

Superseded

Specification (Measurement)

Transport and Main Roads Specifications MRS04 General Earthworks

October 2014

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1 Introduction

This Specification applies to the construction of general earthworks in roadworks and bridgeworks.

The requirements of this Specification apply to excavation and filling operations for all work under the Contract except for excavation for:

- a) cast-in-place piles which is specifically covered by MRS63 *Cast-In-Place Piles*, and
- b) footings for poles which is specifically covered by MRS92 *Traffic Signal and Road Lighting Footings*.

This Specification shall be read in conjunction with MRS01 *Introduction to Specifications* and other Specifications as appropriate.

This Specification forms part of the Transport and Main Roads Specifications Manual.

2 Measurement of work

2.1 Standard Work Items

In accordance with the provisions of Clause 2.1.3 of MRS01 *Introduction to Specifications*, the Standard Work Items incorporated in this Specification are listed in Table 2.1.

Figure 2.1-A to Figure 2.1-C, are schematic representations of the application of some of the Standard Work Items for preparation, excavation, embankment, subgrade and backfill.

Table 2.1 – Standard Work Items

Standard Item No.	Description	Unit of Measurement	Clause Reference
Earthworks			
Earthworks, Preparation			
3101	Clearing and grubbing	m ²	2.2.1
3102	Bridge site preparation	m ²	2.2.1
3103P	Stripping of topsoil (Provisional Quantity as directed)	m ³	2.2.2
3104	Ground surface treatment under embankment, standard	m ²	2.2.4
3105	Ground surface treatment, special (square metres)	m ²	2.2.4
3106	Ground surface treatment, special (cubic metres)	m ³	2.2.4
3107P	Ground surface treatment, insitu treatment of acid sulphate soils with lime (Provisional Quantity if ordered)	m ³	2.2.4
3108P	Excavation and disposal of Unsuitable Material with individual excavation ≤ 10 m ³ (Provisional Quantity as directed)	m ³	2.2.4
3109P	Excavation and disposal of Unsuitable Material with individual excavation > 10 m ³ (Provisional Quantity as directed)	m ³	2.2.4
3111P	Supply and storage of agricultural lime (Provisional Quantity as directed)	tonne	2.2.3

Standard Item No.	Description	Unit of Measurement	Clause Reference
3112P	Quantitative laboratory testing of actual or potential acid sulphate soils (Provisional Quantity if ordered)	set of tests	2.2.3
3113P	Treatment of water contaminated by acid sulphate soil, (Provisional Quantity if ordered)	kL	2.2.3
3304	Supply and installation of geotextile, strength class [<i>strength class</i>], filtration class [<i>filtration class</i>]	m ²	2.2.6
Earthworks, Excavation			
3201	Road excavation, all materials	m ³	2.2.5
3202	Excavation to clear waterways at bridge abutments, all materials	m ³	2.2.5
3203	Excavation for culvert, pipe and conduit trenches, all materials [<i>description</i>]	m ³	2.2.5
3204	Excavation for structures, all materials [<i>description</i>]	m ³	2.2.5
3205	Excavation for diversion channels, all materials	m ³	2.2.5
3206	Excavation for diversion drains, all materials	m ³	2.2.5
3207	Excavation for catch drains, all materials	m ³	2.2.5
3208	Special excavation, all materials [<i>description</i>]	m ³	2.2.5
3211P	Excavation of non-rippable material in road excavation, rate additional to rate for Work Item 3201 (Provisional Quantity)	m ³	2.2.5
3212P	Excavation of non-rippable material in confined excavation, rate additional to rates for Work Items 3203 to 3207 inclusive (Provisional Quantity)	m ³	2.2.5
3213	Pre-splitting batters of rock cuttings	m ²	2.2.5
3215P	Excavation and disposal of Unsuitable Material in and below confined excavations (Provisional Quantity as directed)	m ³	2.2.5
3216P	Excavation and disposal of Unsuitable Material within lines of cuttings, rate additional to rate for Work Item 3201 (Provisional Quantity as directed)	m ³	2.2.5
3221	Blinding concrete, [<i>thickness</i>] mm nominal thickness	m ²	2.2.5
Earthworks, Embankment			
3301	Road embankment	m ³	2.2.6
3302	Levees, catch banks and diversion blocks using clay fill material from all sources	m ³	2.2.6
3303	Special embankment [<i>description</i>] from all sources	m ³	2.2.6
3305P	Addition of lime to embankment materials to neutralise acid sulphate soils, rate additional to rates for Work Items 3301 to 3303 (Provisional Quantity as directed)	m ³	2.2.6
3306	Road verges using general fill material	m ³	2.2.6

Standard Item No.	Description	Unit of Measurement	Clause Reference
Earthworks, Subgrade			
3401P	Testing of existing material below subgrade level in cuttings (Provisional Quantity if ordered)	set of tests	2.2.7
3402P	Subgrade treatment Type A in cuttings and in embankments, (Provisional Quantity if ordered)	m ²	2.2.7
3403P	Subgrade in cuttings, subgrade treatment Type B, replace with subgrade fill material, (Provisional Quantity if ordered)	m ³	2.2.7
3404P	Subgrade in cuttings, subgrade treatment Type C, replace with unbound pavement material (Provisional Quantity if ordered)	m ³	2.2.7
3405P	Subgrade in cuttings, subgrade treatment Type D, insitu stabilise existing (Provisional Quantity if ordered)	m ³	2.2.7
3406P	Subgrade in cuttings, subgrade treatment Type E, replace with plant-mixed stabilised material (Provisional Quantity if ordered)	m ³	2.2.7
3407P	Subgrade in cuttings, subgrade treatment Type F, replace with plant-mixed stabilised and unbound drainage layers (Provisional Quantity if ordered)	m ³	2.2.7
3408P	Subgrade in cuttings, subgrade treatment Type G, replace with insitu stabilised drainage layer (Provisional Quantity if ordered)	m ³	2.2.7
3409P	Subgrade in cuttings, subgrade treatment Type H, replace with plant-mixed stabilised drainage layer (Provisional Quantity if ordered)	m ³	2.2.7
3411P	Subgrade in cuttings, subgrade treatment Type I, [description], (Provisional Quantity if ordered)	m ³	2.2.7
3412P	Excavation of non-rippable material in road excavation, rate additional to rate for Work Items 3406, 3407, 3408 and 3409 (Provisional Quantity)	m ³	2.2.7
3413P	Supply of stabilising agent, lime (Provisional Quantity as directed)	tonne	2.2.7
3414P	Supply of stabilising agent, Type GB cement (Provisional Quantity as directed)	tonne	2.2.7
Earthworks, Backfill			
3501	Backfill with general backfill material to [description]	m ³	2.2.8
3502	Backfill with select backfill material to [description]	m ³	2.2.8
3503	Backfill with free draining granular material to [description]	m ³	2.2.8
3504	Backfill with sand to [description]	m ³	2.2.8
3505	Backfill with cement stabilised pavement material to [description]	m ³	2.2.8
3506	Backfill with stabilised sand to [description]	m ³	2.2.8

Standard Item No.	Description	Unit of Measurement	Clause Reference
3507	Backfill with lean mix concrete to [description]	m ³	2.2.8
3508	Backfill with rock fill to [description]	m ³	2.2.8
3509	Backfill with material for steel culverts to [description]	m ³	2.2.8
3511	Bedding of [description]	m ³	2.2.8
3512	Haunch zone for [description]	m ³	2.2.8
3513	Side zone for [description]	m ³	2.2.8
3514	Overlay zone for [description]	m ³	2.2.8
3521P	Addition of lime to backfill material in Acid Sulphate Soil areas, (Provisional Quantity as directed)	m ³	2.2.8
Earthworks, Turnouts, Entrances and Stopping Places			
3601	Turnouts	m	2.2.9
3602	Entrances to private property	m	2.2.9
3603	Stopping places	Lump Sum	2.2.9
Widening			
3701	Widening of the existing formation (metres)	m	2.2.10
3702	Widening of the existing formation (square metres)	m ²	2.2.10

Figure 2.1-A – Road excavation

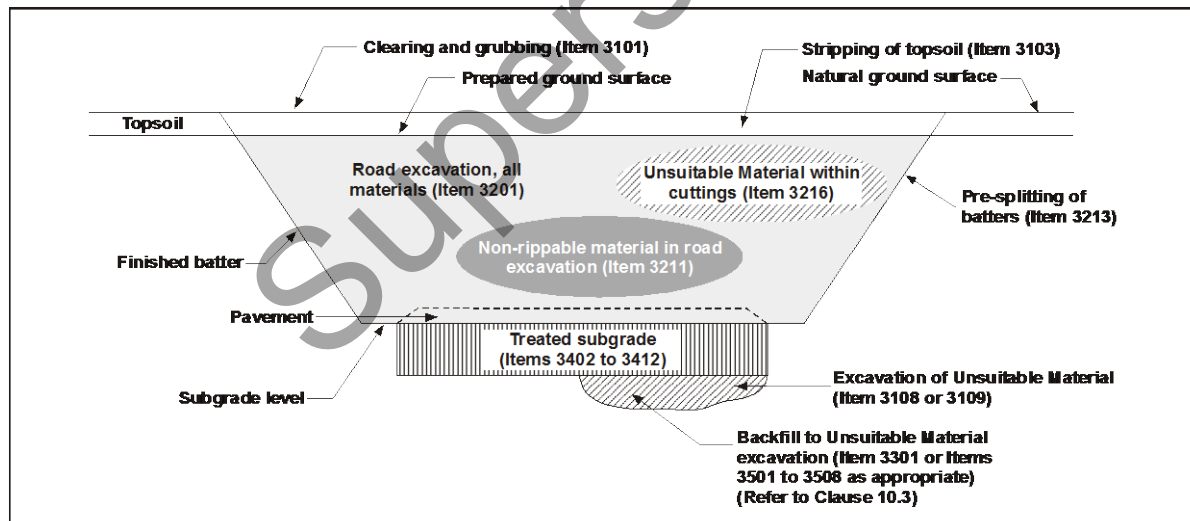
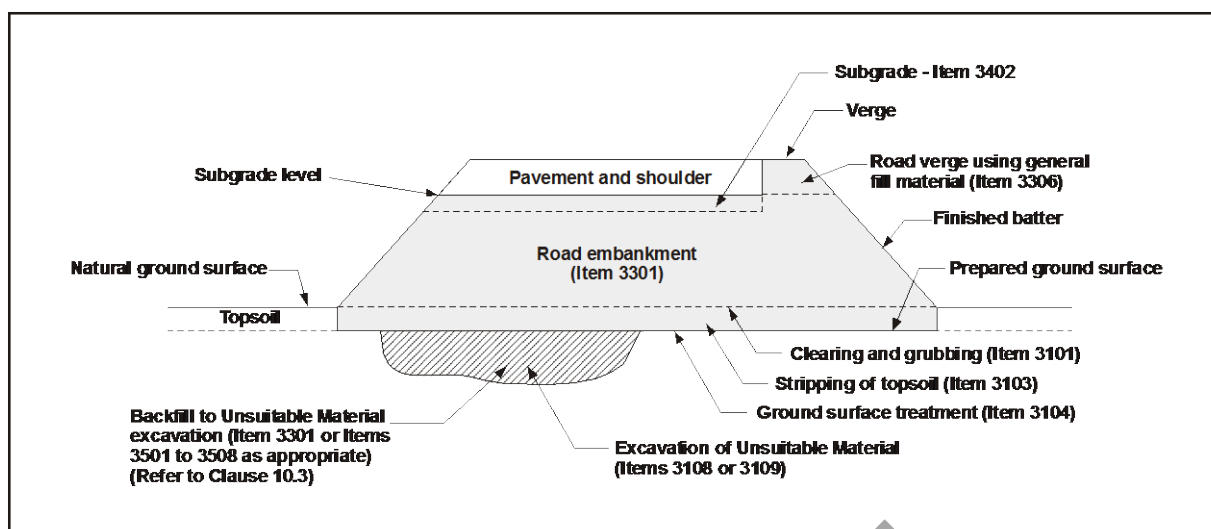
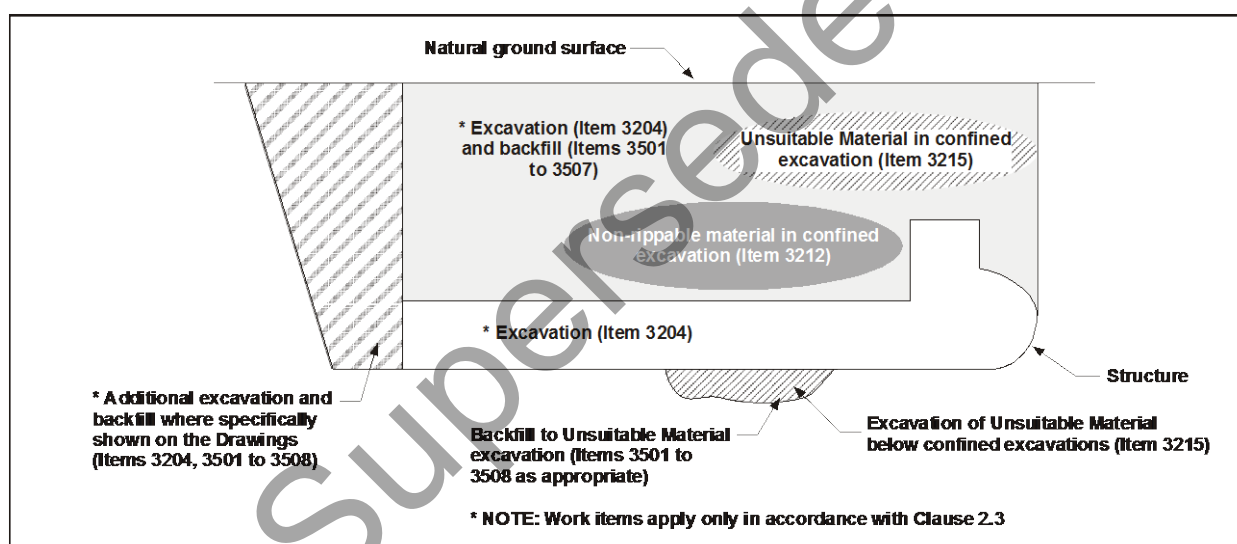


Figure 2.1-B – Road embankment**Figure 2.1-C – Excavation and embankment to structures**

2.2 Work Operations

Work Operations included in the Standard Work Items are specified in the relevant clause adjacent to each Standard Work Item listed in Table 2.1.

2.2.1 Clearing and grubbing

Item 3101 Clearing and grubbing

Item 3102 Bridge site preparation

Work Operations incorporated in the above items include:

- Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- removing trees, shrubs and overhanging branches
- setting aside marketable timber

- d) setting aside vegetative material suitable for processing to produce organic mulch
- e) placing fallen logs and branches suitable for fauna habitat clear of construction activities
- f) removing stumps and roots (including any subsequent regrowth) to a depth not less than 300 mm below ground surface
- g) removing noxious weeds, crops and other vegetable matter from the ground surface (including any subsequent regrowth)
- h) removing rocks, buildings and artificial obstructions from the ground surface
- i) removing and/or demolishing existing drainage infrastructure and roadside furniture including barriers where not scheduled separately
- j) removing abandoned Public Utility Plant to a depth not less than 300 mm below natural ground surface
- k) disposing of all cleared and grubbed materials which are not to be reused, and
- l) trimming and lightly compacting area within the limits of the clearing and grubbing outside the limits of earthworks operations.

2.2.2 Stripping of topsoil

Item 3103P Stripping of topsoil (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) stripping existing topsoil from the Site
- c) identification of material suitable for use as planting media
- d) stockpiling of material considered suitable for use as planting media, and
- e) use of or disposal of surplus material and material unsuitable for use as planting medium.

2.2.3 Acid sulphate soils

Item 3111P Supply and storage of agricultural lime (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) supply and storage of lime.

Item 3112P Quantitative laboratory testing of actual or potential acid sulphate soils (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) collection of sample, appropriate packaging, transport to laboratory, testing and reporting of result.

Item 3113P Treatment of water contaminated by acid sulphate soil, (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) temporary retention of contaminated water
- c) testing and analysis of contaminated water
- d) mixing of lime slurry and incorporation into contaminated water, and
- e) discharge of, or disposal of, treated water and contaminated products.

2.2.4 Ground surface treatment

Item 3104 Ground surface treatment under embankment, standard

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supplying, placing and compacting fill material in holes and localised depressions
- c) adjusting the moisture content of insitu material below the existing ground surface, and
- d) compacting material below the prepared ground surface.

Item 3105 Ground surface treatment, special (square metres)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) all work specified in Clause 12.2.2 of MRTS04.

Item 3106 Ground surface treatment, special (cubic metres)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) all work specified in Clause 12.2.2 of MRTS04.

Item 3107P Ground surface treatment, insitu treatment of acid sulphate soils with lime (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) visual and field testing of materials for acid sulphate potential
- c) identification of areas requiring treatment and level of treatment required
- d) loosening and excavation of materials as directed by the Superintendent
- e) spreading and mixing of lime into excavated material at a rate required to neutralise acid production, and
- f) moisture conditioning and re-compaction of material into excavation.

Item 3108P Excavation and disposal of Unsuitable Material with individual excavation $\leq 10 \text{ m}^3$ (Provisional Quantity as directed)

Item 3109P Excavation and disposal of Unsuitable Material with individual excavation $> 10 \text{ m}^3$ (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) identification of Unsuitable Material including testing and survey where required
- c) loosening insitu material
- d) excavating loading and hauling loosened material to stable slopes as directed by the Superintendent
- e) disposal of Unsuitable Material, and
- f) compaction of base of excavation.

2.2.5 Excavation

Item 3201 Road excavation, all materials

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) identification of material classes and Unsuitable Material including testing and survey where required
- c) loosening insitu material
- d) excavating, loading, hauling and unloading loosened material
- e) any additional stockpiling, reloading, hauling and unloading of excavated material as required to deliver the material to its final point of placement
- f) disposing or otherwise using excavated material
- g) lightly tyning areas specified, and
- h) finishing batters.

Item 3202 Excavation to clear waterways at bridge abutments, all materials

Item 3203 Excavation for culvert, pipe and conduit trenches, all materials [description]

Item 3204 Excavation for structures, all materials [description]

Item 3205 Excavation for diversion channels, all materials

Item 3206 Excavation for diversion drains, all materials

Item 3207 Excavation for catch drains, all materials

Item 3208 Special excavation, all materials [description]

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) loosening insitu material

- c) excavating, loading, hauling and unloading loosened material
- d) any additional stockpiling, reloading, hauling and unloading of excavated material as required to deliver the material to its final point of placement
- e) disposing or otherwise using excavated material
- f) compacting material at the bottom of excavations, and
- g) finishing batters.

Item 3211P Excavation of non-rippable material in road excavation, rate additional to rate for Work Item 3201 (Provisional Quantity)

Item 3212P Excavation of non-rippable material in confined excavation, rate additional to rates for Work Items 3203 to 3207 inclusive (Provisional Quantity)

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) work associated with the excavation of non-rippable material in addition to that required for road excavation or confined excavation, as appropriate, in all materials.

Item 3213 Pre-splitting batters of rock cuttings

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) pre-splitting of face of batter with explosives.

Item 3215P Excavation and disposal of Unsuitable Material in and below confined excavations (Provisional Quantity as directed)

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) identification of Unsuitable Material including testing and survey where required
- c) loosening insitu material
- d) excavating to stable slopes and to extent of Unsuitable Material as directed by the Superintendent, loading and hauling loosened material
- e) use of or disposal of Unsuitable Material, and
- f) compaction of base of excavation.

Item 3216P Excavation and disposal of Unsuitable Material within lines of cuttings, rate additional to rate for Work Item 3201 (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) identification of Unsuitable Material including testing and survey where required
- c) use of or disposal of Unsuitable Material, and
- d) supply of additional fill material, to supplement construction of embankments and other fills.

Item 3221 Blinding concrete, [thickness] mm nominal thickness

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply of concrete
- c) transport of concrete
- d) placing and compacting concrete, and
- e) finishing concrete.

2.2.6 Embankments

Item 3301 Road embankment

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) loosening insitu material
- c) stepping the ground surface
- d) supplying and placing embankment and subgrade fill material from stockpiles and borrow areas on or off the Site as required
- e) separation of embankment fill material into embankment zones where specified
- f) installing embankment geotextile at changes in fill type
- g) spreading fill material
- h) compacting fill material, and
- i) finishing batters.

Item 3302 Levees, catch banks and diversion blocks using clay fill material from all sources

Item 3303 Special embankment [description] from all sources

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) loosening insitu material
- c) stepping the ground surface
- d) supplying and placing fill material from stockpiles and borrow areas on or off the Site as required
- e) separation of fill material into embankment zones where specified
- f) spreading fill material
- g) compacting fill material, and
- h) finishing batters.

Item 3304 Supply and installation of geotextile, strength class [*strength class*], filtration class [*filtration class*]

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply, delivery and handling of geotextile including allowance for lapping, and
- c) installation of geotextile, including lapping/joining.

Item 3305P Addition of lime to embankment materials to neutralise acid sulphate soils, rate additional to rates for Work Items 3301 to 3303 (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) visual assessment and field testing of materials for acid sulphate potential
- c) identification of materials requiring treatment and level of treatment required, and
- d) mixing of lime into excavated material at rate required to neutralise acid production (excluding supply of lime).

Item 3306 Road verges using general fill material

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) loosening insitu material
- c) stepping the ground surface
- d) supplying and placing verge material from stockpiles and borrow areas on or off the Site as required
- e) spreading verge material
- f) compacting verge material, and
- g) finishing batters.

2.2.7 Subgrade

Item 3401P Testing of existing material below subgrade level in cuttings (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction Specifications*
- b) tests as required by Clause 18.3.3.2 of MRTS04 other than lime reaction testing, and
- c) provision of test results to the Superintendent.

Item 3402P Subgrade treatment Type A in cuttings and in embankments, (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) ripping and/or tining to specified treatment depth
- c) adjustment of moisture content, where necessary
- d) compaction of material, and
- e) trimming of subgrade to tolerance.

Item 3403P Subgrade in cuttings, subgrade treatment Type B, replace with subgrade fill material, (Provisional Quantity if ordered)

Item 3404P Subgrade in cuttings, subgrade treatment Type C, replace with unbound pavement material (Provisional Quantity if ordered)

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials
- c) excavation of existing subgrade in accordance with the Work Operations of Item 3201 in Clause 2.1.3.5
- d) placement of appropriate fill material
- e) compaction, and
- f) trimming of subgrade to tolerance.

Item 3405P Subgrade in cuttings, subgrade treatment Type D, insitu stabilise existing (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials excluding stabilising agent
- c) testing insitu material for lime application rate
- d) scarifying and/or pulverising the material to be stabilised
- e) spreading the stabilising agent
- f) incorporation of water and stabilising agent into the material
- g) compaction
- h) trimming of subgrade to tolerance, and
- i) moist curing until subgrade is covered.

Item 3406P Subgrade in cuttings, subgrade treatment Type E, replace with plant-mixed stabilised material (Provisional Quantity if ordered)

Item 3409P Subgrade in cuttings, subgrade treatment Type H, replace with plant-mixed stabilised drainage layer (Provisional Quantity if ordered)

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials excluding stabilising agent
- c) excavation of existing subgrade in accordance with the Work Operations of Item 3201 in Clause 2.1.3.5
- d) storing, metering and mixing of all components of plant-mixed material
- e) placing of plant-mixed material
- f) compaction
- g) trimming of subgrade to tolerance, and
- h) moist curing until subgrade is covered.

Item 3407P Subgrade in cuttings, subgrade treatment Type F, replace with plant-mixed stabilised and unbound drainage layers (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials excluding stabilising agent
- c) excavation of existing subgrade in accordance with the Work Operations of Item 3201 in Clause 2.1.3.5
- d) storing, metering and mixing of all components of plant-mixed material
- e) placing of unbound material
- f) placing of plant mixed material
- g) compaction, and
- h) trimming of subgrade to tolerance.

Item 3408P Subgrade in cuttings, subgrade treatment Type G, replace with insitu stabilised drainage layer (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supply and delivery of all materials excluding stabilising agent
- c) excavation of existing subgrade in accordance with the Work Operations of Item 3201 in Clause 2.1.3.5
- d) placing the unbound material
- e) spreading the stabilising agent

- f) incorporation of water and stabilising agent into the material
- g) compaction
- h) trimming of subgrade to tolerance, and
- i) moist curing until subgrade is covered.

Item 3411P Subgrade in cuttings, subgrade treatment Type I, [description], (Provisional Quantity if ordered)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) All work operations required to supply and construct the particular subgrade treatment described.

Item 3412P Excavation of non-rippable material in road excavation, rate additional to rate for Work Items 3406, 3407, 3408 and 3409 (Provisional Quantity)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) work associated with excavation of non-rippable material in addition to that required for excavation of rippable material.

Item 3413P Supply of stabilising agent, lime (Provisional Quantity as directed)

Item 3414P Supply of stabilising agent, Type GB cement (Provisional Quantity as directed)

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) supply, delivery and storage of stabilising agent.

2.2.8 Backfill

Item 3501 Backfill with general backfill material to [description]

Item 3502 Backfill with select backfill material to [description]

Item 3503 Backfill with free draining granular material to [description]

Item 3504 Backfill with sand to [description]

Item 3505 Backfill with cement stabilised pavement material to [description]

Item 3506 Backfill with stabilised sand to [description]

Item 3507 Backfill with lean mix concrete to [description]

Item 3508 Backfill with rock fill to [description]

Item 3509 Backfill with material for steel culverts to [description]

Item 3511 Bedding of [description]

Item 3512 Haunch zone for [description]

Item 3513 Side zone for [description]

Item 3514 Overlay zone for [description]

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) supplying all materials
- c) mixing all materials where applicable
- d) placing and compacting material in trenches or against structures, and
- e) finishing surfaces of backfill.

Item 3521P Addition of lime to backfill material in Acid Sulphate Soil areas, (Provisional Quantity as directed)

Work Operations incorporated in the above item include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*, and
- b) mixing of lime into backfill material at the rate required to neutralise potential acid production (excluding supply of lime).

2.2.9 Turnouts, entrances and stopping places

Item 3601 Turnouts

Item 3602 Entrances to private property

Item 3603 Stopping places

Work Operations incorporated in the above items include:

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*
- b) clearing and grubbing, topsoil stripping and ground surface treatment standard
- c) constructing road cutting excavations
- d) constructing road embankments, and
- e) constructing subgrade in general fill material.

2.2.10 Widening of existing formation to subgrade level

Item 3701 Widening of the existing formation (metres)

Item 3702 Widening of the existing formation (square metres)

Work Operations incorporated in the above item include all requirements for standard item numbers:

- 3101 Clearing and grubbing
- 3103 Stripping of topsoil
- 3104 Ground surface treatment under embankment, standard
- 3201 Road excavation, all materials
- 3206 Excavation for diversion drains, all materials
- 3207 Excavation for catch drains, all materials
- 3301 Road embankment, and

3402 Subgrade treatment Type A.

2.3 Measurement of excavation and backfilling of trenches and structures

Excavation and backfilling for construction or installation of the following elements shall not be measured separately:

- a) pipes less than 1200 mm nominal diameter
- b) box culverts less than 1200 mm nominal height
- c) conduits and cables
- d) pits, access chambers, gullies and sumps
- e) culvert end structures and aprons
- f) kerbs and channels
- g) subsoil drains of any description
- h) batter, embankment and channel protection of any description
- i) sundry paving for footpaths, bikeways, rail and machinery crossings, relieving slabs and median and verge infill paving
- j) retaining walls
- k) road furniture
- l) landscape works, and
- m) traffic signal and road lighting footings.

Excavation and backfilling for construction or installation of the following elements shall not be measured separately unless specifically stated otherwise in Clause 1 of Annexure MRS04.1 or in the relevant Specification or Supplementary Specification:

- a) pipe culverts greater than or equal to 1200 mm nominal diameter
- b) culverts greater than or equal to 1200 mm nominal height
- c) inlets and outlets to culverts
- d) structures, and
- e) cast-in-place piles.

Where not measured separately, payment for excavation and backfilling for any of the above mentioned elements shall be deemed to be included in the rate for an appropriate Work Item (provided in another Specification or Supplementary Specification) for construction or installation of that particular element.

2.4 Borrow, spoil, hauling, stockpiling and multiple handling

No separate Work Item shall apply to and no separate payment shall be made for borrowing, spoiling, hauling, stockpiling and/or multiple handling of materials forming the earthworks described by this Specification and/or the Drawings. Full payment for such activities shall be deemed to be included in the rates for the Work Items included in the Schedule of Rates.

2.5 Calculation of quantities

In Clause 2.5, the term “top of excavation” shall mean:

- a) in a cutting – subgrade level, or
- b) elsewhere – prepared ground surface. For the purpose of calculating quantities, the prepared ground surface shall be taken as the natural ground surface less the depth of topsoil to be excavated.

The following methods of measurement shall apply to the quantities of earthworks measured under the Contract:

- a) excavation (except as stated otherwise in Clause 2.5) – the volume determined from the three-dimensional shape bounded by the prepared ground surface and the finished shapes and dimensions to subgrade level as shown on the Drawings or otherwise nominated in the Contract
- b) topsoil – the volume calculated using the areas and average depths specified
- c) excavation of Unsuitable Material – the volume determined by a method approved by the Superintendent, which method may require surveys to be carried out before and after excavation of the material
- d) excavation for culverts (where excavation for culverts is to be measured separately in accordance with Clause 2.3) – the volume determined from the three-dimensional shape bounded by the top of excavation, the minimum depth determined from the dimensions shown on Standard Drawing 1359, the vertical planes representing the minimum width of excavation at the centre of the culvert as shown on Standard Drawing 1359 and the actual length of the culvert at top of excavation
- e) excavation for structures (where excavation for structures is to be measured separately in accordance with Clause 2.3) – the volume determined from the three-dimensional shape bounded by the top of excavation, the underside of structure (excluding any blinding concrete) and the vertical planes containing the plan shape of the structure plus any defined backfill zones as shown on the Drawings
- f) excavation in non-rippable material (where excavation in non-rippable material is to be measured separately in accordance with Clause 13.3.1 of MRS04) – the actual volume of non-rippable material excavated provided that the provisions of Clause 3.5 are followed
- g) pre-splitting of batters in cuttings – the area defined by the plane of the inclined rock face shown on the Drawings
- h) embankments – the volume determined from the three-dimensional shape bounded by subgrade level, the prepared ground surface and, the finished shapes and dimensions as shown on the Drawings or otherwise nominated in the Contract
- i) backfill of Unsuitable Material excavations – the volume equal to that described in subparagraph (c) above

- j) backfill for culverts – total backfill for each zone as appropriate (where backfill to culverts is to be measured separately in accordance with Clause 2.3) – the volume equal to that described in subparagraph (d) above less the actual volume of the culvert except that:
 - i. for a trench installation as shown on Standard Drawing 1359, the backfill above the overlay zone will be measured as overlay zone material, and
 - ii. for an embankment installation, the volume of backfill above the prepared ground surface shall be calculated to the lines shown on Standard Drawing 1359
- k) backfill for structures (where backfill to structures is to be measured separately in accordance with Clause 2.3) – the volume equal to that described in subparagraph (e) above less the actual volume of the structure
- l) blinding concrete – the area covered by the footprint of concrete footing or slab as shown on the Drawings,, and
- m) subgrade treatment Type A – the area at subgrade level.

Excavation quantities shall make no allowance for any additional excavation required to place planting media and other landscape treatments to the specified thicknesses and finished levels shown on the Drawings. No additional payment shall be made for such excavation under the Contract. Embankment quantities shall make no allowance for any reduction of embankment dimensions required to place planting media and other landscape treatments to the specified thicknesses and finished levels shown on the Drawings.

3 Measurement and payment

3.1 Unsuitable material

Payment for backfilling of excavations of unsuitable material shall be made under Standard Work Items 3301 or 3216 as appropriate. However, where, in the opinion of the Superintendent, backfilling is required to be carried out in an area which does not allow the use of earthmoving plant of the size and capacity employed by the Contractor in constructing embankments on the Site, payment shall be made under Standard Work Item 3501. The Superintendent may order backfill in alternative materials in accordance with Work Items 3502 to 3508 inclusive.

The Contractor shall carry out surveys, before and after treatment of any Unsuitable Material, to determine the quantity of Unsuitable Material for payment purposes and the cost of such surveys shall be deemed to be included in the Contractor's rates for treatment of Unsuitable Materials.

In the interests of expediency, the Contractor may elect to remove Unsuitable Material and replace it with other material without reference to the Superintendent. In such a case, the Principal will not be bound to make any additional payment.

In general, no additional payment will be made to the Contractor for Unsuitable Material within embankments where there is excavated material which is surplus to the project requirements.

3.2 Acid sulphate soil

The costs of visual and field testing for acid sulphate soils shall be borne by the Contractor. The Superintendent will authorise payment for ordered quantitative laboratory testing under Standard Work Item 3112.

The cost of water treatment where required will be borne by the Principal under Standard Work Item 3113 where the contaminated water is:

- a) groundwater from excavations which are essential to the construction of the Works, or
- b) runoff from stockpiles which have been created as essential steps in the management of acid sulphate soils on the Site

but only where, in the opinion of the Superintendent, the Contractor:

- a) has taken all reasonable steps to avoid contamination, and
- b) is constructing the works in accordance with its construction program.

In all other circumstances the cost of water treatment shall be borne by the Contractor.

3.2.1 Disposal in areas on the site

No additional payment shall be made for shaping, draining, topsoiling and revegetation of spoil sites.

3.3 Non-rippable material

3.3.1 General

For the purpose of Clause 3.3, "production rate" means the rate at which material can be ripped only, without regard to stockpiling, loading or carting.

3.3.2 Road excavation

Non-rippable material in road excavation shall be material which cannot be ripped at a production rate exceeding the rate specified in Table 3.3.2 for the classes of crawler tractor nominated in Clause 2.1 of Annexure MRS04.1. The crawler tractor shall be equipped with a heavy duty, single tine, parallelogram ripper approved by the manufacturer of the crawler tractor for use with the particular model of crawler tractor.

Table 3.3.2 – Road excavation – Production rate limit for non-rippable material

Class of Crawler Tractor ^{1, 2}	Operating Mass (kg) ³	Classifying Power (kW)	Production Rate (m ³ /h)
150C	≥ 20 000 < 29 000	≥ 150 < 200	50
200C	≥ 29 000 < 44 000	≥ 200 < 300	75
300C	≥ 44 000 < 58 000	≥ 300 < 400	90
400C	≥ 58 000 < 73 000	≥ 400 < 500	105
500C	≥ 73 000 < 90 000	≥ 500 < 600	120
600C	≥ 90 000	≥ 600	135

1. C in class number designates a crawler tractor.
2. Class number shall be the number, or the lower of the two numbers for which the machine would be classified separately by classifying power and by operating mass.
3. Operating mass also includes hydraulic controls and fluids, straight bulldozer blade, operator's protective structure.

3.3.3 Confined excavations

Non-rippable material in confined excavation shall be material which cannot be ripped at a production rate exceeding the rate specified in Table 3.3.3 for the classes of crawler excavator nominated in

Clause 2.2 of Annexure MRS04.1. The crawler excavator shall be equipped with a heavy duty bucket or rock bucket (approved by the manufacturer of the crawler excavator for use with the particular model of crawler excavator for excavation in rock) of width not greater than that stated in Table 3.3.3. The bucket teeth shall be fitted with high penetration boots.

Table 3.3.3 – Confined excavation – Production rate limit for non-rippable material and classification of excavators and shovel loaders

Class Number of Crawler Excavator ¹	Operating Mass (kg) ²	Net Engine Power (kW)	Maximum Bucket Width (mm)	Production Rate (m ³ /h)
55	≥ 12 500 < 15 000	≥ 55 < 65	450	1.5
85	≥ 19 000 < 23 000	≥ 85 < 100	600	3
115	≥ 27 000 < 31 000	≥ 115 < 135	750	4.5
155	≥ 38 000 < 44 000	≥ 155 < 175	900	7
200	≥ 50 000 < 60 000	≥ 200 < 235	1050	10

1. Class number shall be the number or the lower of the two numbers, for which the machine would be classified separately by net engine power and by operating mass.
2. Operating mass shall also include standard attachments, e.g. one piece boom standard stick, small bucket, standard undercarriage.

3.3.4 Blasting

In general, no additional payment shall be made to the Contractor for blasting operations in any excavation. The Contractor shall be deemed to have made due allowance in its tendered rates for the cost of all blasting operations.

3.4 All excavations

Except where other specific Work Items are included in the Schedule of Rates, all excavations shall be measured under Standard Work Item 3201.

In general, no additional payment shall be made to the Contractor for excavation in non-rippable material in any excavation. The Contractor shall be deemed to have made its own assessment of the extent and nature of the material to be excavated and to have made due allowance in its tendered rates for the cost of excavation in all materials.

However, where so stated in Clause 2.3 of Annexure MRS04.1, the Contract shall provide for additional payment to be made to the Contractor for excavation of non-rippable material in road excavation and where so stated in Clause 2.4 of Annexure MRS04.1, the Contract shall provide for additional payment to be made to the Contractor for excavation of non-rippable material in confined excavation. Where the Contract provides for additional payment for excavation in non-rippable material, the provisions of Clause 3.5 shall apply.

Irrespective of whether material is rippable or non-rippable, the Contractor may carry out excavations using any equipment and any safe techniques.

3.5 Conditions applicable to additional payment for excavation in non-rippable material

Where the Contract provides for additional payment for excavation in non-rippable material in accordance with Clause 3.4, the following provisions shall apply:

- a) the Schedule of Rates will contain an appropriate Standard Work Item for the work associated with excavation in non-rippable material
- b) proving material to be non-rippable shall be the Contractor's responsibility
- c) proving material to be non-rippable shall be a hold point as specified in MRTS50 *Quality System Requirements* to be released by the Superintendent **Hold Point**
- d) equipment shall be in good working condition and the Superintendent may require the Contractor to demonstrate that the equipment has been regularly and properly serviced
- e) the Superintendent shall have the right to nominate the operator (whether a Contractor's employee or not) and the type, manufacturer and/or size of excavating machine and to direct the operations of the machine during the proving operation
- f) unless the Contractor has proved material to be non-rippable and the Superintendent has agreed that the material is non-rippable prior to excavation of that material, the Principal shall not be bound to make any additional payment for that material on account of its non-rippability
- g) at the discretion of the Superintendent, measurement of quantities of non-rippable material may require surveys, before and after excavation, and such surveys shall be carried out by the Contractor and the cost thereof shall be deemed to be included in the Contractor's rates for excavation in non-rippable material, and
- h) in particular, any additional payment to be made to the Contractor for excavation of non-rippable material for subgrade treatments shall be made strictly in accordance with these provisions.

3.6 Special requirements for cuttings

3.6.1 Bottom of excavation

All excavation down to subgrade level shall be measured under Standard Work Item 3201.

3.6.2 Unsuitable material below the bottom of excavation

The quantity of excavation of unsuitable material below the finished lines and levels of bottom of excavation shall be measured separately under Standard Work Item 3108 or 3109 as appropriate – refer to Figure 2.1 A.

3.7 Unsuitable material in confined excavations

Where excavation for the relevant trench or structure is to be measured separately in accordance with Clause 2.3, the quantity of excavation of Unsuitable Material shall be measured separately under Standard Work Item 3215.

3.8 Special embankment materials

Where special embankment materials are required to be used, they are included in the Schedule of Rates under Standard Work Item 3303.

3.9 Geotextile at changes in material type

No additional payment shall be made for supply or installation of the geotextile at this interface at changes in material type in embankments.

3.10 Borrow operations

No separate payment shall be made for establishing borrow areas or for sourcing material from borrow areas.

3.11 Backfill zones to concrete pipe culverts

Overlay zone material not actually in a trench shall be measured as embankment material under Standard Item Number 3301.

4 Existing ground level survey

The Principal has provided survey data as stated in Clause 3 of Annexure MRS04.1. If the Contractor accepts this data, it shall become the basis for calculation of all quantities.

If the Contractor does not agree with the survey data provided, it shall provide notice to the Superintendent prior to the natural ground surface being disturbed. This notice shall contain a survey of a sample set of points agreed with by the Superintendent showing the differences from the Principal's survey. No additional payment shall be made by the Principal for this sample survey. If the Superintendent accepts that the survey indicates inaccuracies in the Principal's survey sufficient to require an additional independent ground level survey of the disputed areas, it shall be carried out as directed by the Superintendent.

This independent survey shall be arranged, programmed and organised by the Contractor and the survey shall be conducted by a mutually agreed, qualified surveyor working to an agreed program and quoted price. Payment for the survey will be made as a variation.

No additional payment shall be made by the Principal other than for the above independent survey and no extension to time shall be granted as a result.

5 Supplementary requirements

The requirements of MRS04 *General Earthworks* are varied by the supplementary requirements given in Clause 4 of Annexure MRS04.1.

Superseded