Muswellbrook Shire Council

CONSTRUCTION SPECIFICATION

AUS-SPEC (Cot 09)

0222 Earthwork

Version 01

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
0	No amendment has been made	all	Nil		13 June 2012

Contents

0222 EARTHWORK

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide earthworks to the dimensions and tolerances, as documented.

Performance

Requirements: [complete/delete]

Selections: As documented.

Design

Geotechnical and environmental reports provided: [complete/delete]

Design of depths: [complete/delete]

General: The footing or pier depths shown on the drawings are provisional.

Designer: [complete/delete]

Authority requirements: [complete/delete]

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements*.
- *Site management*.

1.3 STANDARDS

General

Earthworks: To AS 3798.

General: Comply with the recommendations of those parts of AS 3798 which are referenced in this worksection.

1.4 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply.

GITA: Geotechnical inspection and testing authority.

GTA: Geotechnical testing authority.

Definitions

General: For the purposes of this worksection the definitions given in AS 1348, AS 3798 and the following apply:

- Description and classification of soils: To AS 1726.
- Site classification: To BCA 3.2.4.
- Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.
- Base: One or more layers of material usually constituting the uppermost structural element of a pavement and on which the surfacing may be placed, which may be composed of fine crushed rock, natural gravel, broken stone, stabilised material, asphalt or Portland cement concrete.
- Discrepancy: A difference between contract information about the site and conditions encountered on the site, including but not limited to discrepancies concerning the following:
- The nature or quantity of the material to be excavated or placed.
- Existing site levels.
- Services or other obstructions beneath the site surface.

- Rock: Monolithic material with volume greater than 0.5 m^3 which cannot be removed until broken up either by explosives or by rippers or percussion tools.
- Site topsoil: Soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine to medium texture classification to AS 4419 (loam, silt, clay loam) and is free from:
- Stones > 25 mm diameter.
- Clay lumps > 75 mm diameter.
- Weeds and tree roots.
- Sticks and rubbish.
- Material toxic to plants.
- Subbase: The material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform.
- Subgrade: The trimmed or prepared portion of the formation on which the pavement or slab is constructed. Generally taken to relate to the upper line of the formation.
- Zone of influence: A foundation zone bounded by planes extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

1.5 INSPECTION

Notice

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

- Items to be measured as listed in **Records of measurement**.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof roll subgrade prior to placing fill.
- Filling completed to contract levels.
- Stockpiled topsoil before spreading.

1.6 TOLERANCES

General

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades; + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Ensure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces: ± 50 mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

1.7 SUBMISSIONS

Design

Calculations: Submit calculations by a professional engineer to show that proposed excavations and temporary supports, including where applicable supports for adjacent structures, will be stable and safe.

Tests

Compaction: Submit certification and/or test results in accordance with the specified level of responsibility to AS 3798.

Materials

Imported fill: Submit certification or test results by a GTA registered laboratory which establish the compliance of imported fill with the contract including the source.

Execution details

Report: Submit a time based schedule noting the methods and equipment proposed for the groundworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages, clearances, batters and temporary supports.
- Stockpiles and borrow pits.
- Placing and compaction methods and stages.

Geotechnical site investigations: Provide a geotechnical report supporting the procedures proposed for excavation.

Disposal location: Submit the locations and evidence of compliance with the relevant authorities for the disposal of material required to be removed from site.

Explosives: Submit proposal for any explosives required. Include name of specialist subcontractor, type of explosives, protection and safety measures to AS 2187.1 and AS 2187.2.

Temporary shoring: Provide a proposal for any temporary shoring or underpinning required including the progressive removal.

Proof rolling: Submit method and equipment for proof rolling.

Certified records of measurement: Submit a certified copy of the agreed records of measurement.

Construction records: Submit the following to AS 3798 clause 3.4 and Appendix B:

- Geotechnical site visit record; and
- Earthworks summary report, or daily geotechnical reports.

2 PRODUCTS

2.1 FILL MATERIALS

General

Suitable material: To AS 3798clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: Do not use unsuitable material for fill in accordance with AS 3798 clause 4.3.

Sulphur content: Do not provide filling with sulphur content exceeding 0.5 % within 500 mm of cement bound elements (for example concrete structures or masonry) unless such elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material in accordance with AS 3798 clause 4.4.

Stockpiles: Segregate the earth and rock material and stockpile, at sites as directed, for reuse in backfilling operations.

Locations: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation.

Disposal: If stockpiling is not permitted under the contract, dispose of excavated material off-site to AS 3798 clause 6.1.8.

2.2 BORROW OR IMPORTED FILL

Borrow or imported material: Only use when no suitable excavated material is available.

- Suitable material: To AS 3798 clause 4.4.

Material complying with the following: [complete/delete]

Borrow pits:

- Location: > 3 m from any fence line, boundary, edge of excavation or embankment.
- Strip and stockpile topsoil.
- Provide erosion protection during winning operations of material and ensure drainage is maintained.
- On completion of winning operations grade abrupt changes of slope, respread topsoil and apply and maintain hydroseeded grassing.

Borrow and imported fill additional testing: [complete/delete]

3 EXECUTION

3.1 SITE PREPARATION

Drainage, erosion and sedimentation control: To the *Site management* worksection.

3.2 GEOTECHNICAL

As found site conditions

General: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies.
- Rock.
- Springs, seepages.
- Topsoil > 100 mm deep.

Inspection and testing

Inspection and testing: Conform to the following:

- Level 1 GITA required to AS 3798 clause 8.2.
- Level 2 GTA required to AS 3798 clause 8.3.

3.3 RECORDS OF MEASUREMENT

Excavation and backfilling

Agreed quantities: If a schedule of rates applies, provisional quantities are specified, or there are variations to the contract levels or dimensions of excavations, do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By registered surveyor unless otherwise agreed.

Rock

Level and class: If rock is measured for payment purposes, whether as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and the classes of rock have been determined.

3.4 REMOVAL OF TOPSOIL

General

Extent: Areas of cut or fill and areas occupied by structures, pavements and embankments.

Maximum depth: 200 mm.

Topsoil stockpiles

General: Stockpile site topsoil intended for re-use and imported topsoil where necessary.

Stockpile heights: Establish stockpiles to maximum height of 1.5 m.

Mark: Identify stockpiles of different soil types.

Vegetation: Do not burn off or remove plant growth which may occur during storage.

Protection: Provide the following:

- Drainage and erosion protection.
- Do not allow traffic on stockpiles.
- If a stockpile is to remain for more than four weeks, sow with temporary grass.
- Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

Remove: Remove topsoil that is unsuitable for re-use from the site to AS 3798 clause 6.1.8.

3.5 EXCAVATION

Extent

Site surface: Excavate over the site to give correct levels and profiles as the basis for structures, pavements, filling and landscaping. Make allowance for compaction, settlement or heaving.

Footings: Excavate for footings, pits, wells and shafts, to the required sizes and depths. Confirm that the foundation conditions meet the design bearing capacity.

Rock

General: Do not use explosives.

Existing footings

Requirement: If excavation is required within the zone of influence of an existing footing, use methods including (temporary) shoring or underpinning which maintain the support of the footing and ensure that the structure and finishes supported by the footing are not damaged.

Existing services

Contact: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, of identifying underground pipe and cables (possible within two working days). See www.1100.com.au.

Location: Identify existing underground services and give notice. Do not excavate by machine within 1 m of underground services.

Proof rolling

Extent: Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the presence of any bad ground.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Outcome: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

Disposal of excess excavated material

General: Remove excess excavated material from site not required or unsuitable for fill.

- Standard: To AS 3798 clause 6.1.8.

Subgrades affected by moisture

General: If the subgrade is unable to support construction equipment, or it is not possible to compact the overlying pavement due to the high moisture content, perform one or more of the following:

- Allow the subgrade to dry until it will support equipment and allow compaction.
- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and remove to spoil, and backfill excavated areas.

Pumping: Provide pump-out from adjacent sumps or install well points.

Adjacent subsidence: Provide recharge points to isolate the dewatering zone.

Bearing surfaces

General: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes. Make the steps to the appropriate courses if supporting masonry.

Deterioration: If the bearing surface deteriorates because of water or other cause, provide drainage to restore the surface or excavate further to a sound surface before placing the loadbearing element.

Reinstatement of excavation

Requirement: If the excavation exceeds the required depth, or deteriorates, reinstate to the correct depth, level and bearing value.

Fill adjacent structures and trenches: To AS 3798 clause 6.2.6.

Zone of influence: Within the zone of influence of footings, beams, or other structural elements, use concrete of strength equal to the structural element, minimum 15 MPa. Ensure that remedial concrete does not create differential bearing conditions.

Below slabs or pavements: Provide selected fill compacted to the specified density.

Cut subgrades: Where the over excavation is less than 100 mm, do not backfill. Make good by increasing the thickness of the layer above.

Rock depressions and subsoil drains: Backfill rock depressions and over excavation of subsoil drains using coarse subsoil filter.

Supporting excavations
Removal of supports: Remove temporary supports progressively as backfilling proceeds in accordance with an approved removal schedule.

Voids
General: Guard against the formation of voids outside sheeting or sheet piling if used. Fill and compact voids to a dry density similar to that of the surrounding material or use approved sand/cement filling.

3.6 ADJACENT STRUCTURES

Temporary supports
General: Provide supports to adjacent structures where necessary, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support using shoring.

Vertical supports: Provide vertical support where necessary using piling or underpinning or both.

Permanent supports
General: If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

Encroachments
General: If encroachments from adjacent structures are encountered and are not shown on the drawings, give notice and obtain instructions.

Zone of influence
Angle from horizontal: [complete/delete]

3.7 ROCK BOLTING

General
General: Provide proprietary high strength steel bars or tubes anchored into holes drilled in the rock and tensioned against plates bearing on the rock face to provide temporary or permanent support for the rock face. Schedule the installation to conform with systematic bolting or calculated relief, as documented.

Standard: To AS 4678.

Protection
General: Protect permanent rock bolts by grouting the drilled hole with cement grout after tensioning the rock bolt. Protect the bearing plate and the exposed portion of rock bolt and anchorage with a protective coating or by embedment in concrete.

3.8 PLACING FILL

Preparation
Stripping: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements to AS 3798 clause 6.1.5. Remove materials which will inhibit or prevent satisfactory placement of fill layers, loose material, debris and organic matter.

Foundation preparation: To AS 3798 clause 6.1.7.

Compaction: Compact the ground exposed after stripping or excavation to the minimum relative compaction in AS 3798 Section 5 and the **Compaction table.**

Scarify method: Loosen exposed excavation by scarifying to a minimum or 150 mm, moisture condition and compact to AS 3798 Section 5 and the **Compaction table**.

Impact roller compaction: Use an approved impact roller or impact completion.

Delete either scarify or impact roller as required.

Slope preparation: If fill is placed on a surface which slopes steeper than 4 H:1 V, bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps > 1 m in width and > 100 mm deep. Recompact the excavated material as part of the filling. Shape to provide free drainage.

Working platform: [complete/delete]

Geotextile: [complete/delete]

Product: [complete/delete]

Properties: [complete/delete]

Under earth mounds: Cultivate the ground to a depth of 200 mm before mound formation.

Under slabs, paving and embankments: Compact the ground to achieve compaction to AS 3798 Section 5 and the **Compaction table**. If necessary loosen the ground to a depth of > 200 mm and adjust the moisture content before compaction to a density consistent with subsequent filling.

Rock ledges: Remove overhanging rock ledges.

Placing fill

Layers: Place fill in near-horizontal layers of uniform thickness no greater than 150 mm after compaction, deposited systematically across the fill area.

Extent: Place and compact fill to the designated dimensions, levels, grades, and cross sections so that the surface is always self draining.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, ensure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. Where necessary, limit the size of compaction equipment or compact by hand. Commence compacting each layer at the structure and proceed away from it.

Protective covering: Do not disturb or damage the protective covering of membranes during backfilling.

Placing at structures

General: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading. Carefully place first layers of fill over the top of structures using equipment or methods certified not to exceed the load capacity of the structure.

Concrete: Do not place fill against concrete retaining walls until the concrete has been in place for 28 days unless the structure is supported by struts.

3.9 FILL MOISTURE CONTROL

General

Moisture content: Adjust the moisture content of fill during compaction within the range of 85 – 115% of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1 as appropriate, in order to achieve the required density.

3.10 COMPACTION REQUIREMENTS FOR FILL AND SUBGRADE

Density

General: Other than rolled fill to AS 2870 clause 6.4.2(b). Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation and to conform to the **Compaction table**. Shape surfaces to provide drainage and prevent ponding.

Compaction table

Location	**Cohesive soils. Minimum dry density ratio (standard compaction) to AS 1289.5.4.1**	**Cohesionless soils. Minimum density index to AS 1289.5.6.1**
Residential: Lot fill, house sites.	95	70
Commercial: Fills to support minor loadings incl. floor loadings < 20 kPa and isolated pad or strip footings < 100 kPa.	98	75
Pavements: Fill to support pavements Subgrade to 300 mm deep	95 98	70 75

Excavated and stripped ground surface: After excavation and/or stripping, compact these surfaces in conformance with the Compaction table to a minimum depth of 150 mm.

Maximum rock and lump size in layer after compaction: 2/3 compacted layer thickness.

Fill batter faces: Either compact separately, or overfill and cut back. Form roughened surfaces to the faces.

Compaction control tests

Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.

Compaction control test frequency

From AS 3798 Table 8.1. Alter as required e.g. per 1000 m^2, per 1000 t, per load, or number of tests required. If frequency of testing depends on location state the different requirements for each location. The required frequency may need adjustment on large scale or concentrated operations e.g. filling of gullies, farm dams. Where specific recommendations for test frequency are given in the geotechnical report for the site these should replace the AS 3798 outline listed below.

Standard: To AS 3798 Table 8.1.

Confined operations: 1 test per 2 layers per 50 m^2.

3.11 COMPLETION

Grading

External areas: Grade to give falls away from buildings, minimum 1:100.

Subfloor areas: Grade the ground surface under suspended floors to drain ground or surface water away from buildings without ponding.

Temporary works

Tree enclosures: Remove temporary tree enclosures at completion.

Tree marking: Remove temporary marks and tags at completion.

Temporary supports: Remove temporary supports to adjacent structures at completion.

Site restoration

Requirement: Where existing ground surfaces are not required to be varied as part of the works, restore them to the condition existing at the commencement of the contract.

Topsoil placement: To the *Site management* worksection.