MRTS16B

Vegetation Ground Works

Appendix

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Test Method – for Determination of Water Repellency of a Soil	
1	Method for Determination of Water Repellency of a Soil

A – PMMP-C Proforma for Low Risk Soils

For low risk soils, the Contractor shall prepare a PMMP-C – as follows:

Low Risk Soils	
Requirements to be Addressed in the PMMP-C	**Support Information Requirements**
1. The Contractor shall provide a statement of justification for treating the project as having low risk soils. 2. The statement is to be accompanied by documented evidence.	The statement shall indicate the Contractor's proven knowledge of local, naturally occurring low risk soils that are representative (the same soil type) of the project site soils. The Contractor shall include a number of similar, completed road construction projects demonstrating compliance with MRTS16 by showing documented and photographic evidence of results achieved, including – • water quality during construction; • erosion and sediment control outcomes; • soil amelioration outcomes; and • landscape and revegetation establishment outcomes.
3. The Contractor shall describe the chosen approach to management of the site's planting media.	The Contractor shall – • assess the site's soils and determine the approach used to manage the site soils; • identify if imported planting media is required; • where imported planting media is required – provide the justification for its use and intended supplier; • where site soil is to be used, provide management processes and activities that demonstrate how the soil shall be managed relevant to – – the Soil Assessment Report; – the Erosion and Sediment Control Plan; – the road construction program; and in particular – the landscape and revegetation operations.

B – PMMP-C Proforma for Moderate to High Risk Soils

For moderate to high risk soils, the Contractor shall prepare a PMMP-C – as follows:

Moderate to High Risk Soils	
Requirements to be Addressed in the PMMP-C	**Support Information Requirements**
1. The Contractor shall describe the chosen approach to management of the site's planting media.	The Contractor shall prepare a plan addressing – • assess the site's soils and determine the approach used to manage the site soils; • identify if imported planting media is required; • where imported planting media is required – provide the justification for its use and intended supplier; and • where site soil is to be used, provide management processes and activities that demonstrate how the soil shall be managed relevant to – – the Soil Assessment Report; – the Erosion and Sediment Control Plan; – the road construction program; and in particular – the landscape and revegetation operations.
2. The Contractor shall include in the plan details addressing soil sampling, testing, stripping, amelioration, storage and placement.	The Contractor shall address the following – • soil sampling and testing scheme (including in situ, stockpile and retesting schemes after amelioration operations); • determination of the suitability of site soil as planting media; • determination of specific soils relevant to intended use (for example, soil that may contain native seed); • determination of unsuitable soils for use as planting media and method of disposal (for example, soil containing high concentrations of declared weeds); • determination of stripping depths of suitable soil; • identification of amelioration requirements for proposed outer embankment material; • estimated volumes of available suitable soil; • amelioration program addressing – – hydrophobicity; – wettability and / or moisture retention; – soil acidity and / or alkalinity; – exchangeable sodium percentage (ESP); – calcium magnesium ratio (Ca:Mg); and / or – organic matter content, • proposed location, storage duration and management of soil stockpiles (including weed and erosion control); and • proposed placement of planting media relevant to particular soil characteristics and intended use and location of placed planting media.

C – Full-Suite Analysis Schedule

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	**Test Method**	**Soil Test Parameter Requirements**	**Soil Test Results**
Refer AS 4419 – Soils for landscaping and garden use NOTE MODIFIED REQUIREMENTS			
Bulk density (BD)	Clause 5.2	> 0.7 kg/L	
Organic matter (OM) (relevant to the organic carbon concentration)	Clause 5.3	3 to 10%	
Wettability	Clause 5.4	> 5 mm/min.	
pH (H2O, 1:5) – a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity (EC)	Clause 5.6	< 1.2 dS/m	
Extractable phosphorous content (Extr. P) Very P sensitive plants Moderately P sensitive plants	Clause 5.8	< 5 mg/kg < 20 mg/kg	
Permeability	Clause 5.12	2 – 100 cm/hr	
Texture	Clause 5.13	Refer to Table AS 4419, Table I1 Soil texture Classification	
Large particles – planting media to – a) Turfed or grass seeded areas to be mown or slashed b) Batters to be mulched or hydraulic seeded and hydraulically mulched c) Broad acre areas to be seeded with native species	Clause 5.14	100% by weight to pass a 20 mm sieve 100% by weight to pass a 50 mm sieve 100% by weight to pass a 75 mm sieve	
Refer Appendix Table 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)			
Water Repellence Rating (for sands to clay loams)	Appendix Table 1	Class 0 or 1	
Refer AS 1289.3.8.1 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	Clause 3.8.1	Class 3 to 8	

Schedule continued over page.

C – Full-Suite Analysis Schedule – (continued)

Schedule continued from previous page.

Soil Test Parameter	Test Method	Soil Test Parameters Requirements	Soil Test Results
Refer ALHS (Australian Laboratory Handbook of Soil and Water Methods)			
Exchangeable calcium (Ca) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	≥ 2 meq/100g ≥ 5 meq/100g	
Exchangeable magnesium (Mg) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.6 meq/100g > 1.0 meq/100g	
Calcium magnesium ratio (Ca:Mg) Exchangeable form for sands and loamy sands and sandy loams to clay loams	Clause 15B3	2 – 10	
Exchangeable sodium percentage (ESP) (Na base saturation % = % Na of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	< 6 < 15	
Exchangeable potassium (K) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.2 meq/100g > 0.4 meq/100g	
Exchangeable aluminium percentage (Al base saturation % = % Al of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15G1	< 25 < 40	
Effective cation exchange capacity (ECEC) (ECEC = sum of exchangeable cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15J1	> 5 meq/100g > 10 meq/100g	

D – Sub-Suite Analysis Schedule

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	Test Method	Soil Test Parameter Requirements	Soil Test Results
Refer AS 4419 – Soils for landscaping and garden use NOTE MODIFIED REQUIREMENTS			
Organic matter (OM) (relevant to the organic carbon concentration)	Clause 5.3	3 to 10%	
pH (H2O, 1:5) – a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity (EC)	Clause 5.6	< 1.2 dS/m	
Refer Appendix Table 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)			
Water Repellence Rating (for sands to clay loams)	Appendix Table 1	Class 0 or 1	
Refer AS 1289.3.8.1 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	Clause 3.8.1	Class 3 to 8	
Refer ALHS (Australian Laboratory Handbook of Soil and Water Methods)			
Exchangeable calcium (Ca) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	≥ 2 meq/100g ≥ 5 meq/100g	
Exchangeable magnesium (Mg) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.6 meq/100g > 1.0 meq/100g	
Calcium magnesium ratio (Ca:Mg) Exchangeable form for sands and loamy sands and sandy loams to clay loams	Clause 15B3	2 – 10	
Exchangeable sodium percentage (ESP) (Na base saturation % = % Na of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	< 6 < 15	
Exchangeable potassium (K) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15B3	> 0.2 meq/100g > 0.4 meq/100g	
Exchangeable aluminium percentage (Al base saturation % = % Al of total cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15G1	< 25 < 40	
Effective cation exchange capacity (ECEC) (ECEC = sum of exchangeable cations) a) Sands and loamy sands b) Sandy loams to clay loams	Clause 15J1	> 5 meq/100g > 10 meq/100g	

E – Test Suite Analysis Schedule for Construction of Drainage Devices

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile No:
Date Tested:	Layer and Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Soil Test Parameter	Test Method	Soil Test Parameter Requirements	Soil Test Results
Refer MRTS04 – General Earthworks			
General fill material Class A	Table 9A	Requirements as per Table 9A – embankment Material Properties	
Refer AS 1289 – Methods of testing soils for engineering purposes			
Dispersion – Emerson class number	AS 1289 3.8.1	Class 3 or greater	
Material Testing Manual			
Construction moisture content	Q110A	± 2% (OMC)	
Refer AS 4419 – Soils for landscaping and garden use – NOTE MODIFIED REQUIREMENTS			
pH (H_2O, 1:5) – a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
Electrical conductivity – EC	Clause 5.6	< 1.2 dS / m	
Refer ALHS (Australian Laboratory Handbook of Soil and Water Methods)			
Exchangeable sodium % of total cations	Clause 15B3	< 6 (< 15 where clay is > 35%)	

F – Organic Soil Conditioner Requirements

Site Sample Identification	
Project Name:	Sample Location:
Job / Contract No:	Site / Stockpile / Windrow No:
Date Tested:	Depth (from surface in mm):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No:

Organic Soil Conditioner Parameter	Test Method	Organic Soil Conditioner Test Parameter Requirements	Organic Soil Conditioner Test Results
Refer AS 4454 – Composts, soil conditioners and mulches			
National health standards	Clause 2.1.1	Complies with standards	
Visible extraneous material (% dry matter) – a) glass, metal, rigid plastics > 2 mm b) plastics-light, flexible or film > 5 mm c) stones and lumps of clay ≥ 5 mm	Appendix H	0.5% 0.05% ≤ 5%	
United States Environmental Protection Agency (USEPA)			
Soil Conditioner Quality USEPAA/625/R – 92/013 Control of pathogens	Thermophilic	Turning and temperature	
Refer AS 4419 – Soils for landscaping and garden use – NOTE MODIFIED REQUIREMENTS			
*pH (H2O, 1:5) – a) General range b) Naturally occurring acid soils c) Naturally occurring alkaline soils	Clause 5.5	> 5.5 and < 7.5 > 5.5 and < 6.5 > 7.0 and < 8.5	
NDI (Nitrogen Drawdown Index)	Clause 5.9	> 0.5	
*Wettability	Clause 5.4	> 5 mm/min.	
*EC (Electrical Conductivity)	Clause 5.6	< 2.5 dS/m	
Particle size of soil conditioner – a) to pass a 10 mm sieve b) to pass a 20 mm sieve c) not to pass a 20 mm sieve	Clause 5.14	90% by weight 8% by weight 2% by weight	
Refer Appendix Table 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)			
Water Repellence Rating (for sands to clay loams)	Appendix Table 1	Class 0 or 1	
Refer ALHS (Australian Laboratory Handbook of Soil and Water Methods)			
Moisture content	2 B1 Rayment & Higginson	> 25% and < 35%	
Refer Draft Guidelines for the Assessment & Management of Contaminated Land in Qld – EPA			
Heavy metals and organic chemicals contaminants	Appendix 9 Table 9.1	Not to exceed EIL thresholds	

* Test requirements that have been modified from those in AS 4419.

G – Soil Sample Label

The Contractor shall complete and securely attach a label to each bagged soil sample using the following label format –

MRTS16B 2008 – Appendix – Proforma G

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Project Name: ……

Job/Contract Number: ……

Sample Date: ……

Sample Location/Site No: ……

Sample Depth and Layer: ……

H – Soil Assessment Report

Site Sample Identification	
Project Name:	Sample Location (general):
Job / Contract No:	Site No's:
Date Tested:	Soil Layers (topsoil and / or subsoil):

Testing Laboratory Sample Identification	
Laboratory No:	Sample No's:

The Soil Assessment Report shall include –

- a completed test suite analysis schedule per sample;
- written assessment and interpretation of test results relevant to the intended use of planting media; including –
  - an erodibility and dispersion risk assessment; and
  - recommendations for the best use of a particular soil type, where applicable,
- clearly defined non-conforming soil properties;
- where amelioration is required, the type of ameliorant material together with rates and methods of incorporation; and
- where required, provide a Soil Assessment Report on the material to be used for the construction of drainage devices as outlined above.

Test Method 1 – Method for Determination of Water Repellency of a Soil (Hydrophobicity)

Scope

Test method 1 sets out the method for determining water repellency by using the water droplet penetration time (WDPT) test [1].

Principle

A measured amount of water in droplets is applied to a dried, smoothed, level, uncompacted soil surface and the time that lapses before the droplets are absorbed is determined.

Reagent

Deionized or distilled water.

Apparatus

The following apparatus is required –

a) an oven capable of heating a sample of soil to 40 ± 2ºC and validated for time to constant mass;

NOTE: constant mass is achieved when, after the initial drying period, successive drying over 1 h periods gives rise to a weight loss of not more than 1% of the initial weight loss;

b) standard medicine dropper; and

c) stopwatch.

Procedure

The procedure shall be as follows –

a) in the oven (1.4(a)), dry a minimum 300 ml volume of soil – that has a smoothed, levelled but uncompacted surface – on a flat tray to constant 40ºC;

b) to the sample that has been allowed to cool to room temperature, apply 3 water droplets from the standard medicine dropper (1.4(b));

c) using a stopwatch (1.4(c)), record the time it takes for the water to infiltrate (disappear) into the soil; and

d) determine the classification of water repellency after 1 minute by referring to Table 1.

Table 1 – Classification of the Persistence of Soil Water Repellency

Class	WDPT (seconds)	Water Repellence Rating
0	< 5	wettable; non-water repellent
1	5 – 60	slightly water repellent
2	> 60	strongly water repellent

Test Report

The test report shall contain the following –

a) sample identification, including sufficient details to show the time period between the sampling and testing of the product;

b) classification of persistence of soil water repellency of the sample; and

c) reference to this test method, that is Test Method 1 – Appendix of MRTS16B *Vegetation Ground Works*.

1. The WDPT test was originally developed by Van't Woudt, 1959.

2. The classification of a soil's wettability was developed by Louis W, Dekker, 1988.