drill holes shall not exceed 750 mm centre to centre.

(3) Blasting records

The Contractor shall maintain accurate records of each blast showing the details listed below:

(a) date and time of blast;

(b) location, number, and diameter of holes loaded;

(c) depth of each hole loaded;

(d) inclination of holes;

(e) maximum and minimum burden;

(f) types of explosives used;

(g) charge distribution in each hole;

(h) maximum instantaneous charge;

(i) delay periods and sequence;

(j) total amount of charges in the blast; and

(k) length and type of stemming in each hole.

The records shall be prepared as holes are loaded and signed by the Powder man. A copy shall be provided to the Superintendent on the day of the blast.

(4) Control of air blast over-pressure

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

The Contractor's attention is drawn to the recommendations given in the *Environmental Protection (Noise) Policy 2019* or as amended for the reduction of air blast over-pressure.

The noise emanating from blasting operations shall not exceed an over-pressure level of 115 dB (linear peak) at any noise sensitive location (such as residential premises, schools, or hospitals). Up to 10 per cent of the total number of blasts may exceed this value provided a level of 120 dB is not exceeded at any time.

The Contractor shall arrange for the monitoring of air blast over-pressure to ensure compliance with the specified limits. All monitoring shall be carried out by personnel possessing current NATA registration for suchmonitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this section. In general, a monitoring location will be near the perimeter of the noise sensitive location at the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

In the event that the measured air blast over-pressure exceeds the specified limits, the Contractor shall suspend further blasting work and shall submit to the Superintendent proposals detailing any additional steps and precautions the Contractor shall take to ensure that for any future blast, the limiting over-pressure shall notbe exceeded. The Contractor shall not resume any blasting until such proposals have been submitted.

(5) Control of ground vibration

The Contractor shall arrange for the monitoring of ground vibrations to ensure compliance with the peak particle velocity limits shown in Table SC6.4.7.2 Limiting Peak Particle Velocity. All monitoring shall be carried out bypersonnel possessing current NATA registration for such monitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this part of the section. In general, a monitoring location shall be near the perimeter of the structure or building at

the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

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

For the first blast, monitors shall 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 shall not exceed that calculated from thefollowing formula:

$$MIC = 0.5\left[\frac{D}{\left[\frac{PPV}{1140}\right]^{-0.625}}\right]^2$$

Where:

MIC = Maximum Instantaneous Charge in Kilograms

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

PPV = Limiting peak particle velocity (vertical axis) versus Scaled Distance (horizontal axis) shall be plotted

Where:

$$\text{Scaled Distance} = \frac{D}{\sqrt{MIC}}$$

The mean regression line shall be obtained by the least squares method.

For subsequent blasts, the MIC and other aspects of blast design may be adjusted provided that further groundvibration monitoring is undertaken and the mean regression line redetermined to demonstrate that peak particle velocity limits are not exceeded. The Contractor shall make the regression line plots available to the Superintendent, if so requested.

SC6.4.7.8 Unsuitable material

Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth forstripping topsoil beneath embankments, which the Superintendent deems to be unsuitable for embankment orpavement support in its present position. Unsuitable material also includes material in cuttings which the Superintendent deems to be unsuitable for embankment construction.

Such material shall be excavated to the extent directed by the Superintendent. Material removed as unsuitable, asdirected by the Superintendent, may be incorporated in embankments in accordance with Clause SC6.4.7.9(2) Embankment material or spoiled in accordance with Clause SC6.4.7.9 (13) Spoil.

After removal of the unsuitable material, the floor of the excavation shall be re-presented to the

Superintendent for inspection, prior to backfilling with replacement material, to determine whether a sufficient depth of unsuitable materialhas been removed. Prior to placing replacement material, the excavated surface shall be compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements.

The unsuitable material which has been removed shall be replaced with material from cuttings, or with material borrowed in accordance with Clause SC6.4.7.9 (14) Borrow, of the quality specified in Clause SC6.4.7.9(6) Embankment materials. Replacement material is deemed to form part of embankment construction. It shall be placed in accordance with Clause SC6.4.7.9 (5) Placing fill for embankment construction and compacted in accordancewith Clause SC6.4.7.11 (1). Compaction and moisture requirements.

Reworking or replacing any material which the Superintendent deems to have become unsuitable because of inappropriate construction activities shall be borne by the Contractor.

Excavate and dispose of all contaminated material in an environmentally responsible manner including the following:

(1) assay material uncovered on-site prior to disposal. If the wastes include putrescibles wastes, then also analyseleachate and landfill gases;

(2) excavate material in a manner which avoids off-site environmental problems;

(3) seal remaining contaminated material or wastes, where only part of the tip has been excavated, to ensure thanthere is no off-site effect now or in the future;

(4) transport odorous wastes in covered vehicles; and

(5) dispose of contaminated material in a landfill licensed to take the type of contaminated material or wastesuncovered.

SC6.4.7.9 Embankment construction

(1) Scope

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 SC6.4.7.9(5) Unsuitable material, 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 pre-treatment such as breaking down or blending material or drying out material containing excess moisture.

(2) Embankment material

Material for embankment construction shall be obtained from the cuttings within the Works in accordance withClause SC6.4.7.9 (3)(b) Excavation supplemented by borrow in accordance with Clause SC6.4.7.9 (14) Borrow and from other sources as approved by the Superintendent if necessary. The material shall be free of tree stumps and roots, clay, topsoil, steel, organic material, and other contaminants and shall be capable of being compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements.

The work shall be programmed so that material of the quality specified in Clause SC6.4.7.9 (6)(e) Placing fill for embankment construction and SC6.4.7.9(9) Selected material zone for the upper zones of the formation is available when required.

(3) Foundations and embankments

(a) Removal of topsoil

Following removal of topsoil in accordance with Clause SC6.4.7.9 (2) Removal of topsoil, the embankment foundation area shall be made available for inspection by the Superintendent. Where the Superintendent considers that any underlying material is unsuitable, the Superintendent may direct that it be removed and replaced in accordance with Clause SC6.4.7.9 (5) Unsuitable material.

(b) Foundations for shallow embankments

Shallow embankments are those embankments of a depth less than 1.0 m from the top of pavement tonatural surface. After removal of topsoil the Contractor shall survey and work out the extent of the area ofshallow embankments.

Material in the foundations for shallow embankments which does not achieve a moisture content within the range of 60% to 90% of optimum , shall be deemed unsuitable in accordance with Clause SC6.4.7.9(5) Unsuitable material and shall be replaced by material of the specified quality.

(c) Other embankments

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 200 mm as specified in ClauseSC6.4.7.11(1) Compaction and moisture requirements.

The bridging layer shall consist of free draining granular material with or without geofabric interlayer as specified on the drawings. The granular material shall be end dumped and spread in a single layer and insufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements shall not apply to the bridging layer.

A bridging layer may also be employed, subject to the approval of the Superintendent, 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 SC6.4.7.11 (1) Compaction and moisture requirements. A bridging layer shall not be acceptable if its proximity to the pavement is likely to affect the pavement design. As an alternative to a bridging layer, approval of a working platform created by the chemical stabilisation of in situ material to conform Section SC6.4.6 Road works and traffic control, , may be required.

(4) Hillside embankments

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 1m 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.

(5) Placing fill for embankment construction

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.

The embankment shall be constructed 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 SC6.4.7.11 (1) Compaction and moisture requirements.

Fill material for embankment construction shall be placed in layers parallel to the grade line and compacted in accordance with Clause SC6.4.7.11 (1) Compaction and moisture requirements. The layers shall be of uniform compacted thickness not exceeding 200 mm, except that where more than 25% by volume of the filling consists of rock with any dimension larger than 150 mm, the Superintendent may approve an increase in the compacted layer thickness to 300 mm, provided that the relative compaction specified in Clause SC6.4.7.11 (1) Compaction and moisture requirements is attained.

The maximum dimension, measured in any direction, of rock pieces in the fill material for embankment construction shall not exceed two thirds of the approved compacted layer thickness. Any larger rock pieces shall be reduced in size for incorporation in the embankment layers.

Rock material shall be broken down and evenly distributed through the fill material, and sufficient fine material must be placed around the larger material as it is deposited to fill the voids and produce a dense, compact embankment. Where the Superintendent 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.

Stony patches with insufficient fine material to fill the voids shall be reworked with additional fine material being Sblended in to achieve a dense, compact layer.

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.

After compaction, embankment material in the zone(s) below the selected material zone (or subbase layer, where no selected material zone) shall have a 4-day soaked CBR value not less than 3%.

For the purpose of this clause, the CBR value of the material shall be determined by Test Method AS1289.6.1.1.

The Contractor shall be responsible for determining suitable sources of material and for any processing to satisfy these quality requirements.

(6) Embankment batters

The batter slopes shown on the drawings represent the estimated requirements for the expected types of materials and may be subject to redetermination by the Superintendent according to the Superintendent'sassessment of the materials encountered.

When completed, the slope of embankment batter shall conform to those shown on the drawings and conformto the following tolerances:

(a) for a vertical distance to 1m below the shoulder, no point on the completed batter to vary from thespecified slope line by more than 150 mm when measured at right angles to the slope line;

(b) at distances greater than 1m vertically below the shoulder, no point on the completed batter to vary fromthe specified slope line by more than 300 mm when measured at right angles to the slope; and

(c) in no case is the edge of the formation at the underside of the pavement to be nearer to the roadway thanshown on the drawings and the batter slope at no point be steeper than the specified slope.

However, in no case shall the edge of the formation at the underside of the pavement be nearer to the roadwaythan shown on the drawings. Undulations in the general plane of the batter shall not be permitted.

(7) Rock facing to embankments

Where shown on the drawings, embankment batters (including embankments at bridge abutments) shall beprovided with a facing of clean, hard, durable rock.

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.

The Contractor shall adjust its working methods and programme the work to obtain hard and durable rockof 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 does not overfill the voids between the 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.

The Contractor shall exercise extreme caution whilst placing the rock facing. Where embankment material isplaced 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 anyadjacent roadway or track in use.

(8) Trimming tops of embankments

The tops of embankments shall be trimmed parallel to the designed grade line at levels equal to the finished surface level less the thicknesses of pavement courses and the selected material zone.

The tops of embankments at these levels shall be compacted to meet the requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements and trimmed so that they do not vary by more than ±50 mm from the calculated level. The width of the embankment at subgrade level shall not be less than thatspecified.

Prior to placing any subsequent pavement layers over the completed top of embankment filling, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of the relevant specifications.

(9) Select material zones

A selected material zone must be provided in accordance with the following quality requirements:

(a) it shall be free from stone larger than 75 mm maximum dimension and have no less than 50% passing the 19 mm AS sieve;

(b) a 4-day soaked CBR value not less than 10 for the fraction passing AS 19 mm sieve;

(c) a depth of 200 mm; and

(d) Plasticity Index of 15 maximum.

If chemical stabilisation is specified these requirements must apply to the selected material immediately prior to incorporating the stabilising agent.

The Contractor shall use working methods to yield material for the selected material zone by breaking down oversize rock or by other means, including processing through a crusher, to ensure that the resulting materialconforms to the requirements of this clause.

The Contractor shall ensure that any material encountered of the quality specified for the selected material zoneshall be either placed directly in the selected material zone or stockpiled at locations approved by the Superintendent for future use by the Contractor in the selected material zone until at least sufficient material is reserved to complete the selected material zone over the whole work. Should the Contractor fail to conserve material of the specified quality, the Superintendent may direct that material of equivalent quality be provided.

The selected material zone shall be placed and compacted in layers with the compacted thickness of each layer not exceeding 150 mm. The selected material shall be homogeneous and free from patches containing segregated stone or excess fines. There shall be no areas containing material which does not comply with thespecified requirements of this clause and compaction shall be as specified in Clause SC6.4.7.11(1) Compaction and moisture requirements.

The top of the selected material zone shall be compacted and trimmed parallel with the designed grade line at alevel equal to the finished surface level minus the thickness of pavement layers adopted. Construction tolerances for Selected Material Zones is to be +50mm of the designed grade and crossfall profile.

Prior to placing any subsequent pavement layers over the completed select material zone surface, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of Council's requirements.

(10) Fill adjacent to structures

For the purpose of this clause, structures shall include bridges, precast and cast-in-situ box culverts and retaining walls. Fill adjacent to other culverts and drainage structures to be provided in accordance with Section SC6.4.9 Stormwater quantity, Clauses SC6.4.9.12 Drainage structures construction, SC6.4.9.13 Pipe drainage construction, and SC6.4.9.14 Precast box culverts.

No filling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placingof the concrete, unless the walls are effectively supported by struts to the satisfaction of the Superintendent, orwhen the Contractor can demonstrate that 85% of the design strength of

the concrete has been achieved. This includes concrete in bridge decks and fill placement that impacts the position, stability, and serviceability of bridge deck member bearings.

(11) Treatment at weep holes

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

(a) the maximum particle dimension shall not exceed 50 mm; and

(b) no more than 5% by mass shall pass the 9.5 mm A.S. sieve.

The broken stone or river gravel shall be continuous in the line of the weepholes, extend at least 300 mmhorizontally into the fill and extend from 200 mm below to at least 450 mm vertically above the level of the weepholes, where practicable.

Alternatively, the Contractor may provide a synthetic membrane (geotextile) of equivalent drainage characteristics. It shall be stored and installed in accordance with Manufacturer's instructions. The use of asynthetic membrane (geotextile) shall be subject to the Superintendent's approval.

(12) Selected backfill

(a) Selected backfill shall be placed adjacent to structures in accordance with Table SC6.4.7.3 Selected Backfill, Width and Height. The selected backfill shall consist of a granular material having a maximum dimension not exceeding 50 mm and a Plasticity Index, determined by AS1289.3.3.1, neither less than 2 nor more than 12.

Table SC6.4.7.3 - Select Backfill, Width and Height

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

(Where H = height of structure)

The selected backfill shall be placed in layers, with a maximum compacted thickness of 150 mm. 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 and shall meet the requirements of Clause SC6.4.7.11(1) Compaction and moisture requirements.

The existing embankment slope behind the structure shall be cut in the form of successive horizontal terraces,each terrace being at least 1m in width, and the selected backfill shall be placed in accordance with Clause SC6.4.7.9(5) Placing fill for embankment construction.

Where a bridge deck is being concreted adjacent to an abutment, no filling shall be placed against the abutment within 21 days after placing concrete in the bridge deck, unless approved by the Superintendent.

In the case of spill through abutments, rocks shall not be dumped against the columns or retaining walls butshall be built up evenly by individual placement around or against such

structures.

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 notexceed 500 mm.

(13) Spoil

Spoil is surplus material from excavations which is not required to complete the Works as specified or othermaterial from excavations whose quality the Superintendent deems to be unacceptable for incorporation in the works.

Where there is surplus material, the Superintendent may direct that flatter batter slopes be provided on embankments which have not been commenced, and/or direct that the excess material be used in the uniform widening of embankments, the surface of which shall be shaped to provide a tidy appearance and effective drainage. The surplus material shall be spread and compacted as specified in Clauses SC6.4.7.9 (5) Placing fill for embankment construction, and SC6.4.7.11 (1) Compaction and moisture requirements, for material in embankments.

Alternatively, spoil shall be disposed of in the manner and at locations approved by the Superintendent withinthe specified working area for the Works or be removed and disposed of off-site by the Contractor. Surplus material so deposited shall be compacted as specified in Clause SC6.4.7.11 (1) Compaction and moisture requirements, for material in embankments or to such lesser extent as may be approved by the Superintendent.

(14) Borrow

Borrow will only be authorised by the Superintendent if, in constructing cuttings and embankments to the batterslopes specified or directed by the Superintendent or in providing materials of the quality specified, and not by reason of excess widening of embankments or wastage by the Contractor of material of the quality specified in Clauses SC6.4.7.9 (2) Embankment material, SC6.4.7.9 (7) Rock facing of embankments, SC6.4.7.9.(8) Trimming tops of embankments or SC6.4.7.9 (10) Fill adjacent to structures, there is an overall deficiency in either the quantity or the quality of material required to complete the works.

Where borrow material is required to complete the Works as specified, the location of borrow sites shall be asapproved by the Superintendent, and the quality of material shall be acceptable to the Superintendent in accordance with Clauses SC6.4.7.9 (2) Embankment material, SC6.4.7.9 (7) Rock facing of embankments, or SC6.4.7.9 (10) Fill adjacent to structures, as appropriate. The edges of borrow sites must be no closer than 3 m from any fence line, or edge of excavation or embankment. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have drainage outlets acceptable to the Superintendent, cut batter slopes not steeper than 4h to 1v, and shall be left by the Contractor in a tidy and safe condition (I.e., stabilising disturbed areas).

For borrow within the defined working area for the Works as specified, site preparation shall be in accordancewith Clauses SC6.4.7.1 Clearing and grubbing, and SC6.4.7.5 Removal of topsoil. restoration of borrow sitesshall be carried out by Contractor in accordance with *Best Practice Erosion and Sediment Control.*

If borrow material is obtained by uniformly widening a cutting, the requirements of Clauses SC6.4.7.6 (2) Excavation, SC6.4.7.6 (3) Batter tolerances and SC6.4.7.6(5) Treatment of floors of cuttings as to the redetermination of batter slopes, the trimming of batters and the compaction of floors of cuttings respectively shall apply to the borrow area.

The Contractor shall be responsible for obtaining any permits required for entry on land and for the payment ofany royalty for such borrow material. The Contractor shall also comply with any

requirements of the *Planning Act 2016* – as amended, Townsville City Plan, Local laws, and landowners, as appropriate.

SC6.4.7.10 Acid sulphate soils

(1) Objective

To minimise disturbance to areas of potential acid sulphate soils (PASS) and/or actual acid sulphate soils (ASS). If disturbance of PASS/ASS cannot be avoided, appropriate treatment is required to minimise the potential for environmental harm.

PASS and ASS are soils that have the potential to generate acid through oxidation of iron sulphides whenexposed to air. ASS and PASS are generally found in coastal areas, and generally in soils at an elevation of5m AHD or lower.

(2) References and source documents:

Reference and source documents that must be read in conjunction with this section are as follow:

(a) Queensland Government

Queensland Acid Sulphate Soil Technical Manual Soil Management Guidelines

State Planning Policy

(3) Safety requirements

Works shall comply with provisions of the *Work Health and Safety Act 2011* and subsequent regulations. Personnel are responsible for their own Personal Protective Equipment (PPE) and the safety of the surrounding workplace during works.

Care is to be taken when using hydrogen peroxide, including gloves and eye protection.

(4) Environmental requirements:

Compliance with *Environmental Protection Act 1994* and subordinate legislation.

Compliance with *Queensland Acid Sulphate Soil Technical Manual Soil Management Guidelines*

Compliance with the *State Planning Policy*.

Compliance with TCC Environmental Policy.
Compliance with all other environmental legislation.

(5) Equipment and materials

Testing should be undertaken by a suitably qualified laboratory.

(6) Method

(a) Identifying ASS/PASS on site

The following points can assist in determining if soil has a likelihood of containing ASS/PASS. Affirmativeanswers to the following questions may indicate the presence of ASS/PASS. Field observations and tests should be complemented by laboratory testing.

(i) Is the site elevation 5m AHD or less?

(ii) Are mangroves, she-oaks or melaleuca species (I.e., paper barks) present on site?

(iii) Is there other vegetation that is stunted or dying?

(iv) Does the soil have a dark grey to grey appearance?

(v) Is there a rotten egg smell (hydrogen sulphide) to disturbed soil?

(vi) Is there a mottled yellow mineral present in the soil (Jarosite)?

(vii) Are there water bodies nearby that have a very clear blue-ish appearance, or does it appear to be reddish (rust) in colour?

(viii) Is the pH of the excavated sediment, or water, below 4?

(b) Managing and treating ASS and PASS

(i) Determine if works can be undertaken without disturbing ASS/PASS material.

(ii) If ASS/PASS is to be disturbed as a result of project activities, then undertake testing to determinethe severity of the potential acidification and extent of ASS/PASS material.

(iii) ASS/PASS material excavated on site must either be treated on site or transported to a treatmentlocation. A treatment pad should be set up as per the *Queensland Acid Sulphate Soil Technical Manual, Soil Management Guidelines.*

(iv) ASS material should be transported as regulated waste as it has the potential to be generatingacid while exposed to the atmosphere.

(v) All treatment of PASS/ASS must be undertaken in compliance with the *Queensland Acid Sulphate Soil Technical Manual, Soil Management Guidelines.*

(vi) ASS/PASS treatment must be undertaken as per the laboratory recommendations.

(c) Corrective/emergency actions

If PASS and/or ASS are identified through site inspection and confirmed through lab testing, followprocedure outline in (6) above.

If corrective actions are identified, an Incident, Hazard, Improvement Report is to be completed andsubsequent review of this procedure undertaken in accordance with these guidelines.

(d) Waste control

Treat PASS and ASS in accordance with guidelines (State Policy).

Ensure wastes generated from field testing or work activities are disposed of correctly.

(e) Responsibilities

(i) Site foreperson/works controller is responsible for:

1. monitoring and testing soils; and

2. minimising disturbance to PASS/ASS.

(ii) The Environmental Engineer is responsible for ensuring any environmental noncompliance's are reported.

(iii) The Executive Manager, Engineering Services is responsible for:

1. notifying relevant personnel of changes to this procedure; and

2. delivering training to personnel (if required).

(f) Monitoring and reporting

The foreperson will monitor and test soils prior to commencement of works and record results of fieldtests on daily checklist.

SC6.4.7.11 Compaction and quality control

(1) Compaction and moisture requirements

In areas listed below, all layers shall be uniformly compacted to not less than the relative compaction specifiedbefore the next layer is commenced. Each layer of material shall be trimmed prior to and during compaction to avoid bridging over low areas. A smooth surface shall be presented at the top of each layer.

(a) The following areas shall be compacted to provide a relative compaction, determined by AS1289.5.1.1using AS1289.5.4.1 or AS1289.5.7.1 for standard compactive effort, of not less than 95%.

(i) each layer of material replacing unsuitable material as detailed in Clause SC6.4.7.9(5) Unsuitable material;

(ii) each layer of material placed in embankments, up to 300 mm from the top of the sub-grade;

(iii) fill placed adjacent to structures up to 300 mm from the top of sub-grade;

(iv) material in unsealed verges and within medians up to the level at which topsoil is placed;

(v) spoil (excluding unsuitable material); and

(vi) all other areas except those where a higher relative compaction is specified.

Unsuitable material shall be stockpiled as directed by the Superintendent and compacted by track rolling.

(b) The following areas shall be compacted to provide a relative compaction of not less than 97% as determined by AS1289.5.1.1 using AS1289.5.4.1 or AS1289.5.7.1 for standard compactive effort:

(i) foundations for shallow embankments;

(ii) foundations other than shallow embankments;

(iii) the whole area on the floors of cuttings;

(iv) each layer of the embankment or cutting within 300 mm from the top of sub-grade;

(v) each layer of the selected material zone as specified in Clause SC6.4.7.9 (9) Selected material zone;

(vi) any areas of material of specified quality which may be shown on the drawings or specifiedelsewhere behind kerbs and/or gutters or adjacent to rigid pavements; and

(vii) the fill material placed adjacent to structures as specified in Clauses SC6.4.7.9 (10) Fill adjacent to structures, and SC6.4.7.9 (12) Selected backfill in each layer within 300 mm from the top of the sub-grade.

Where the vertical alignment design is such that a substantial portion of the road is required to be built at orclose to the natural surface, cut the prepared subgrade to a depth below natural surface of less than 0.5 m. Approval is required when shallow cutting conditions occur, the specified transition from cut to fill may be modified such that the depth of terrace excavation at the transition from cut to fill is reduced from 900 mm to250 mm.

Treat the floor of shallow cutting as specified in Clause SC6.4.7.6 (5) Treatment of floors of cuttings, and Clause SC6.4.7.6 (6) Transition from cut to fill and compact to provide a relative compaction of not less than100% for a depth of 200 mm determined by AS1289.5.4.1, for standard compactive effort.

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, unless

otherwise approved by the Superintendent, is within the range of 60% to 90% of the optimum moisture content as determined by AS1289.5.1.1 or AS1289.5.7.1. 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. The drying process may be assisted by aeration, or, where approved by the Superintendent, by the use of hydrated or quick lime. Alternatively, the Contractor may transport the wet material to a stockpile site for drying out and later use as fill material. 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.

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.

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 AS1289.5.4.1, 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 ofwetted material to a stockpile site for drying and later re-use.

(2) Test locations

The specified compaction and moisture tests shall be taken at the random test locations established in eachlot in accordance with the specified minimum testing frequency. Prior to testing the Contractor shall work thelot to ensure uniform moisture content and compaction of all material within the lot.

The test(s) then taken shall be considered to represent the total volume of material placed within the lot.

Where the Superintendent considers that the material which is present has not achieved uniformity required by this clause or Clause SC6.4.7.9 (5) Placing fill for embankment construction, the Superintendent may take or direct further testing. The Superintendent shall nominate the area represented by the additional testing.

If such testing confirms that material not conforming to the Specification, the Contractor shall carry out remedialwork as necessary to achieve conformance to the requirements of Clause SC6.4.7.11 (1) Compaction and moisture requirements.

(3) Deflection monitoring

Following completion of the formation to the underside of the selected material zone in accordance with Clauses SC6.4.7.9 (3) Foundations for embankments and SC6.4.7.9 (5) Placing fill for embankment construction, completion of the selected material zone in accordance with Clauses SC6.4.7.9 (9) Selected material zone, and SC6.4.7.6 (5) Treatment of subgrade of cutting, the Contractor shall make the work available in lots, for the Superintendent or Council to carry out deflection monitoring.

A lot for deflection testing shall consist of a continuous length of formation, in compliance with council requirements, and a single carriageway width which is generally homogeneous with respect to material andappearance. The Contractor shall identify the boundaries of each lot with stakes clearly labelled to the satisfaction of the Superintendent.

Prior to the release of the lot, a proof roll is to be performed with a single drive axle truck with an axle load of 8.2 t covering all lanes of carriage way including parking bays having no evident movement.

(4) Widening of formation

Road shoulders and formation shall be widened to accommodate footpaths, guard fence, street light plinths,emergency telephone bays and vehicle standing areas as shown on the drawings.

(5) Subgrade testing and treatment

Refer to Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.2(6) Subgrade treatment.

SC6.4.7.12 Summary of limits and tolerances

The limits and tolerances applicable to the various clauses in this section are summarised in Table SC6.4.7.4 Summary of Limits and Tolerances below.

Table SC6.4.7.4 - Summary of Limits and Tolerances

Item	Activity	Limits / Tolerances
(1)	Batter Slopes (a) Excavation (b) Embankment	 (a) ± 300 mm (b) ± 300 mm
(2)	Subgrade (a) Vertical Tolerance (b) Horizontal Tolerance	 (a) Parallel to designed grade line. Tolerance is to bewithin +0 mm - 50 mm of the levels specified. (b) The width of the cutting at subgrade level for support ofthe pavement shall not be less than that specified on the drawings or documentation.
(3)	Tops of Embankments (a) Vertical Tolerance (b) Horizontal Tolerance	(a) Parallel to the designed grade line. Tolerance is to bewithin, ± 50 mm from the levels specified (b) The width of an embankment at subgrade shall not beless than that specified on the drawings or documentation.
(4)	Selected Material	Refer to SC6.4.7.9 Embankment construction and SC6.4.7.11 Compaction and quality control

Editor's Note - Tolerances are measured at right angles to design surfaces.

SC6.4.7.13 Clearing and grubbing hold points

Please click here to view SC6.4.23.5 Table SC6.4.23.38 – Clearing and Grubbing Hold-Points

SC6.4.7.14 Clearing and grubbing witness points

Please click here to view SC6.4.23.5 Table SC6.4.23.39 – Clearing and Grubbing Witness-Points

SC6.4.7.15 Earthworks hold points

Please click here to view SC6.4.23.5 Table SC6.4.23.36 – Earthworks Hold-Points

SC6.4.7.16 Earthworks witness points

Please click here to view SC6.4.23.5 Table SC6.4.23.37 – Earthworks Witness-Points