NOTES FOR GUIDANCE ON THE METHOD OF MEASUREMENT FOR HIGHWAY WORKS

Introduction

The Method of Measurement for Road Works (MMRW) has been based upon the Specification for Road Works (SRW) and the Road Construction Details (RCD) published as Volume 1 and Volume 3 of the Manual of Contract Documents for Road Works.

They are intended for use with the Conditions of Contract included in the Model Contract Document for Road Works published as Section 1 of Volume 0 of the Manual of Contract Documents for Road Works.

Chapters I, II and III

1 Item Coverage

Item coverages in the MMRW ensure that the Contractor knows the items of work to be covered by the rates and prices he inserts against the appropriate items in the Bill of Quantities. However, coverages relative to the base item description are not normally included, for example cement in concrete, nor are those contingently and indispensably necessary to enable the work item to be completed satisfactorily, for example nuts and bolts in safety fences. Similarly general obligations are not separately covered, for example obligations set out in the Conditions of Contract or covered in the Preambles to Bill of Quantities. The basic item coverages closely match the SRW and RCD. Hence if changes are introduced into the Specification the item coverages have to be reviewed to ensure that they accurately relate to the revised Specification. Changes to the Specification should not be introduced on the Drawings although revised Drawings may reflect revisions to the Specification in which case reference to the Drawings should be incorporated in the Specification. Conversely item coverages should not be extended to include items of work which are not specified or not shown in the RCD.

Item coverages often refer to item coverages set out in one or more other Series. The complete item coverage therefore embodies all such references despite those references appearing to be unconnected with the original item in some cases.

2 Extra Over Items

Extra Over (EO) items shown in the MMRW are applied to a base item where a significant additional burden is placed upon the Contractor to undertake extra work of much the same nature as the work covered by the base item. The quantities to be billed for the EO items must be in respect of work included with the quantities for the base item. Consequently the item coverage in respect of the quantities for the EO item comprises a summation of that for the base item and the EO item.

3 Remove From Store and Re-erect/Re-install/Relay

The items for remove from store and re-erect, re-install, relay include items which have been removed to store off Site designated by the Overseeing Organisation and items which have been set aside by the Contractor as required by the Contract.

4 Hard Material

Excavation in Hard Material occurs in the item coverage for several items of work, for example, fencing, safety fencing, traffic signs and road markings, road lighting and electrical work. The Contract should contain information

known to the compiler about the existence and extent of Hard Material and this should include existing buried roads and the like. This would not relieve the Contractor of his obligations under the Conditions of Contract. Hard Material is measured extra over normal excavation for earthworks, fencing and drainage and guidance is given under Series 600.

5 Dayworks

Where it is anticipated work will be required to be executed on a daywork basis, attention is drawn to the Model Contract Document for Road Works, which sets out the means of providing for Dayworks in the Contract. The Compiler when considering the particular form of contract to be utilised shall decide whether it is appropriate to include Daywork items. The Compiler shall decide whether the deletion of references from within documentation to Dayworks is appropriate.

6 Testing

The compiler's attention is drawn to paragraph 17 of the Preamble to Bill of Quantities which sets out the manner in which testing is either to be allowed for in the rates and prices or measured in the Bill of Quantities.

Compliance testing of the permanent works to be carried out by the Contractor at specified frequencies is scheduled by the compiler in Appendix 1/5 to the Specification. Paragraph 2(x) of the Preambles to the Bill of Quantities covers testing listed in Appendix 1/5 and no items should be included in the Bill of Quantities in respect of these tests. Appendix 1/5 may also include tests to be carried out on the permanent works to prove the Overseeing Organisation's design, or validate design assumptions, and these tests are also covered by paragraph 2(x).

Other compliance testing, checking, inspecting, measuring and verifying of workmanship, goods and materials incorporated into the permanent works required to be carried out by the Contractor but not listed in Appendix 1/5 is covered by paragraph 2 (xii) of the Preamble to the Bill of Quantities and no items should be included in the Bill of Quantities in respect of these tests. Tests to be carried out on the permanent works to prove the Overseeing Organisation's design, or validate design assumptions, but which are not separately listed in Appendix 1/5 are also covered by paragraph 2(xii).
Trial construction and associated testing to be carried out by the Contractor for the purpose of proving the Overseeing Organisation's design or validating design assumptions, e.g. installation and test loading of trial piles in advance of the main piling or loading tests for safety fence posts, shall be measured separately in the relevant Series. The compiler should ensure that appropriate items are included in the Bill of Quantities for these and any similar tests and, where necessary, make appropriate amendments to the Method of Measurement.

There are in principle four types of compliance testing as explained in Series 900, Sub-Clause 2 to 5 :

- Production control – costs are covered by the Contractor;

- Control testing – results are the base for the acceptance of the works and costs are covered by the Overseeing Organisation;
- Additional control testing;
- Arbitrary testing.

Type and frequency of testing is also to be found in the relevant Series.

7 Modification and New Materials

The item coverage applicable to removing from store and re-erecting/reinstalling/relaying various materials includes for modification and new materials to the extent that the requirements are detailed in the Contract. Modification and new materials of which the Contractor was not informed at the time of tender are not covered by this item coverage.

8 Telephone Calls

Where provision is made in the Contract telephone calls made by the Overseeing Organisation are reimbursable in the case of the certified actual price but the cost of telephone rental and installation is not reimbursable, as it is included in item coverage for temporary accommodation.

9 Special Preliminary Items

The use of Special Preliminary Items is identified in Chapter III Preparation of Bill of Quantities paragraph 4 and the intention is that they are only included in exceptional circumstances as described in sub-paragraphs (a) and (b). The Compiler shall ensure that if items are included that they are adequately covered within the documentation including any required item coverage.

Series 100: Preliminaries

1 General

These Notes for Guidance use generic terms and compilers should refer to the proposed particular Form of Contract being used for derivation of contract specific terminology.

2 Privately and Publicly Owned Services and Supplies

Particulars of the services and supplies affected by the Permanent Works and any preliminary arrangements for alterations by the owner or authority responsible should be detailed in Appendix 1/16 of the Specification but not included in Items or Sums in the Bill of Quantities, apart from any permanent works for the alterations which are to be provided by the Contractor, for example ducts. Charges by the owner or authority responsible for these alterations will be paid by the Overseeing Organisation after scrutiny. Any alterations to services and supplies required for the Contractor's temporary works, diversions and the like are the responsibility of the Contractor and are deemed to be covered by the rates and prices in the Bill of Quantities.

3 Maintenance of Highways

Appendix 1/17 of the Specification specifies those maintenance functions which will be the responsibility of the Contractor within defined physical limits and time periods.

The work scheduled in this Appendix is covered by the rates and prices inserted by the Contractor in the Bill of Quantities.

4 Contraflows (Traffic Safety and Management)

There are three possible methods by which contraflows can be planned and designed:

(a) full proposals drawn up by the Overseeing Organisation;
(b) outline proposals drawn up by the Overseeing Organisation and completed by the Contractor;
(c) full proposals drawn up by the Contractor.

Requirements under methods (a) or (b) should be scheduled in Appendix 1/17. Method (c) will be deemed as Contractor's temporary works to be included in the contraflow item.

It is recommended that the contraflow item is always included when traffic management is required thus allowing for Contractor's proposals as described in method (c) above.

5 Temporary Diversion for Traffic

The MMRW allows for temporary diversions for traffic to be measured as follows:

(a) **Specific Locations** - These may include those where, in the opinion of the compiler, the diversionary work is likely to be complicated, expensive, or its impact on or disruption of the Works is likely to be substantial. The description should include the appropriate reference from Appendix 1/18 of the Specification.

(b) **Omnibus Item** - This should include all diversions of a minor nature scheduled in Appendix 1/18 of the Specification. The omnibus item should not include in its description the references from Appendix 1/18 of the Specification.

(c) A separate omnibus item should always be provided for all diversions at locations proposed by the Contractor.

6 Damage to the Roadway

The responsibility for repairing damage to roadways rests with the Contractor unless stated otherwise in Appendix 1/17 or 1/18. The compiler should check whether or not the Conditions of Contract requires the Contractor to insure and indemnify the Overseeing Organisation against loss, damage and claims. If so, this is covered by Preamble 2 (vii) to the Bill of Quantities.

7 Information Boards and Driver Information Signs

The items in the Bills of Quantities for Information Boards shall only be in respect of those Information Boards detailed in Appendix 1/21 to the Specification.

The Information Boards should not be confused with Driver Information Signs which, when required, will be detailed in Appendix 1/17 to the Specification and are included in the Item Coverage for Traffic Safety and Management.

Series 200: Site Clearance

1 Obstructions Above Ground Level

The various Group I, Feature 3 items of site clearance measured separately are to be referenced on the site clearance drawings and listed in Appendix 2/1.

The referencing of items for site clearance can include consolidated references such as - "a house with adjoining garage and outbuildings" provided that full identification is given in, or cross referenced in, Appendix 2/1.

2 General Site Clearance

The stated unit of measurement for General Site Clearance is hectare as paragraph 2(i). However there may be circumstance in which this unit of measurement is not appropriate for certain schemes such as those involving a high degree of maintenance work. In these circumstances the compiler may wish to amend the unit of measurement to "item" by the insertion of a Preamble to the Bill of Quantities. In any event the limits of General Site Clearance should be clearly indicated on the drawings.

The compiler's attention is drawn to Specification paragraph 202.3 which refers to cutting back existing trees, bushes and hedges. Item coverage paragraph 5(h) allows the tenderer to price this requirement. However it is recommended that the extent of the cutting back to existing trees be taken into consideration since this aspect may be more appropriately measured in accordance with Series 3000, particularly if specialist activities such as tree surgery are required.

3 Take Up or Down

Take up or down and set aside for re-use should only be used for those materials or items that are required to be stored on Site by the Contractor prior to re-use. Take up or down and remove to store off Site is appropriate to those materials or items which are required to be taken off Site to a store designated and described in the Contract. These requirements should be detailed in Appendix 2/3 of the Specification including the distance to the store.
The item(s) for take up or down and remove to tip off Site shall be used only when no item for General Site Clearance has been included in the Bill of Quantities for that particular area. In this case it is essential that all items to be removed to tip off Site are measured separately in accordance with paragraphs 8 to 11.

4 Damage to Items

Item coverage includes for replacing items damaged in the process of taking up or down and setting aside or storing. It is the Contractor's responsibility to ascertain at the time of tender the extent of any damage which may occur and to make the appropriate allowance in his rates and prices.

Series 300: Fencing

1 Temporary Fencing

The Specification requires the Contractor to erect temporary fencing in all situations where he does not provide permanent fencing immediately. To comply with the Specification, Health and Safety Regulations and the Conditions of Contract the Contractor has the choice of a range of four specified types of temporary fencing. This temporary fencing is not shown on the Drawings nor is it included in the Bill of Quantities. However, should some specific temporary fencing be required by the Overseeing Organisation then this should be shown on the Drawings and included within Appendix 3/1 and the Bill of Quantities.

The Compiler should ensure that the obligations under the Form of Contract being utilised are sufficient and adequately cover the particular requirements of an individual scheme.

2 Concrete Foundations or Longer Posts

Items are provided in the MMRW for concrete foundations to timber posts. These are only to be measured where such a requirement is identified in Appendices 1/15 or 3/1 of the Specification.

Foundations in all other circumstances, including those for all posts other than timber, shall be deemed to be included within the fencing item to which they relate.

Locations where longer posts are required should also be identified in Appendices 1/15 or 3/1, a specific Type reference should be given, and reference made in item descriptions.

Series 400: Safety Barriers and Pedestrian Guardrails

1 Safety Barriers

The MMRW provides for three categories of curvature for payment purposes. Curves which are made up from individual straight lengths of beams should not be considered to be small lengths of straight fence. They should be measured as curved fences within the Group II features in MMRW. The radius is to be considered to be the radius equal to that of the arc which passes through the posts.

2 Pedestrian Guardrails and Handrails

Curves which are made up from individual straight lengths should not be considered as curved elements but as straight guardrails or handrails. Where the rails are actually curved they should be measured as curved guardrails or handrails as described by the specific radius.

3 Re-tensioning of Existing Safety Fences and Barriers

Where re-tensioning of existing safety fences and safety barriers when connected to new is required the Drawings and/or Specification should clearly identify the work.

Series 500: Drainage and Service Ducts

1 Tabulated Billing

The billing of pipe runs of varying diameter and specification with their attendant adjustment items produces a lengthy Series 500 bill. It is suggested that a tabulated method is used as shown in the example overleaf. This method will reduce the repetition of item descriptions. This method can also be extended to manholes and chambers.

Where non-standard or small quantities exist they would be best billed in the traditional manner.

2 Drainage and Service Ducts in Structures

The extent of the quantities included in the item for drainage and service ducts to a structure and their interface with non-structural drainage should be clearly shown on the Drawings. The quantities making up this item should either be scheduled in an appendix or on a drawing of the structure.

3 Alternative Types of Pavement

There is no requirement to provide separate drainage Bills of Quantities corresponding with each alternative Type of Pavement. Measurement of drainage must be based upon the thinnest construction permitted for any of the alternative Types of Pavement irrespective of the Type of Pavement chosen by the Contractor.

Tabulated Drainage Example

1 Drains

Item	Description	Unit	Quantity	Rate	Lm	c
	'A' mm internal diameter drain or sewer specified trench and bedding type or design group 'B' in trench depth to invert exceeding 2 metres, but not exceeding 4 metres, average depth to invert 'C' metres. Adjustment on this item for variation greater than 150mm above or below the average depth of 'C' metres per 25mm of variation in excess of 150mm. Rate per metre 'D' (not to be extended).					
	'A' dia / 'B' Trench and bedding type or design group / 'C' ave. depth / 'D' adjust. rate					
21	150 / 6 / 2.625	m	54			
22	225 / 7 / 2.950	m	18			
23	300 / 7 / 2.875	m	78			
24	450 / 8 / 3.275	m	157			

NOTE: Adjustment rate 'D' shall apply to both increases and decreases of average depth in excess of 150mm, and will result in either a positive or negative adjustment of the rate.

2 Chambers

Item	Description	Unit	Quantity	Rate	Lm	c
	Chamber specified design group 'A' sub-type 'B' with 'C' 'D' and frame depth to invert exceeding 'E' metres but not exceeding 'F' metres.					
	'A' design group / 'B' sub-type / 'C' cover grade / 'D' type / 'E' depth min. / 'F' range max.					

76	2	-	grade A	cover	1	2	no	10
77	3	a	grade A	cover	1	2	no	60
78	3	b	grade A	cover	1	2	no	70
79	3	c	grade A	cover	2	3	no	55

Series 600: Earthworks

1 General

Where the Contractor has obligations in respect of classification of earthworks materials then these obligations include sampling and testing in accordance with the directions given in the Contract. The Contractor retains overall responsibility to provide acceptable earthworks materials as defined in the Contract both when classification and determination of acceptability is done by the Contractor and when it is done by the Overseeing Organisation.

The attention of compilers is drawn to the criteria for classification of earthworks materials which are set down in Clause 601.1 and Table 6/1 of the Specification as modified and extended to suit the requirements of any particular Contract by Appendix 6/1. Classification is based on the simple principle that all materials which meet the requirements for acceptability for use as fill forming any part of the Permanent Works, whatever their usage, are termed acceptable materials. Materials which fail to meet the criteria for acceptability for any of the classes of fill required for the Permanent Works are termed unacceptable materials. Separation between acceptable and unacceptable material in the measurement of excavation, disposal of material, deposition of fill and compaction of fill must conform strictly with the acceptability parameters established in the Specification.

In particular, all materials excavated from within the Site, which at the point of excavation, comply with the acceptability requirements for any of the various classes of fill permitted by the Contract, notwithstanding that materials in any particular class may be surplus to the requirements of the Contract for that class, or outside the limits for other classes, shall be classified and measured as excavation of acceptable material. For the avoidance of doubt the Specification and the Method of Measurement provide for the inclusion amongst excavated acceptable materials of the lower categories of material not suitable for use in structural embankments but acceptable for use as fills in landscaping areas (Class 4 fills) and environmental earthwork bunds. These lower categories of material must therefore be included in the measurement of excavation, disposal of material, deposition of fill and compaction of fill as acceptable material.

Those materials which, on excavation, fall outside the specified limits for acceptability or require further processing to render them acceptable for use in the Works, shall be classified and measured as excavation of unacceptable materials.

It is emphasised that the Specification and the Method of Measurement only provide for a change in classification and measurement from excavation in unacceptable material to deposition of acceptable material where the Overseeing Organisation specifies that materials classified and measured as unacceptable on excavation shall be processed to render them acceptable for use as fill in the Permanent Works.

Furthermore, compilers are advised that neither the Specification nor the Method of Measurement provide for, nor in any circumstances should they be amended to provide for, the deposition, importation or compaction of unacceptable materials.

If the Contractor opts to render unacceptable material acceptable for use in the Works (as opposed to when the Overseeing Organisation has specified that this should take place) then measurement shall be as though the unacceptable material had been disposed of and acceptable material of the class rendered acceptable, imported. If the Contract requires that unacceptable material is rendered acceptable then that material is measured as treatment of unacceptable material Class U1 and then considered to be acceptable material arising from the Site.

2 Processing Materials

When the Overseeing Organisation decides to assess and designate material within the excavation which can be processed into acceptable material for general fill or selected fill, he should state the Class or Classes of acceptable material with which the processed material must comply.

The class of the processed material should be specified and the location of its excavation should be shown on the Drawings and referenced.

The sequence of measurement items is as follows:

(i) Excavation of unacceptable material Class U1 (in cutting etc).

(ii) Extra over excavation for excavation in Hard Material in cutting and other excavations.

(iii) Processing of unacceptable material Class U1 to acceptable material stated class or classes.

(iv) Deposition of acceptable material (in embankments etc).

(v) Compaction of acceptable material (in embankments etc).

The earthworks schedules may require additional items under the fill sections depending on Specification and deposition requirements.

3 Compaction and Deposition of Fill

The volume of material measured in Compaction of Fill should include the quantities measured in Imported Fill and Deposition of Fill.

The quantity of material measured in Deposition of Fill should relate only to the acceptable material arising from the Site including material so arising as unacceptable but required to be processed to become acceptable and not that measured in Imported Fill.

4 Geological Terms

Excavated material which comes within the definition of acceptable material should be billed as stated in the MMRW/LSID and not described by a geological term or common name e.g. chalk.

5 Alternative Types of Pavement

Where the Contract provides for the Contractor to select the Type of Pavement a separate Earthworks Bill of Quantities is required to correspond with each alternative Type of Pavement. The measurement for each of the individual Bills of Quantities is to be based on the thinnest construction permitted for each Type of Pavement. The tenderer is required to price and extend only the Earthworks Bill which applies to his selected Type of Pavement.

6 Capping

The material required and detailed in the Contract for use as capping may be obtained from various specified classes of material. This material should not be billed as “capping” material but should be as described in the MMRW and LSID under the appropriate feature classification for acceptable material.

7 Hard Material

This note gives general guidance on the way Hard Material should be dealt with when included in contract documentation.
The definition of Hard Material in the MMRW has evolved over a period of time and it should not be changed. The inclusion of the definition in contract documentation effectively excludes all other forms of definition. The aim is to achieve consistency of approach throughout the country giving benefit to the Overseeing Organisation and Contractors. There are two parts to the definition and in general they should be compatible.

The excavation of Hard Material has been recognised in the MMRW as warranting measurement as extra over normal excavation because of the relative cost of the removal of such material.

Hard Material is defined for measurement purposes only, in Chapter I Definitions, paragraph 1(h) as the following:

(i) material so designated in the Preambles to Bill of Quantities;

and/or

(ii) material which requires the use of blasting, breakers or splitters for its removal but excluding individual masses less than 0.20 cubic metres.

Sub-paragraph (ii) of the definition outlines the means of determining the volume of Hard Material when circumstances preclude the use of sub-paragraph (i). These circumstances should be rare. At the time of tender the Contractor should generally be made aware of what material is to be expected and he is deemed to have supplemented this by inspection where the Conditions of Contract so require. At the time of tender the Overseeing Organisation should designate which strata or deposits are to be measured as being Hard Material; bound materials in existing pavements and the like will always be Hard Material. In bulk earthworks, materials which in the Overseeing Organisation's judgement may reasonably be removed by using conventional rippers, taking into account factors such as the location and extent of the excavation, the size of the project and other limitations, should not be designated as Hard Material.

If the material found during the course of construction is that which was shown at the time of tender, or could be ascertained by the Contractor's pre-tender inspection, then admeasurement should follow the same designations irrespective of the actual hardness of the material. If the material found in the course of construction is not as described in the tender documents or apparent by inspection, the Contractor may raise a claim if permitted under the Conditions of Contract. It will then be for the Contractor to demonstrate that the
material could not reasonably have been foreseen and that extra costs had arisen, according to the terms of the Contract.

Difficulties can arise when the extent of designated strata is not clear. Soils are widely variable and the interface between strata can be indistinct: fragmented Hard Materials might gradually merge with other soils for example. The points to which the measurements of Hard Material strata are taken may then be ascertained by the application of sub-paragraph (ii) above. At the time of tender the Overseeing Organisation has to make a judgement regarding the extent of designated strata. In the course of construction a similar judgement will be required based upon observations in the field. Hard Material is only measured separately in Series 300: Fencing, Series 500: Drainage and Series 600: Earthworks. It is not likely that the application of sub-paragraph (ii) above will cause problems of measurement under Series 500. Drainage excavation usually will be done with backhoes appropriate to the size of the trench and it is unlikely that the Contractor would use other plant unless it was essential. The extent of the designated strata therefore should be apparent from performance and only a limited amount of judgement would be required. In bulk earthworks the position might not be so clear. For example, the Contractor might be excavating by means of scrapers and in areas where designated Hard Material strata are shown the scrapers might be augmented by other plant; the extent to which such plant is actually used would not show the limit of the Hard Material

strata and the Overseeing Organisation would have to give a decision on the extent of the designated strata.

Paragraph 13(c) of the Preambles to the Bill of Quantities sets out three methods of designating Hard Material for measurement purposes:

(a) designated strata

(b) designated deposits with limits shown on the Drawings

(c) existing pavements, footways, paved areas and foundations.

The selection of (a) or (b) above is achieved by applying professional judgement to borehole data and other sources of information to determine those identifiable strata and deposits which are likely to create significant costs relative to the excavation of other materials in the Works. It is intended that the results of this judgement should be included in the Contract.

The compiler should ensure that only one method of designation is used for any particular material. Once a strata or deposit has been designated as Hard Material it is not subject to reclassification. Conversely, the fact that a material similar to that designated as Hard Material in a deposit within defined limits shown on the Drawings, may be found elsewhere does not indicate that it will be measured as Hard Material in the other location.

Designation of material as Hard Material is for measurement purposes and is not intended to indicate that the material has any particular level of strength, bearing capacity or other characteristic.

Where Hard Material is designated by reference to named strata alone the total quantity excavated from within those strata is subject to admeasurement. Where deposits are designated by limits shown on the Drawings that volume is measured and paid for as Hard Material. For both methods of designation the material actually excavated may not fall within the definition of Hard Material as set out in sub-paragraph 1(h)(ii) of Chapter I. Hard Material designated under Preamble 13(c) i.e. existing pavements, footways, paved areas and foundations is subject to admeasurement but excluding any unbound materials within the pavement, footway, paved area, or foundation.

Notwithstanding the means of designating Hard Material, care must be taken to ensure that the quantity inserted in the Bill of Quantities is consistent with the information made available to the Contractor.

8 Crib Walling, Reinforced Earth Structures and Anchored Earth Structures

When designed by the Contractor, these structures are to be measured under Series 2500. The references throughout Series 600 to these structures are included only to allow the Contractor to produce his priced schedules of quantities required by Preamble 16 to the Bill of Quantities.

9 Typical Earthworks Schedules

The schedules shown overleaf illustrate information to be provided by the Overseeing Organisation and incorporated in the Contract. The sub-division of the schedules should be based on substantial changes in the type of construction or at major physical obstructions. For example a sub-division may be appropriate in the roadworks schedule where a cut/fill interface is reached or where an area of embankment is to be surcharged.

10 Ground Water Lowering

This item is for use when the Overseeing Organisation has either designed the method of de-watering or specified the reduced water level. It is not intended for the normal Site drainage as specified under General Requirements (Clause 602 of SRW).

11 Trial Pits

The item for excavation of trial pits should be used for specific trial pits specified in the Contract or ordered by the Overseeing Organisation during the currency of the Works. It is not intended for the various testing and sampling required by the Contract and scheduled in Appendix 1/5 or 1/6. Trial pits excavated for the sole purpose of classification of earthworks materials are not to be measured as these are covered by Preamble 2(vii) to the Bill of Quantities; however, the extent of sampling should be clearly defined in the tender documents.

12 Perforation of Redundant Slabs, Basements and the Like

The location and extent of perforation required should be detailed in Appendix 2/1.

13 Geotextiles

Laps which are described in the Specification are included in item coverage for geotextiles and not measured separately. The measurement of geotextile shall be the developed area of the geotextile and this will include turn ups at edges, returns for anchorages and laps shown on the drawings.

14 Stated Class of Imported Material

Bill compilers should not utilise Group 1 Feature 2, stated class of imported material, when excavated acceptable materials Classes 1 to 4 arising from site are inadequate or not present to satisfy the specific requirements of placement of acceptable material in particular locations. Any shortfall of acceptable materials Class 1 to 4 should be measured within Group 1 Feature 1.

It is the responsibility of the compiler to make the appropriate engineering judgement in balancing those classes or sub-classes of acceptable materials that are available to the Contractor from excavations measured in Series 600 to the quantity of acceptable materials required for placement in the Works.

15 Ground Improvement - Vibrated Stone Columns

Vibrated stone columns require separate itemisation for different diameters. Due to the nature of the process the final diameter of the stone column will differ from the diameter of the original hole formed. Classification should relate to the minimum diameter required, as specified in the Contract. Should the final diameter be larger than the minimum specified this is the responsibility of the Contractor and he should make allowance to his rates and prices in accordance with item coverage paragraph 113 of Series 600.

16 Imported Topsoil and Topsoiling

When there is a shortfall of site won topsoil and the need to measure items for imported topsoil is identified then corresponding items for topsoiling should be measured in accordance with paragraphs 77 to 81. This measurement should include for the placing of topsoil Class 5A excavated from within the site and the placing of imported topsoil Class 5B.

17 Surcharge Material

Excavation of Acceptable Material which is to be used as Surcharge, should be (a) included in the Earthworks Schedule and (b) identified separately. Note 9 above (on page 5) and page 9 of this Series provide a proforma folded A3-size sheet with a "Typical Roadworks Earthworks Schedule". Below the heading of that schedule in the third row, is a sample entry "(Surcharge Ch 910-1155)". The earthworks schedules should include the volumes of surcharge material placed and removed. Sufficient information should be given by the Overseeing Organisation in the tender documents (whether specified, drawn or quantified) to enable the surcharge requirement and the likely loss of surcharge material to be established both for inclusion in the earthworks balance and to enable the tenderer to separately identify these volumes.

The inclusion at paragraph 18 of

> "(p) disposal of surcharge material (as this Series paragraph 39);"

as item coverage is not intended to specifically cover the disposal of the measured volume of residual surcharge material as calculated in accordance with paragraph 15 (c). The measurement and earthworks balance is based on the re-use of residual surcharge material. Specification sub-Clauses 608.6 and 608.7 and Appendix 6/3 are particularly relevant. The Contractor may, however, wish for his own operational reasons to import material for the finished embankment and dispose of the residual surcharge, e.g. subject to (a) Appendix 6/3, and/or (b) Appendix 1/13. The replacement by the Contractor of acceptable material arising on site is an obligation imposed on the Contractor

under sub-Clause 602.3 of the Specification. Item coverage for excavation has therefore been extended to include the cost of the Contractor's optional disposal of surcharge. This principle would apply also to any constraints imposed by the Employer under the Contract which, in all practicality, prevented the re-use of surcharge material. MMRW measurement paragraphs have been drawn up to apply universally and in order to provide for use of all available acceptable arisings irrespective of optional or imposed constraints which obviate such use. Due allowance should be made by tenderers in their rates against the measured quantities to reflect their actual disposal/import requirements. Item coverage paragraph 18(p) provides for disposal of surcharge only where the Contractor opts for disposal to suit his method of working or where constraints in the contract inhibit re-use of surcharge material.

Concerning Disposal of Material, MCRW 4.1 (MMRW) Series 600, paragraph 35(a) states that

> "The measurement of disposal of acceptable material shall be, for acceptable material excluding Class 5A – the volume excavated from within the Site measured in this Series ……"

It is intended that this measurement should include the volume of Surcharge for removal measured under paragraph 15(c) and itemised under paragraph 16(Group III, Feature 8). The earthworks balance and the measurement paragraphs are based on the re-use of the residual material within the completed embankments (ie the final compacted volume after removal of surcharge).

It is not uncommon for tenderers to have to include in their rates for essential items of work which are not actually measured. For example, excavation and backfilling of working space, over-filling an embankment for protection then trimming back to formation.

To summarise, the measurement paragraphs include:

(a) the temporary surcharge volume in the total measured deposition and compaction volumes.

By later deducting

(b) the re-excavated surcharge volume at the end of the specified consolidation period,

these paragraphs operate to calculate

(c) the final disposal or import requirement based on the material required for the finished embankment (ie after removal of surcharge)

and to cover only

(d) the loss of surcharge material due to consolidation of the embankment and its foundation.

To illustrate the above, three worked examples using a theoretical Bill of Quantities are included below:

Example No 1

Shortfall of Excavated Material. Compaction of Fill	= 1,000,000m^3. Includes surcharge of 250,000m^3.	
Excavation from cuttings etc	= 600,000m^3	
Excavation in removal of surcharge - Paragraph 15 (c)	= 220,000m^3*	820,000m^3
Imported Fill	= 1,000,000m^3 – 820,000m^3	= 180,000m^3
Deposition of Fill	1,000,000m^3 – 180,000m^3	= 820,000m^3
Disposal of Material	820,000m^3 – (1,000,000m^3 – 180,000m^3)	= 0m^3

* Reflects settlement in embankment of 30,000m3.

Example No 2

Surplus of Excavated Material. Compaction of Fill	= 1,000,000m^3. Includes surcharge of 250,000m^3.	
Excavation from cuttings etc.	= 800,000m^3	
Excavation in removal of surcharge - Paragraph 15 (c)	= 220,000m^3 *	1,020,000m^3
Imported Fill	= 1,000,000m^3 - 1,020,000m^3 Therefore Import Required = 0m^3	= -20,000m^3
Deposition of Fill	= 1,000,000m^3 - 0m^3 = 1,000,000m^3	
Disposal of Material	= 1,020,000m^3 - (1,000,000m^3 - 0m^3)	= 20,000m^3

*Reflects settlement in embankment of 30,000m^3

Example No 3

No site won material. Embankments constructed using Imported Fill.

Compaction of Fill	= 1,000,000m^3 Includes surcharge of 250,000m^3	
Excavation from cuttings etc.	= 0m^3	
Excavation in removal of surcharge - Paragraph 15(c)	= 220,000 m^3*	220,000m^3
Imported Fill	= 1,000,000m^3 - 220,000m^3	= 780,000m^3

Deposition of Fill**	= 1,000,000m³ - 780,000m³	= 220,000m³
Disposal of Material	= 220,000m³ - (1,000,000m³ - 780,000m³)	= 0m³

*Reflects settlement in embankment of 30,000m³.

** Reflects temporary deposition of imported material used in surcharge.

TYPICAL ROADWORKS EARTHWORKS SCHEDULE

EXCAVATION														FILL															
ACCEPTABLE						UNACCEPTABLE								GENERAL				LAND-SCAPING	SELECTED GRANULAR								SELECTED COHESIVE				
5A	3					U1		U2										4	6A	6B	6C	6D	6E	6F	6G	6R	7E	7F	7G	7I	
	Above Earthworks Outline	Below Earthworks Outline	Other than Class 3 and Class 5A: Above Earthworks Outline	Other than Class 3 and Class 5A: Below Earthworks Outline	Total Acceptable other than Class 5A (to include processed U1 material)	Above Earthworks Outline	Below Earthworks Outline	Above Earthworks Outline	Below Earthworks Outline	Total Excavation other than Class 5A	EO Hard Material	Processing of Class U1	LOCATION	Embankments, etc	Strengthened Embankments	On Sub-base, Capping, etc	Environmental Bunds	Fill to Landscape Areas	Starter Layer (Below Water)	Starter Layer (Coarse)	Starter Layer	Starter Layer under PFA	Capping for Cement Stabilisation	Capping	Fill to Gabions	Capping for Lime and Cement Stabilisation	Capping for Lime Stabilisation	Capping for Cement Stabilisation	PFA Capping for Cement Stabilisation	Capping for Lime and Cement Stabilisation	Total Fill Material
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
													ROADWORKS Main Carriageway Ch 0-700																	
													Main Carriageway Ch 700-1600																	
													(Surcharge) Ch 910-1155																	
													Interchanges Reference 1																	
													Side Roads Reference 4																	
													WATERCOURSES New: Reference X																	
													Enlarged: Reference Y																	
													Intercepting Ditches: Ch 250-500																	
													Clearing: Reference Z																	
													To include other such as: Motorway Compounds, Accommodation Works, Service Areas, Farm access roads.																	
													Sub-totals																	
													ROADWORKS TOTAL																	

Notes: (i) Columns 7 and 8 should include the volumes of materials which are to be processed into acceptable material
(ii) Column 11 should include the volume of material which will be processed from U1 material

TYPICAL STRUCTURES EARTHWORKS SCHEDULE

EXCAVATION										FILL																					
ACCEPTABLE			UNACCEPTABLE							GENERAL							SELECTED GRANULAR								SELECTED COHESIVE							
										Other than 1C or 6B			Specified 1C		Specified 6B		6H		6I		6J		6N/P		7A		7B			7C	7D	
3	Other than Class 3 and Class 5A	Total other than Class 5A	U1	U2	Total	Total other than Class 5A (to include processed U1 material)	EO Hard Material	Processing of Class U1	STRUCTURE	Above Structural Foundations	Fill to Structures	On Bridges	Starter Layer (Below Water)	Starter Layer (Coarse)	Above Structural Foundations	Fill to Structures	Drainage Layer to Reinforced Earth*	Drainage Layer to Anchored Earth*	Reinforced Earth*	Anchored Earth*	Reinforced Earth*	Anchored Earth*	Above Structural Foundations	Fill to Structures	Above Structural Foundations	Fill to Structures	Reinforced Earth*	Reinforced Earth*	Reinforced Earth*	Total Fill Material
1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
									High Lane Bridge																						
									Low Road Underpass																						
									Stated Structure																						
									To include others such as: Service Area Bridges, Maintenance Compound Bridges, Accommodation Works Bridges, Culverts, Retaining structures.																						
									Sub-totals																						
									STRUCTURES TOTALS																						

* Only to be used when the structure is not within Designated Outlines

Series 700: Pavements

1 Joints

The item coverage in Series 700: Pavements encompasses all cutting back to existing surfaces and the forming of all temporary and permanent joints. The Contractor is to allow in his prices for any specified joints, for access and the costs of any temporary joints.

2 Alternative Types of Pavement

The example overleaf illustrates the compilation of Bills for alternative Types of Pavement. The measurement for each of the individual Bills of Quantities is to be based on the thinnest construction permitted for each Type of Pavement. However, the item description should be for permitted groups rather than specific materials.

3 Tack Coats

A tack coat should be measured as a separate item when the Contract requires a separate or additional tack coat to be applied to an existing surface prior to the construction of the following course of treatment. Attention is drawn to paragraphs 20 to 24 of Series 700 in which the
tack coats are measured.

4 Repairs to Existing Carriageways

The locations and areas of repairs should be shown on the Drawings.

5 Regulating Course

It is recommended that where a significant quantity of regulating material is anticipated to be required, as in motorway widening schemes, the regulating course be measured in cubic metres. Measurements by tonnage will only be used exceptionally where there will be significant difficulties in measuring the volume.

Where the contract provides for the measurement of bituminous regulating course by tonnage a contract specific table should be prepared by the compiler and included within the Bill of Quantities immediately following the items of Regulating Course included in Series 700: Pavements. The measurement of bituminous regulating course by tonne shall be calculated from the tonnage of material certified by the Overseeing Organisation.

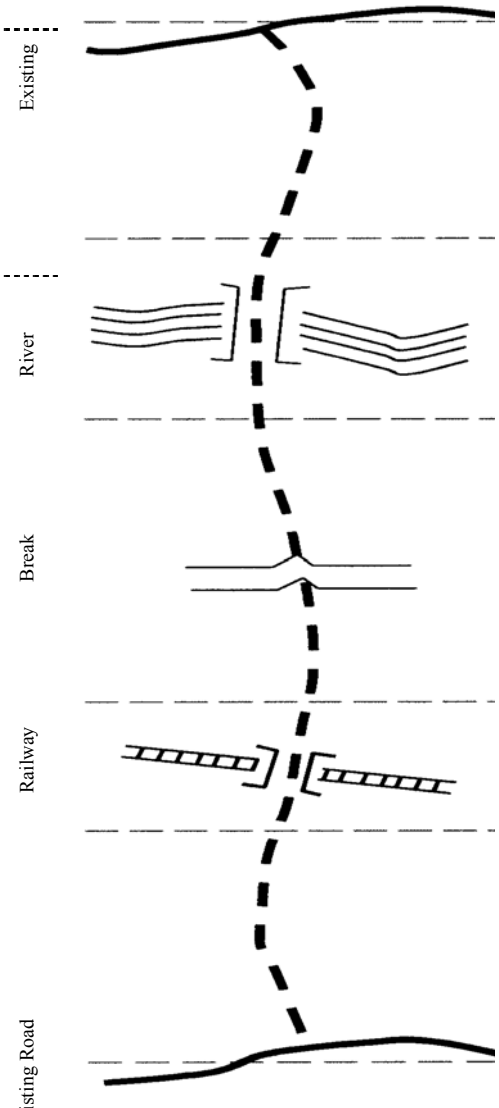
6 Breaking Up and Perforation of Redundant Pavements

This is measured in Series 600 paragraphs 173 to 176 inclusive.

7 Lower Base Course and Upper Base Course

The terms lower base course and upper base course shall be applied only when the base course is specified to be constructed with two different materials.

Illustrative example of how Bills of Quantities relative to differing Types of Pavement construction for a main carriageway are compiled



(i) Section of new road

1	2	3	4	5

(ii) Permitted Types of Pavement

(a)	Flexible	(a)	Flexible	(a)	Flexible	(a)	Flexible	(a)	Flexible
(b)	Flexible Composite			(b)	Flexible Composite			(b)	Flexible Composite
				(c)	Rigid				
				(d)	Rigid Composite				

(iii) Quantities relative to each Type of Pavement Construction included in separate Bills of Quantities

Bill								Compilation
A. Flexible	(a)	Flexible	(a)	Flexible	(a)	Flexible	(a)	1+2+3+4+5
B. Flexible Composite	(b)	Flexible Composite	(a)	Flexible	(b)	Flexible Composite	(a)	1+3+5 Flexible Composite 2+4 Flexible
C. Rigid	(a)	Flexible	(a)	Flexible	(c)	Rigid	(a)	3 Rigid 1+2+4+5 Flexible
D. Rigid Composite	(a)	Flexible	(a)	Flexible	(d)	Rigid Composite	(a)	3 Rigid Composite 1+2+4+5 Flexible

Series 800 is not taken up

Series 900 is not taken up

Series 1000 is not taken up

Series 1100: Kerbs, Footways and Paved Areas

1 Steps

The measurement of steps in this Series is intended for isolated steps and landings (eg steps to communication cabinets in cutting slopes). The Drawings should define within the Contract the extent of the steps and landings at each individual location and each complete set of steps and landings is measured individually at each location. Steps and landings incorporated in a structure should be measured in accordance with the appropriate Series of the MMRW.

2 Bituminous and Cement Bound Regulating Course

Where the contract requires bituminous and cement bound regulating course in footways and paved areas a contract specific table should be prepared by the compiler and included within the Bill of Quantities immediately following the items of regulating course. This table should be in a similar format to that required for Series 700 – Pavements.

Series 1200: Traffic Signs and Road Markings

1 Road Studs

Generally road studs will be chosen by the appropriate Overseeing Organisation to meet the specified requirements. The Contractor will submit details of the reflecting road studs he proposes to use in the works to the Overseeing Organisation for approval.

2 Removal of Road Markings

The removal of road markings in connection with In-situ Recycling Processes is not required to be measured as this is already included with Series 700 Item Coverage paragraph 32(f).

3 Traffic Signal Installations - Network Cabling

For the purposes of measurement of Traffic Signal Installations the network is defined as all cabling emanating from either an outstation transmission unit (O.T.U.), an outstation monitoring unit (O.M.U.) or an outstation monitoring and control unit (O.M.C.U.) and terminating at a location outside the limits of the site.

Series 1300 is not taken up

Series 1400 is not taken up

Series 1500 is not taken up

Series 1600 is not taken up

Series 1700: Structural Concrete

1 Curved Formwork

The items for curved formwork in paragraph 13, Group II, Features 5, 6 and 7 are to be used for any formwork that is required to produce a permanent curved finish to the concrete. Formwork curved or hogged in construction before the placement of concrete and designed to achieve a permanent flat finish shall not be measured as curved. Formwork required to produce curved falls and cambers is measured as curved formwork.

2 Finishes to Concrete

Unformed finishes (U1 to U5 etc.) should not be measured. They are covered by the item coverage in paragraph 4 of Series 1700.

3 Underbridges and Footbridges

When underbridges up to 8 m span and footbridges are designed by the Contractor they are to be measured under Series 2500.

Series 1800 is not taken up

Series 1900 is not taken up

Series 2000: Waterproofing for Concrete Structures

1 Additional Protective Layers

The Specification requires an additional protective layer, in the form of a red tinted bituminous protection, to be laid on those areas of any waterproofing system that are to be overlaid with hot rolled surfacing materials. The Drawings should show these areas and also other areas that are to be provided with other types of additional protective layers, such as a protective concrete screed. These protective layers are included in the item coverage for waterproofing and are not measured separately.

Series 2100 is not taken up

Series 2200 is not taken up

Series 2300 is not taken up

Series 2400: Brickwork, Blockwork and Stonework

1 General

The item coverage applicable to removing from store and relaying brickwork, blockwork and stonework includes for replacing items damaged during removal, cleaning, transportation and modifications. The requirements for this work and the expected recovery of second hand materials should be detailed in the Contract. Modifications of which the Contractor was not informed at the time of tender are not covered by this item coverage.

Series 2500 is not taken up

Series 2600 is not taken up

Series 2700 is not taken up

Series 2800 is not taken up

Series 2900 is not taken up

Series 3000 is not taken up