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Transport Infrastructure Ireland

## TII Publications



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# Requirements for Measuring and Pricing of Earthworks

**CC-RMP-00600**  
January 2019

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## TII Publications



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<b>Activity:</b>	Construction & Commissioning (CC)
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**Updates to TII Publications resulting in changes to  
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**Amendment Details:**

Referencing error amended.

Section 68 – First paragraph of paragraph 68 amended to reference item “67 (ii)”.

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# 1. Earthworks

## Definitions

- 1** The Earthworks Outline, unless expressly stated otherwise, is defined as the finished earthworks levels and dimensions (prior to topsoiling) required by the Contract for the construction, where specified, of:
  - (a) carriageway, hard shoulder, hard strip, footway, paved area, central reserve, verge, side slope;
  - (b) sub-base, fill on capping, sub-base material and roadbase;
  - (c) contiguous filter material, lightweight aggregate infill;
  - (d) surface water channels;
  - (e) landscape areas, screening mounds, environmental bunds.

In all cases of filter drains the Earthworks Outline shall be the top of the filter material.
- 2** Where capping is required by the Contract in cutting or on embankment, the Earthworks Outline shall be as defined in paragraph 1 of this document i.e. as the top of capping
- 3** Where an embankment is required by the Contract to be surcharged, the Earthworks Outline shall be as defined in paragraph 1 of this document and exclude the surcharge.
- 4** Where permanent storage or stockpiling of topsoil is required by the Contract, the Earthworks Outline shall be as defined in paragraph 1 of this document and exclude stored topsoil.
- 5** Where the bottom of a structural foundation for an earth retaining structure (other than for reinforced earth and an anchored earth structure) is below Existing Ground Level, the Earthworks Outline shall be the permanently exposed face of the structure below Existing Ground Level.
- 6** Where the bottom of the facing foundation for a reinforced earth structure or an anchored earth structure is below Existing Ground Level, the Earthworks Outline shall be the inside face of the facing above Existing Ground Level to the underside of the capping unit, or where no capping unit is required, to the finished earthworks level prior to topsoiling.
- 7** Where the ground has been subjected to treatment under the Contract in respect of ground improvement, mine workings, swallow holes and the like, for the purpose of this document Existing Ground Level shall be the level obtained upon completion of any such treatment of the areas affected.
- 8** Sub-soil Level is defined as the level of the ground after the removal of topsoil required by the Contract.
- 9** Surcharge is defined as material placed on embankments for the purpose of loading the embankment for the periods stated in the Contract.

## Measurement General

- 10** For the purposes of this document it shall be assumed that one cubic metre of material excavated forms one cubic metre of compacted fill.

No allowance shall be made in the measurement for bulking and shrinkage of any material.

**11** Earthworks within Designated Outlines shall not be measured in this document.

**12** For the purpose of this document no account shall be taken of excavated material arising from the Works measured in accordance with CC-RMP-00100 to CC-RMP-00500 and CC-RMP-00700 to CC-RMP-02900 hereof.

**13** Where deposition and compaction of an embankment has been carried out in accordance with the Contract and settlement occurs:

(a) subsequent to the Earthworks Outline having been reached, or in the case of a surcharged embankment subsequent to the removal of the surcharge; or

(b) from settlement of or penetration into the ground beneath the embankment;

then the additional fill, deposition and compaction required shall be measured immediately prior to the preparation of formation, provided that the first 75 mm of settlement or penetration shall not be measured.

In the case of landscape areas, screening mounds, environmental bunds and other areas of fill where settlement or penetration occurs, the additional fill, deposition and compaction required shall not be measured.

## Excavation

### Units

**14** The unit of excavation shall be:

(i) excavation ..... cubic metre.

### Measurement

**15** The measurement of excavation shall be, for:

(a) Topsoil Class 5A – the volume of the void formed by the excavation of material designated topsoil Class 5A;

(b) Cutting and other excavation:

(i) cutting and bulk excavation – the volume of the void formed by the excavation of material from Existing Ground Level down to the Earthworks Outline, together with the volume of the void formed by the excavation of material below that Outline;

or

(ii) under embankments and other areas of fill – the volume of the void formed by the excavation of material below Existing Ground Level;

less in each case the volume of topsoil Class 5A in the void included in the measurement under paragraph 15(a). The volume of excavation of soft spots measured under paragraph 62 of this document shall not be included.

(c) Removal of surcharge – the volume of material remaining as surcharge to be removed down to the datum stated in the Contract, or if none is stated, to the Earthworks Outline;

- (d) Structural foundations – the volume of the void to accommodate the structural foundation calculated on the basis of the horizontal area of the bottom of the foundation with the depth being measured from the bottom of the foundation (including blinding concrete) to:
- (i) where the bottom of the foundation is below Existing Ground Level – the Existing Ground Level; provided that where the Earthworks Outline is below Existing Ground Level the depth shall be measured to the Earthworks Outline;
  - (ii) where the bottom of the foundation is at or above Existing Ground Level – the datum stated in the Contract, or where none is stated to the Earthworks Outline;

less in each case the volume of topsoil Class 5A in the void included in the measurement under paragraph 15(a). The volume of excavation of soft spots measured under paragraph 62 of this document shall not be included.

The classification of stage depths for the excavation of structural foundations shall be the maximum depth of excavation obtained in accordance with this sub-paragraph;

- (a) Foundations for corrugated steel buried structures and the like – the volume of the void to accommodate the structure, bedding and surround down to the outline stated in the Contract from:
- (i) where the bottom of the bedding is below Existing Ground Level – Existing Ground Level;
  - (ii) where the bottom of the bedding is at or above Existing Ground Level – the datum stated in the Contract or where none is stated – Earthworks Outline;

Less in each case the volume of topsoil Class 5A in the void included in the measurement under paragraph 15(a). The volume of excavation of soft spots measured under paragraph 62 of this document shall not be included.

The classification of stage depths for the excavation of the foundation shall be the maximum depth of excavation obtained in accordance with this sub-paragraph.

- (b) New and enlarged watercourses, intercepting ditches – the volume of the void formed from Existing Ground Level down to the outline stated in the Contract less the volume of topsoil Class 5A in the void included in the measurement under paragraph 15(a) of this document;
- (c) Clearing abandoned watercourses – the volume of the void formed from Existing Ground Level down to the outline stated in the Contract;
- (d) Gabion walling, mattresses and crib walling – as for structural foundations sub-paragraph (d) of this paragraph;
- (e) Caps to mine working, well, swallow hole and the like – the volume of the voids formed to accommodate the caps;
- (f) Swamps, marshes and bogs – the volume of the void formed from existing Ground Level down to the outline stated in the Contract.

**Itemisation**

**16**

Separate items shall be provided for excavation in accordance with Section 3 of CC-RMP-00010 - Introduction to the Requirements for Measuring and Pricing paragraphs 3 and 4, and the following:



<b>Group Feature</b>		
I	1	Excavation
II	1	Acceptable material Class 5A
	2	Not used
	3	Acceptable material excluding Class 5A
	4	Unacceptable material Class U1
	5	Unacceptable material Class U2
III	1	Cutting and other excavation
	2	Structural foundations
	3	Foundations for corrugated steel buried structures and the like
	4	New watercourses
	5	Enlarged watercourses
	6	Intercepting ditches
	7	Clearing abandoned watercourses
	8	Removal of surcharge
	9	Gabion walling and mattresses
	10	Crib walling
	11	Caps to mine working, well, swallow hole and the like
	12	Swamps, marshes and bogs
IV	1	0 metres to 3 metres in depth
	2	0 metres to 6 metres in depth and so on in steps of 3 metres

**Note 1:** Acceptable material Class 5A shall not be separately identified by any Group III or IV feature.

**Note 2:** Group IV features shall be applied only to Features 2, 3, 9, 10 and 11 of Group III.

**Excavation of Acceptable Material Class 5A**

**17** The items for excavation of acceptable material Class 5A shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) loading into transport;
- (b) multiple handling of material;
- (c) selection and separation of materials;
- (d) keeping earthworks free of water;
- (e) haulage and deposition in temporary stockpiles including the provision of sites for stockpiles;
- (f) taking precautions to avoid damage to property, structures, drains, sewers, services, instrumentation and the like;
- (g) grading beds and trimming side slopes of watercourses and the like;
- (h) replacing acceptable material rendered unacceptable;
- (i) facilitating Archaeologist.

**Excavation of  
Acceptable Material  
excluding Class 5A**

**18** The items for excavation of acceptable material excluding Class 5A shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) loosening or breaking up material before or in the process of excavation;
- (b) upholding the sides;
- (c) working around and between piles;
- (d) overbreak and making good;
- (e) keeping earthworks free of water;
- (f) selection and separation of materials;
- (g) forming and trimming side slopes, benchings and berms;
- (h) trimming the bottom and sides of foundations;
- (i) grading beds and trimming sides of watercourses and the like, and working in and dealing with the flow of water;
- (j) protection of subgrade;
- (k) additional excavation the Contractor may require for working space, timbering, formwork or other temporary works and its subsequent backfilling with approved materials and compaction;
- (l) taking precautions to avoid damage to property, structures, drains, sewers, services, instrumentation and the like;
- (m) treatment of faces of cuttings which are not to receive topsoil;
- (n) loading into transport;
- (o) multiple handling of material;
- (p) disposal of surcharge material (as this document paragraph 39);
- (q) waiting for frozen material to thaw;
- (r) haulage, deposition and compaction in temporary stockpiles including provision of sites for stockpiles;
- (s) replacing acceptable material rendered unacceptable;
- (t) breaking down and processing material necessary to comply with the requirements of fill;
- (u) complying with special requirements for materials requiring special treatments;
- (v) excavation difficulties due to the presence of traffic on public roads;
- (w) facilitating installation of permanent drainage before excavation reaches 300 mm above formation;
- (x) selection and separation by load of made ground.

**Excavation of  
Unacceptable Material  
Classes U1 and U2**

**19** The items for excavation of unacceptable material Classes U1 and U2 shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation (as this document paragraph 18);
- (b) special measures for dealing with Class U2 material;



## Processing of Unacceptable Material Class U1

**Definition**                      **24**     The term 'processing' shall refer to treatment whereby material arising from the Site is rendered acceptable for a particular use in the Works by mechanical, chemical, hydraulic or other means.

**Units**                                **25**     The unit of measurement shall be:  
 (i)    processing of unacceptable material Class U1 ..... cubic metre.

**Measurement**                    **26**     The processing of unacceptable material Class U1 shall be measured only when the Contract specifically requires particular material to be obtained for use in the Works by processing. Other processing carried out by the Contractor shall not be measured. The measurement of processing of unacceptable material Class U1 shall be the volume of the void required to be filled with the processed material.

**Itemisation**                        **27**     Separate items shall be provided for processing of unacceptable material Class U1 in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

### Group Feature

- |     |   |   |
|-----|---|---|
| I   | 1 | Processing of unacceptable material Class U1  |
| II  | 1 | Different locations                           |
| III | 1 | Into different classes of acceptable material |

**Processing of Unacceptable Material Class U1**                    **28**     The items for processing of unacceptable material Class U1 shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) selection and separation of materials;
  - (b) taking precautions to avoid damage to property, structures, drains, sewers, services, instrumentation and the like;
  - (c) loading into transport;
  - (d) multiple handling of material;
  - (e) waiting for frozen material to thaw;
  - (f) replacing acceptable material rendered unacceptable;
  - (g) haulage, deposition and compaction in temporary stockpiles including provision of sites for stockpiles;
  - (h) crushing, screening, mixing, grading, drying, wetting and sieving;
  - (i) mechanical, chemical, hydraulic and other methods;
  - (j) producing the required classification of material from Site-won materials;
  - (k) obtaining permissions and approvals.

## Deposition of Fill

**Units**                                **29**     The unit of measurement shall be:  
 (i)    deposition of fill ..... cubic metre.

**Measurement**                    **30**     The measurement of deposition of fill shall be the volume of compacted fill, calculated in accordance with paragraphs 47, 48 and 49 of this document, less the volume of imported fill calculated in accordance with paragraphs 41 and 42 of this document.

**31** Deposition of Class 1C and 6B materials shall be separately measured only where Class 1C or 6B material is specifically stated by the Contract to be required to be placed in a particular location.

**32** Separate items shall be provided for deposition of fill in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

Group Feature

I	1	Deposition
II	1	Acceptable material
	2	Acceptable material Class 1C
	3	Not used
	4	Acceptable material Class 6B
III	1	Embankments and other areas of fill
	2	Strengthened embankments
	3	Reinforced earth structures
	4	Anchored earth structures
	5	Landscape areas and screening mounds
	6	Environmental bunds
	7	Fill to structures
	8	Fill above structural concrete foundations
	9	Fill on capping, sub-base material and roadbase
	10	Fill on bridges (under footways, verges and central reserves)
	11	Upper bedding to corrugated steel buried structures and the like
	12	Lower bedding to corrugated steel buried structures and the like
	13	Surround to corrugated steel buried structures and the like
	14	Fill above corrugated steel buried structures and the like

**Deposition of Fill**

**33** The items for deposition of fill shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item of Coverage**

- (a) protection of subgrade;
- (b) multiple handling of material;
- (c) keeping earthworks free of water;
- (d) complying with requirements and constraints on the sequence, timing and rate of deposition and filling, and equalisation of earth pressures;
- (e) complying with the special requirements for materials requiring special treatments;

- (f) complying with the particular requirements and constraints with regard to soil stabilisation, reinforced earth structures, strengthened embankments, anchored earth structures, corrugated steel buried structures and the like;
- (g) taking precautions to avoid damage to property, structures, sewers, drains, services, instrumentation and the like;
- (h) haulage;
- (i) waiting for frozen material to thaw;
- (j) replacing acceptable material rendered unacceptable;
- (k) selection of material of stated Classes and layering or depositing in locations stated in the Contract;
- (l) depositing fill to slope away from vertical drainage layers and measures to prevent surface water entering such layers;
- (m) treatment of soil as the Contractor may require to facilitate the use of particular plant;
- (n) trimming and shaping to levels and contours;
- (o) deposition of fill resulting from settlement and penetration of landscape areas, screening mounds, environmental bunds and other areas of fill, and from the first 75 mm of settlement and penetration of embankments.

## **Disposal of Material**

### **Units**

**34** The unit of measurement shall be:

- (i) disposal of material ..... cubic metre

### **Measurement**

**35** The measurement of disposal of acceptable material shall be for:

- (a) acceptable material excluding Class 5A – the volume excavated from within the Site measured in this document less the volume of compacted fill calculated in accordance with paragraphs 47, 48 and 49 of this document, after deduction from the latter of the volume of imported fill calculated in accordance with paragraphs 41 and 42 of this document;
- (b) acceptable material Class 5A – the volume excavated from within the Site measured in accordance with paragraph 15(a) of this document less the volume of topsoil to be permanently stored and the volume of topsoil calculated from the areas and thicknesses to be topsoiled in accordance with paragraph 78 of this document.

**36** The measurement of disposal of unacceptable material Class U1 shall be the volume of unacceptable material Class U1 excavated from within the Site and measured under this document less the volume of processed unacceptable material Class U1 calculated in accordance with paragraph 21 of this document.

**37** The measurement of disposal of unacceptable material Class U2 shall be the volume of unacceptable material Class U2 excavated from within the Site and measured under this document.

### **Itemisation**

**38** Separate items shall be provided for disposal of material in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

		<b>Group Feature</b>
	I	1 Disposal
	II	1 Acceptable material excluding Class 5A
		2 Acceptable material Class 5A
		3 Unacceptable material Class U1
		4 Unacceptable material Class U2
<b>Disposal of Material</b>	<b>39</b>	The items for disposal of material shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) haulage and deposition in tips off Site provided by the Contractor or other appropriate locations off Site identified by the Contractor;
		(b) multiple handling of material;
		(c) special measures for dealing with Class U2 material;
		(d) allowing for deposition in lieu of disposal of acceptable fill resulting from settlement and penetration of landscape areas, environmental bunds, screening mounds and other areas of fill, and from the first 75 mm of settlement and penetration of embankments;
		(e) special measures for dealing with materials from swamps, marshes and bogs.
<b>Imported Fill</b>		
<b>Units</b>	<b>40</b>	The unit of measurement shall be:
		(i) imported fill ..... cubic metre
<b>Measurement</b>	<b>41</b>	The measurement of imported acceptable fill shall be the volume of compacted fill, calculated in accordance with paragraphs 47, 48 and 49 of this document less the volumes of:
		(a) acceptable material (including that measured in accordance with this document paragraph 26), excluding topsoil Class 5A, excavated from within the Site and measured in this document;
		(b) other stated classes of imported acceptable fill excluding topsoil Class 5B
	<b>42</b>	The measurement of other stated classes of imported acceptable fill, other than topsoil Class 5B, shall be the volume of the void filled with the stated class of imported acceptable fill to the outline stated in the Contract.
	<b>43</b>	The measurement of imported topsoil Class 5B shall be the volume of topsoil calculated from the areas and thicknesses to be topsoiled less the volume of topsoil Class 5A excavated from within the Site and measured in accordance with paragraph 15(a) of this document.
<b>Itemisation</b>	<b>44</b>	Separate items shall be provided for imported acceptable fill in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
		<b>Group Feature</b>
	I	1 Imported topsoil Class 5B
		2 Imported acceptable material fill.

- |    |    |  |
|----|----|--|
| II | 1  | Embankments and other areas of fill                              |
|    | 2  | Strengthened embankments   |
|    | 3  | Reinforced earth structures                                      |
|    | 4  | Anchored earth structures  |
|    | 5  | Landscape areas and screening mounds                             |
|    | 6  | Environmental bunds  |
|    | 7  | Fill to structures   |
|    | 8  | Fill above structural concrete foundations                       |
|    | 9  | Fill on capping, sub-base material and roadbase                  |
|    | 10 | Fill on bridges (under footways, verges and central reserves)    |
|    | 11 | Upper bedding to corrugated steel buried structures and the like |
|    | 12 | Lower bedding to corrugated steel buried structures and the like |
|    | 13 | Surround to corrugated steel buried structures and the like      |
|    | 14 | Fill above corrugated steel buried structures and the like       |

**Note 1:** Group I Feature 1 Imported topsoil Class 5B shall not be separately identified by any Group II feature.

**Imported Fill**

**45**

The items for imported fill shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) protection of subgrade;
- (b) multiple handling of material;
- (c) keeping earthworks free of water;
- (d) complying with requirements and constraints on the sequence, timing and rate of deposition and filling, and equalisation of earth pressures;
- (e) complying with the special requirements for Class 3 material and other materials requiring special treatments;
- (f) complying with the particular requirements and constraints with regard to soil stabilisation, reinforced earth structures, strengthened embankments, anchored earth structures, corrugated steel buried structures and the like;
- (g) taking precautions to avoid damage to property, structures, sewers, drains, services, instrumentation and the like;
- (h) fill provided by the Contractor from sources outside the Site;
- (i) replacing acceptable material rendered unacceptable;
- (j) selection of material of stated Classes and layering or depositing in locations stated in the Contract;
- (k) depositing fill to slope away from vertical drainage layers and measures to prevent surface water entering such layers;
- (l) trimming and shaping to levels and contours;



(m) imported fill resulting from settlement and penetration of landscape areas, screening mounds, environmental bunds and other areas of fill, and from the first 75 mm of settlement and penetration of embankments:

(n) reports.

## Compaction of Fill

### Units

**46** The unit of measurement shall be:

(i) compaction of fill ..... cubic metre

### Measurement

**47** The measurement of compaction of fill in embankments and other areas of fill, in strengthened embankments, in reinforced earth structures, in anchored earth structures, in landscape areas, in screening mounds and in environmental bunds shall be the volume of the embankment or void filled from Existing Ground Level up to the Earthworks Outline plus, where required by the Contract, the volume of:

(a) the void formed by the removal of topsoil Class 5A beneath the fill in question, and included in the measurement under paragraph 15(a) of this document;

(b) the void formed by excavation for the fill in question –

(i) below the Earthworks Outline included in the measurement under paragraph 15(b)(i) of this document; and

(ii) below Existing Ground Level included in the measurement under paragraph 15(b) (ii) of this document;

(c) surcharge, being the void filled from the Earthworks Outline up to the profile stated in the Contract to which the surcharge is required to be constructed;

less in each case the volume of any compaction of fill to structures, and bedding and surround to corrugated steel buried structures and the like included in the volume so obtained and which is measured separately under paragraph 49 of this document.

**48** The measurement of compaction of fill above structural concrete foundations shall be the volume of the void measured in accordance with paragraph 15(d) of this document less the volume of the structural foundation and structure within that void.

**49** The measurement of compaction of:

(a) fill to structures;

(b) fill on capping, sub-base material and roadbase;

(c) fill on bridges (under footways, verges and central reserves);

(d) bedding to corrugated steel buried structures and the like;

(e) surround to corrugated steel buried structures and the like;

in each case, shall be the volume of the voids filled to the outline stated in the Contract less the volume of corrugated steel buried structures and the like within that void.

**50** Compaction of Class 1C and 6B materials shall be separately measured only where Class 1C or 6B material as such is specifically stated by the Contract to be required to be placed in a particular location.

**Itemisation**

**51** Separate items shall be provided for compaction of fill in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- |     |    |  |
|-----|----|--|
| I   | 1  | Compaction   |
| II  | 1  | Acceptable material  |
|     | 2  | Acceptable material Class 1C                                     |
|     | 3  | Not used   |
|     | 4  | Acceptable material Class 6B                                     |
| III | 1  | Embankments and other areas of fill                              |
|     | 2  | Strengthened embankments   |
|     | 3  | Reinforced earth structures                                      |
|     | 4  | Anchored earth structures  |
|     | 5  | Landscape areas and screening mounds                             |
|     | 6  | Environmental bunds  |
|     | 7  | Fill to structures   |
|     | 8  | Fill above structural concrete foundations                       |
|     | 9  | Fill on capping, sub-base material and roadbase                  |
|     | 10 | Fill on bridges (under footways, verges and central reserves)    |
|     | 11 | Upper bedding to corrugated steel buried structures and the like |
|     | 12 | Lower bedding to corrugated steel buried structures and the like |
|     | 13 | Surround to corrugated steel buried structures and the like      |
|     | 14 | Fill above corrugated steel buried structures and the like.      |

**Compaction of Fill**

**52** The items for compaction of fill shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) protection of subgrade;
- (b) multiple handling of material;
- (c) keeping earthworks free of water;
- (d) complying with requirements and constraints on the sequence, timing and rate of deposition and filling, and equalisation of earth pressures;
- (e) complying with the requirements for materials requiring special treatment;
- (f) complying with the particular requirements and constraints with regard to soil stabilisation, reinforced earth structures, strengthened embankments, anchored earth structures, corrugated steel buried structures and the like;
- (g) taking precautions to avoid damage to property, structures, sewers, drains, services, instrumentation and the like;

- (h) spreading and levelling;
- (i) trial areas, trials and demonstrations;
- (j) making good after sampling and testing;
- (k) forming and trimming side slopes, benchings and berms;
- (l) treatment of side slopes and berms;
- (m) compaction of fill resulting from settlement and penetration of landscape areas, screening mounds, environmental bunds and other areas of fill, and from the first 75 mm of settlement and penetration of embankments;
- (n) blinding;
- (o) special measures for dealing with processed material.

**Soil Improvement**

- Units**                      **53**      The unit of measurement shall be:
- (i) soil improvement ..... cubic metre.
- Measurement**              **54**      The measurement of soil improvement shall be the volume of material to be improved measured to the outlines stated in the Contract irrespective of the number of layers or thicknesses, methods or sequences of operations involved in improving the material to the depth required.
- Note: Soil improvement means the process of improvement whether the material is intact and undisturbed or deposited and compacted prior to improvement.
- Excavation, fill, import, disposal and compaction required to expose or produce the layer to be improved, as appropriate, shall be included under the measurement of earthworks elsewhere in this document.
- Excavation, deposition and compaction involved in the process of improvement itself shall not be measured.
- Itemisation**                      **55**      Separate items shall be provided for soil improvement in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
- Group Feature**
- |     |   |                  |
|-----|---|------------------|
| I   | 1 | Soil Improvement |
| II  | 1 | General Fill     |
| III | 1 | Cement           |
|     | 2 | Lime             |
- Soil Improvement**              **56**      The items for soil Improvement to form general fill shall in accordance with the Preambles to Bill of Quantities General Directions include for:
- Item Coverage**
- (a) excavation of unacceptable material (as this document paragraph 19);
  - (b) deposition (as this document paragraph 33);
  - (c) compaction of fill (as this document paragraph 52);
  - (d) pulverising, measuring, spreading and mixing;
  - (e) laps and joints;
  - (f) lime

- (g) cement
- (h) addition of water
- (i) curing, protection and sealing;
- (j) shaping to cambers, falls and crowns;
- (k) edge supports;
- (l) additional fill, deposition, compaction or disposal resulting from the process of stabilisation;
- (m) additional fill and stabilisation resulting from the first 75mm of settlement and penetration of embankments.

**Geotextiles**

- Units**                      **57**      The unit of measurement shall be:
- (i) geotextile ..... square metre.
- Measurement**            **58**      The measurement of geotextile shall be the developed area covered by the geotextile measured to the limits stated in the Contract.
- Itemisation**                **59**      **Group Feature**
- |     |   |                  |
|-----|---|------------------|
| I   | 1 | Geotextile       |
| II  | 1 | Different types  |
| III | 1 | Different grades |
- Geotextile**                      **60**      The items for geotextile shall in accordance with Preambles to Bill of Quantities General Directions include for:
- Item Coverage**
- (a) cleaning, trimming, regulating and preparing surfaces;
  - (b) laps;
  - (c) measures to protect material;
  - (d) cutting and jointing, sealing and fixing;
  - (e) securing material in place;
  - (f) complying with the requirements of strengthened earthworks;
  - (g) turn ups and overlaps at edges.

**Soft Spots and Other Voids**

- Units**                      **61**      The unit of measurement shall be:
- (i) soft spots, other voids ..... cubic metre.
- Measurement**            **62**      The measurement of soft spots and other voids shall be the volume of the voids directed to be excavated or filled. Soft spots and other voids shall be measured separately from the main excavation or filling where the volume:
- (a) below structural foundations, foundations for corrugated steel buried structures or in side slopes of cuttings is less than 1 cubic metre;
  - (b) elsewhere is less than 25 cubic metres.
- Itemisation**                **63**      Separate items shall be provided for soft spots and other voids in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Excavation of soft spots and other voids
- 2 Filling of soft spots and other voids
- II 1 Below cuttings or under embankments
- 2 In side slopes
- 3 Below structural foundations and foundations for corrugated steel buried structures
- III 1 Different types of fill

**Excavation of Soft Spots and Other Voids 64**

The items for excavation of soft spots and other voids shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation of acceptable material (as this document paragraphs 17 and 18);
- (b) excavation of unacceptable material (as this document paragraph 19);
- (c) disposal of material (as this document paragraph 39);
- (d) trimming back cutting faces.

**Filling of Soft Spots and Other Voids 65**

The items for filling of soft spots and other voids shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) deposition of fill (as this document paragraph 33);
- (b) compaction of fill (as this document paragraph 52);
- (c) formwork (as CC-RMP-01700 paragraph 14);
- (d) treatment of cutting faces;
- (e) in situ concrete (as CC-RMP-01700 paragraph 4).

**Disused Sewers, Drains, Cables, Ducts, Pipelines and the Like Occurring at Formation or Sub-formation Level; Disused Basements, Cellars and the Like and Gullies**

**Definition 66**

The term 'services' in paragraphs 67 to 72 inclusive shall be deemed to include sewers, drains, cables, ducts, pipelines and the like, together with associated chambers, fittings etc.

**Units 67**

- The units of measurement shall be:
- (i) removal of disused services ..... linear metre;
  - (ii) removal of disused gullies, manholes and chambers .... number.
  - (iii) backfilling disused services ..... cubic metre;
  - (iv) backfilling disused basement, cellar and the like ..... cubic metre;
  - (v) backfilling disused gullies ..... number.

**Measurement 68**

The measurement of removal of disused services shall be applied only to those existing services occurring at or below formation or sub-formation level in cutting and, or which are specifically stated in the Contract to be removed. The measurement shall be the distance along the centre line of the route of the services and, unless stated otherwise in the Contract no deduction shall be made for chambers and the like occurring on the pipe run.

Where no piperun is being removed and isolated gullies, manhole and chambers are to be removed item 67 (ii) then applies.

The measurement of backfilling disused services shall be applied only to those existing services occurring at or below formation or sub-formation level in cutting and, or which are specifically stated in the Contract to be backfilled. The measurement shall be the volume of the void directed to be filled, and unless stated otherwise in the Contract shall include chambers and the like.

The removal or backfilling of other disused services occurring elsewhere in the Works shall not qualify for separate measurement under this paragraph.

- 69** The measurement of backfilling disused basements, cellars and the like shall be the volume of the void directed to be filled.

The measurement of backfilling disused gullies shall be the complete operation.

**Itemisation**

- 70** Separate items shall be provided for removal, backfilling disused services, backfilling disused basements, cellars and the like and gullies in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- |     |   |   |
|-----|---|---|
| I   | 1 | Removal   |
|     | 2 | Backfilling   |
| II  | 1 | Different types   |
| III | 1 | Different sizes   |
| IV  | 1 | Disused service with one metre or less of cover to formation level  |
|     | 2 | Disused service exceeding one metre and not exceeding two metres of cover to formation level, and so on in steps of one metre |
|     | 3 | Disused basement, cellar and the like   |
|     | 4 | Disused gully   |
| V   | 1 | Different materials   |

**Note 1:** Group IV Features 3 and 4 shall not be applied to Group I Feature 1.

**Removal of Disused Services**

- 71** The items for removal of disused services shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation of acceptable material (as this document paragraphs 17 and 18);
- (b) excavation of unacceptable material (as this document paragraph 19);
- (c) breaking up beds, haunches and surrounds;
- (d) disposal of material (as this document paragraph 39);
- (e) sealing ends of services;
- (f) credit value of materials.

**Backfilling, Disused Services, Basements, Cellars and the like and gullies**      **72**      The items for backfilling disused services, basements, cellars and the like and gullies shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) compaction (as this document paragraph 52);
  - (b) perforation of existing slabs and cleaning;
  - (c) in situ concrete (as CC-RMP-01700 paragraph 4);
  - (d) reinforcement (as CC-RMP-01700 paragraph 25);
  - (e) formwork (as CC-RMP-01700 paragraph 14);
  - (f) sealing ends of services;
  - (g) grouting.

**Supports left in Excavation**

**Units**      **73**      The unit of measurement shall be:

- (i) supports left in excavation ..... square metre.

**Measurement**      **74**      The measurement of supports left in excavation shall be the area of face directed to be left with supports in position.

**Itemisation**      **75**      Separate items shall be provided for supports left in excavation in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

I	1	Support
II	1	Timber
	2	Steel
III	1	Different types

**76**      The items for supports left in excavation shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) struts, walings and the like and working around them.

**Topsoiling and Storage of Topsoil**

**Units**      **77**      The units of measurement shall be:

- (i) topsoiling ..... square metre.
- (ii) permanent storage of topsoil ..... cubic metre.

**Measurement**      **78**      The measurement of topsoiling shall be the area of the surface to be topsoiled and shall include topsoil class 5A excavated from within the site and imported topsoil Class 5B. The measurement of the permanent storage of topsoil shall be the volume of topsoil Class 5A excavated from within the Site and measured in accordance with paragraph 15(a) of this document less the volume of topsoil calculated from the areas and thicknesses to be topsoiled.

**Itemisation**      **79**      Separate items shall be provided for topsoiling in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Topsoiling of different thicknesses
- 2 Permanent storage of topsoil
- II 1 Surfaces sloping at 10° or less to the horizontal
- 2 Surfaces sloping at more than 10° to the horizontal

**Note 1:** Group I Feature 2 shall not be identified by any Group II Feature.

**Topsoiling**

**80**

The items for topsoiling shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) the removal of stone and other debris;
- (b) taking delivery of imported topsoil;
- (c) excavation from stockpile;
- (d) loading into transport;
- (e) haulage, deposition, spreading, levelling and compaction;
- (f) trimming and shaping to levels and contours;
- (g) harrowing;
- (h) herbicide treatment.

**Permanent Storage of Topsoil**

**81**

The items for permanent storage of topsoil shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation from stockpile;
- (b) loading into transport;
- (c) hauling, deposition, spreading, levelling and compaction in permanent storage area;
- (d) trimming and shaping to levels and contours;
- (e) multiple handling of material.

**Grass Seeding and Turfing**

**Units**

**82**

The unit of measurement shall be:

- (i) grass seeding, turfing ..... square metre.

**Itemisation**

**83**

Separate items shall be provided for grass seeding and turfing in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Grass seeding
- 2 Turfing
- 3 Hydraulic mulch grass seeding
- II 1 Surfaces sloping at 10° or less to the horizontal
- 2 Surfaces sloping at more than 10° to the horizontal
- III 1 Turfing in two layers
- IV 1 Different mixtures



<b>Grass Seeding and Turfing</b>	<b>84</b>	The items for grass seeding and turfing topsoil shall in accordance with the Preambles to Bill of Quantities General Directions include for:																		
<b>Item Coverage</b>		<ul style="list-style-type: none"> <li>(a) freeing surfaces of areas to be grassed or turfed from stones and other debris and reducing the soil to a tilth immediately prior to grassing;</li> <li>(b) fertilising including additional plant nutrients;</li> <li>(c) mowing and clearance of grass cuttings;</li> <li>(d) pegging and wiring of turves;</li> <li>(e) raking, watering, retaining agent and herbicide treatment;</li> <li>(f) additives.</li> </ul>																		
<b>Completion of Formation and Sub-Formation</b>																				
<b>Units</b>	<b>85</b>	The unit of measurement shall be: <ul style="list-style-type: none"> <li>(i) completion of formation, sub-formation ..... square metre.</li> </ul>																		
<b>Measurement</b>	<b>86</b>	<p>The measurement of completion of formation for roads shall be the area of the surface immediately beneath the sub-base except that where capping is required the measurement shall be the area of the surface of the capping excluding sloping sides and edges.</p> <p>Completion of formation and sub-formation on Classes 1C and 6B materials shall be measured separately only when the Contract states specifically that those materials are to be provided at formation or sub-formation level.</p> <p>The measurement of completion of sub-formation for roads shall be the area of the surface immediately beneath capping. The measurement of completion of formation beneath structures shall be the area of the surface immediately beneath the blinding.</p>																		
<b>Itemisation</b>	<b>87</b>	<p>Separate items shall be provided for completion of formation and sub-formation in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:</p> <p><b>Group Feature</b></p> <table border="0" style="margin-left: 20px;"> <tr> <td style="padding-right: 10px;">I</td> <td style="padding-right: 10px;">1</td> <td>Completion of sub-formation</td> </tr> <tr> <td></td> <td>2</td> <td>Completion of formation</td> </tr> <tr> <td>II</td> <td>1</td> <td>On acceptable material</td> </tr> <tr> <td></td> <td>2</td> <td>On Class 1C material</td> </tr> <tr> <td></td> <td>3</td> <td>On Class 6B material</td> </tr> <tr> <td></td> <td>4</td> <td>On rock in cuttings</td> </tr> </table>	I	1	Completion of sub-formation		2	Completion of formation	II	1	On acceptable material		2	On Class 1C material		3	On Class 6B material		4	On rock in cuttings
I	1	Completion of sub-formation																		
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	2	On Class 1C material																		
	3	On Class 6B material																		
	4	On rock in cuttings																		
<b>Completion of Formation and Sub-formation</b>	<b>88</b>	The items for completion of formation and sub-formation shall in accordance with the Preambles to Bill of Quantities General Directions include for:																		
<b>Item Coverage</b>		<ul style="list-style-type: none"> <li>(a) removal of protective layer, mud and slurry;</li> <li>(b) compaction;</li> <li>(c) cleaning, trimming, regulating, making good and rolling;</li> <li>(d) cement bound materials;</li> </ul>																		

- (e) excavation, processing, compaction of naturally occurring Hard Material;
- (f) measures to protect formation and sub-formation against deterioration or degradation.

### Lining of Watercourses

<b>Units</b>	<b>89</b>	The unit of measurement shall be: (i) lining of watercourses ..... square metre.																					
<b>Measurement</b>	<b>90</b>	Measurement of lining of watercourses shall be the permanently exposed face area of the work.  Measurement of bagwork shall be the flat undeveloped area of the work.																					
<b>Itemisation</b>	<b>91</b>	Separate items shall be provided for lining of watercourses in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> <table border="0" style="margin-left: 20px;"> <tr> <td style="padding-right: 10px;">I</td> <td style="padding-right: 10px;">1</td> <td>Lining of new watercourse</td> </tr> <tr> <td></td> <td>2</td> <td>Lining of enlarged watercourse</td> </tr> <tr> <td></td> <td>3</td> <td>Lining of intercepting ditches</td> </tr> <tr> <td>II</td> <td>1</td> <td>To inverts</td> </tr> <tr> <td></td> <td>2</td> <td>To side slopes</td> </tr> <tr> <td>III</td> <td>1</td> <td>Different types</td> </tr> <tr> <td>IV</td> <td>1</td> <td>Different thicknesses</td> </tr> </table>	I	1	Lining of new watercourse		2	Lining of enlarged watercourse		3	Lining of intercepting ditches	II	1	To inverts		2	To side slopes	III	1	Different types	IV	1	Different thicknesses
I	1	Lining of new watercourse																					
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	3	Lining of intercepting ditches																					
II	1	To inverts																					
	2	To side slopes																					
III	1	Different types																					
IV	1	Different thicknesses																					

<b>Lining of Watercourses</b>	<b>92</b>	The items for lining of watercourses shall in accordance with the Preambles to Bill of Quantities General Directions include for:  <b>Item Coverage</b> (a) bedding and compaction; (b) laying, setting, bedding, jointing, wedging, cutting and pointing; (c) building in pipes; (d) concrete (as CC-RMP-01700 paragraphs 4 and 9); (e) formwork (as CC-RMP-01700 paragraph 14); (f) reinforcement (as CC-RMP-01700 paragraph 25); (g) bags, filling, staking and securing; (h) blinding concrete (as CC-RMP-01700 paragraph 4).
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### Clearing of Existing Ditches

<b>Units</b>	<b>93</b>	The unit of measurement shall be: (i) clearing of existing ditches ..... linear metre.
<b>Measurement</b>	<b>94</b>	The measurement of clearing of existing ditches shall be the length along the centre line of the ditch.
<b>Itemisation</b>	<b>95</b>	Separate items shall be provided for clearing of existing ditches in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Clearing of existing ditches
- II 2 Different locations

**Clearing of Existing Ditches** 96 The items for clearing of existing ditches shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) excavation and loading into transport;
  - (b) haulage and deposition of excavated materials in tips off Site provided by the Contractor;
  - (c) clearing and removing debris and vegetable growth to tips off Site provided by the Contractor;
  - (d) trimming side slopes and grading bottoms;
  - (e) maintaining existing outfalls.

**Ground Improvement – Establishment of Dynamic Compaction Plant**

**Units** 97 The unit of measurement shall be:

- (i) establishment of dynamic compaction plant ..... item.

**Measurement** 98 The establishment of dynamic compaction plant shall be measured once only to each separate location of dynamic compaction on the Site. Any additional establishment of dynamic compaction plant to suit the Contractor's method of working shall not be measured.

**Itemisation** 99 Separate items shall be provided for establishment of dynamic compaction plant in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Establishment of dynamic compaction plant
- II 2 Different locations

**Establishment of Dynamic Compaction Plant** 100 The items for establishment of dynamic compaction plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) bringing plant and equipment to the location of dynamic compaction;
  - (b) erecting and setting up plant and equipment including site preparation, levelling, and access ramps;
  - (c) moving and setting up plant and equipment at each position including site preparation, levelling and access ramps;
  - (d) dismantling and removing plant and equipment from the Site on completion.

**Ground Improvement –Dynamic Compaction**

**Units** 101 The units of measurement shall be:

- (i) dynamic compaction ..... linear metre;
- (ii) dynamic compaction plant standing time ..... hour;
- (iii) granular blanket ..... tonne.

**Measurement** 102 The measurement of dynamic compaction shall be the sum of the distances through which the pounder is required to fall.

The distance for each drop shall be the vertical measurement from the underside of the poulder immediately prior to release, to the level of the ground beneath the poulder immediately prior to the first drop at that point.

**103** The measurement of dynamic compaction plant standing time shall be for the period or periods of standing time ordered by the Employer's Representative. Periods of less than half an hour shall not be measured. Any other standing time due to the Contractor's method of working, necessitated by the process of ground improvement provided for in the Contract or other than that ordered by the Employer's Representative shall not be measured.

**104** The measurement of granular blanket shall be the tonnage of material certified by the Employer's Representative, being only that material included on delivery tickets which is incorporated within the permanent Works in the locations to the extent and thicknesses stated in the Contract or ordered by the Employer's Representative.

**Itemisation**

**105** Separate items shall be provided for dynamic compaction, dynamic compaction plant standing time, and granular blanket in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- |     |   |  |
|-----|---|--|
| I   | 1 | Dynamic compaction                     |
|     | 2 | Dynamic compaction plant standing time |
|     | 3 | Granular blanket                       |
| II  | 1 | Trial compaction                       |
|     | 2 | Main compaction                        |
| III | 1 | Different weight of poulder            |
| IV  | 1 | Different materials                    |

**Dynamic Compaction**

**106** The items for dynamic compaction shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) preparation and levelling prior to placing the granular blanket;
- (b) pounding;
- (c) filling craters with adjacent material and compaction;
- (d) keeping earthworks free of water;
- (e) compaction of surface after the final pass;
- (f) complying with particular requirements and constraints;
- (g) keeping records;
- (h) extracting buried poulder.

**Dynamic Compaction Plant Standing Time**

**107** The items for dynamic compaction plant standing time shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) ancillary plant;
- (b) equipment and operatives;
- (c) periods of less than half an hour.

- Granular Blanket**                      **108**     The items for granular blanket shall in accordance with the Preambles to Bill of Quantities General Directions include for:
- (a) deposition of fill (as this document paragraph 33);
  - (b) compaction of fill (as this document paragraph 52).

**Gabion Walling and Mattresses**

- Units**                                      **109**     The unit of measurement shall be:
- (i) gabion walling, mattresses ..... cubic metre.
- Measurement**                      **110**     The measurement of gabion walling and mattresses shall be the volume contained within the outline of the gabions or mattresses as stated in the Contract.
- Itemisation**                              **111**     Separate items shall be provided for gabion walling and mattresses in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

I	1	Gabion walling
	2	Mattresses
II	1	Different mesh materials
III	1	Different mesh size
IV	1	Different types of fill
V	1	Mattresses installed at 10° or less to the horizontal
	2	Mattresses installed at more than 10° to the horizontal
VI	1	In environmental bunds

- Gabion Walling and Mattresses**                      **112**     The items for gabion walling and mattresses shall in accordance with the Preambles to Bill of Quantities General Directions include for:
- Item Coverage**
- (a) blinding layer;
  - (b) assembling, tying, fixing, staking and tensioning;
  - (c) fill, compaction and finishes;
  - (d) mesh including cutting and folding to form special units and shapes;
  - (e) bracing and wiring lids.

**Crib Walling**

- Units**                                      **113**     The unit of measurement shall be:
- (i) crib walling ..... square metre
- Measurement**                      **114**     The measurement shall be the flat undeveloped area of crib walling. No deduction shall be made for openings within the wall which are part of the modular system, nor for other openings of one square metre or less.
- Itemisation**                              **115**     Separate items shall be provided for crib walling in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Crib walling
- II 1 Different types
- III 1 Curved on plan
- IV 1 With a battered face
- V 1 Different finishes
- VI 1 Different infill

**Crib Walling** 116 The items for crib walling shall in accordance with the Preamble to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) blinding layer
- (b) bedding and jointing;
- (c) dowels and pins;
- (d) granular infill and compaction;
- (e) special units and forming ends and corners;
- (f) obtaining manufacturer’s certificate and supplying copy to the Employer’s Representative;
- (g) building in pipes and forming small openings.

**Filling and Caps to Mine Working, Well, Swallow Hole and the Like**

**Units** 117 The units of measurement shall be:

- (i) filling to mine working, well, swallow hole and the like .....  
tonne;
- (ii) caps to mine working, well, swallow hole and the like .....  
cubic metre.

**Measurement** 118 The measurement of filling to mine working, well, swallow hole and the like shall be calculated from the tonnage of material certified by the Employer’s Representative, being only that material, included on delivery tickets, which is incorporated in the permanent Works in the locations and to the extent and thickness required by the Contract. Material in excess of the requirements of the Contract and material used for any other purpose shall not be included within the certified tonnage.

119 The measurement of caps to mine working, well, swallow hole and the like shall be the volume of concrete forming the caps.

**Itemisation** 120 Separate items shall be provided for filling and caps to mine working, well, swallow hole and the like in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Filling
- 2 Caps
- II 1 Mine working
- 2 Well
- 3 Swallow hole and the like
- III 1 Different materials

**Filling and Caps to mine working, well, swallow hole and the like**

**121** The items for filling and caps to mine working, well, swallow hole and the like shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation of acceptable material (as this document paragraphs 17 and 18);
- (b) excavation of unacceptable material (as this document paragraph 19);
- (c) backfilling and compaction;
- (d) concrete (as CC-RMP-01700 paragraphs 4 and 9);
- (e) formwork including permanent formwork (as CC-RMP-01700 paragraph 14);
- (f) reinforcement (as CC-RMP-01700 paragraph 25);
- (g) flushing;
- (h) disposal of material (as this document paragraph 39);
- (i) investigation and monitoring;
- (j) material not used as filling.

**Ground Anchorages & Soil Nails – Ground Anchorage & Soil Nail Plant**

**Units**

**122** The unit of measurement shall be:

- (i) establishment of ground anchorage & soil nail plant ..... item.

**Measurement**

**123** The establishment of ground anchorage & soil nail plant shall be measured once only to each separate location of ground anchorages & soil nail on the Site. Any additional establishment of ground anchorage & soil nail plant to suit the Contractor’s method of working shall not be measured.

**Itemisation**

**124** Separate items shall be provided for ground anchorage & soil nail plant in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Establishment of ground anchorage & soil nail plant
- II 1 Different locations

**Establishment of Ground Anchorage & Soil Nail Plant**

**125** The items for establishment of ground anchorage & soil nail plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) bringing plant and equipment to the location of ground anchorages & soil nails;
- (b) erecting and setting up plant and equipment including site preparation, levelling and access ramps;
- (c) moving and setting up plant and equipment at each position including site preparation, levelling and access ramps;
- (d) dismantling and removing plant and equipment from Site on completion.

## Ground Anchorages & Soil Nails

<b>Units</b>	<b>126</b>	The unit of measurement shall be: (i) ground anchorages & soil nails ..... linear metre.
<b>Measurement</b>	<b>127</b>	The measurement of ground anchorages & soil nails shall be for the complete anchorage or nail assembly and shall be the length from the bottom of the fixed anchorage or nail to the bearing face.
<b>Itemisation</b>	<b>128</b>	Separate items shall be provided for ground anchorages & soil nails in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> I      1      Ground anchorages & soil nails II     2      Different types III    1      Different capacities IV    1      Not exceeding 5 metres in length 2      Exceeding 5 metres in length but not exceeding 10 metres in length and so on in steps of 5 metres V     1      Trial anchorages / nails 2      Main anchorages / nails
<b>Ground Anchorages &amp; soil nails</b>	<b>129</b>	The items for ground anchorages & soil nails shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) design where specified under the contract; (b) provision of data and drawings; (c) certificates; (d) resubmissions and modifications; (e) amendments to the Works; (f) boring, augering, lining, under-reaming, removing and disposing of material; (g) cables, wires or strands with couplers, binders and spacers; (h) anchorages, nails, bearing plates, reinforcing helices, grout inlets, vents and the like; (i) applying water under pressure and proving watertightness of boreholes; (j) flushing borehole, cleaning and preparation; (k) protective system (as CC-RMP-01900 paragraph 5); (l) grouting ground anchorages including fixed length and free stressing length; (m) applying prestress in one or more stages; (n) grouting soil nails (o) checking the accuracy of load measuring equipment and adjusting; (p) taking observations and compiling a record of stressing and grouting operations and supplying one copy to the Employer's Representative;



- (q) measures to prove anchorage or nail suitability;
- (r) proof loading;
- (s) facilities for Employer's Representative's proof loading.

**Ground Anchorages – Waterproofing Anchorage Boreholes**

<b>Units</b>	<b>130</b>	The unit of measurement shall be: (i) waterproofing of boreholes ..... linear metre.
<b>Measurement</b>	<b>131</b>	The measurement of waterproofing of boreholes shall be the total length of waterproofing operation instructed by the Employer's Representative.
<b>Itemisation</b>	<b>132</b>	Separate items shall be provided for waterproofing of boreholes in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> I      1      Waterproofing of boreholes II     1      Standard grouting 2      Pressure grouting
<b>Waterproofing of Boreholes</b>	<b>133</b>	The items for waterproofing of boreholes shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) pre-grouting; (b) re-drilling and applying water under pressure and proving watertightness of borehole.

**Instrumentation and Monitoring – Boring Plant**

<b>Units</b>	<b>134</b>	The unit of measurement shall be: (i) establishment of boring plant ..... item.
<b>Measurement</b>	<b>135</b>	The establishment of boring plant shall be measured once only to each separate location of boring on the Site. Any additional establishment of boring plant to suit the Contractor's method of working shall not be measured.
<b>Itemisation</b>	<b>136</b>	Separate items shall be provided for boring plant in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> I      1      Establishment of boring plant II     1      Different locations
<b>Establishment of Boring Plant</b>	<b>137</b>	The items for establishment of boring plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) bringing plant and equipment to the location of boring; (b) erecting and setting up plant and equipment including site preparation, levelling and access ramps; (c) moving and setting up plant at each position including site preparation, levelling, and access ramps;

- (d) dismantling and removing plant and equipment from Site on completion.

### Instrumentation and Monitoring – Boring Holes

<b>Units</b>	<b>138</b>	The unit of measurement shall be: (i) boring holes ..... linear metre.															
<b>Measurement</b>	<b>139</b>	The measurement of boring holes shall be the linear distance along the axis of the borehole between the instrument base and the level stated in the Contract.															
<b>Itemisation</b>	<b>140</b>	Separate items shall be provided for boring holes in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> <table><tr><td>I</td><td>1</td><td>Boring holes</td></tr><tr><td>II</td><td>1</td><td>Vertical</td></tr><tr><td></td><td>2</td><td>Raking</td></tr><tr><td>III</td><td>1</td><td>Depth not exceeding 10 metres</td></tr><tr><td></td><td>2</td><td>Depth exceeding 10 metres but not exceeding 20 metres and so on in steps of 10 metres</td></tr></table>	I	1	Boring holes	II	1	Vertical		2	Raking	III	1	Depth not exceeding 10 metres		2	Depth exceeding 10 metres but not exceeding 20 metres and so on in steps of 10 metres
I	1	Boring holes															
II	1	Vertical															
	2	Raking															
III	1	Depth not exceeding 10 metres															
	2	Depth exceeding 10 metres but not exceeding 20 metres and so on in steps of 10 metres															
<b>Boring Holes</b>	<b>141</b>	The items for boring holes shall in accordance with the Preambles to Bill of Quantities General Directions include for:  <b>Item Coverage</b> (a) boring holes in any material, including changing bits and tools; (b) disposal of material (as this document paragraph 39); (c) taking measures to deal with the presence of water in the boreholes; (d) drilling fluid; (e) standing time including ancillary plant, equipment and operatives.															

### Instrumentation and Monitoring – Instrumentation

<b>Units</b>	<b>142</b>	The units of measurement shall be: (i) installation of instruments ..... number; (ii) installation of tubing, cabling and the like ..... linear metre; (iii) grouting ..... linear metre.
<b>Measurement</b>	<b>143</b>	The measurement of installation of instruments shall be the complete installation.  The measurement of tubing and the like shall be the length measured from the instrument to the underside of the screw cap, plug or the like, along the centre line of the trench or borehole.  The measurement of cabling and the like shall be the length measured from the instrument to the base of the instrument hut or cabinet along the centre line of the trench or borehole.  The measurement of grouting shall be the distance from the top of the seal to either the bottom of the trench or to the underside of the screw cap plug or the like whichever is the lower.

<b>Itemisation</b>	<b>144</b>	Separate items shall be provided for instrumentation in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b>  I        1        Installation II       1        Different types of instruments 2        Different types of tubing or cabling 3        Different types of grouting III      1        Length or depth not exceeding 10 metres 2        Length or depth exceeding 10 metres but not exceeding 50 metres, and so on in steps of 50 metres
<b>Installation of Instruments</b>	<b>145</b>	The items for installation of instruments shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) recording water levels; (b) cleaning and keeping hole free of deleterious materials; (c) connections and joints; (d) keeping items clean during installation; (e) sand filters including allowing time for settlement; (f) removing contaminated water; (g) recording data and supplying one copy to the Employer's Representative; (h) proving correct functioning; (i) bedding and surround.
<b>Installation of Tubing and Cabling</b>	<b>146</b>	The items for installation of tubing and cabling shall in accordance with the Preambles to Bill of Quantities General Directions include for:  (a) standpipes; (b) cutting and jointing tubing including fittings and screw caps; (c) connections and joints; (d) excavation in any material (as this document paragraphs 17, 18, 19 and 23); (e) bedding and surround to cable or tube; (f) backfilling and compaction; (g) marking tape or cable covers; (h) extra length of cable for connection to monitoring equipment; (i) twisting and snaking; (j) incremental installation; (k) ducts (as CC-RMP-00500 paragraph 12).
<b>Grouting</b>	<b>147</b>	The items for grouting shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item Coverage</b>		(a) mixing and placing grout; (b) in situ concrete (as CC-RMP-01700 paragraph 4);

- (c) formwork (as CC-RMP-01700 paragraph 14);
- (d) backfilling and compaction;
- (e) disposal of material (as this document paragraph 39);
- (f) covers, frames, seatings and bedding;
- (g) locks and keys.

**Instrumentation and Monitoring – Instrument Hut or Cabinet**

<b>Units</b>	<b>148</b>	The unit of measurement shall be: <ul style="list-style-type: none"> <li>(i) erection, servicing, dismantling of instrument hut or cabinet ..... item.</li> </ul>																					
<b>Itemisation</b>	<b>149</b>	Separate items shall be provided for instrument hut or cabinet in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <p style="margin-left: 40px;"><b>Group Feature</b></p> <table border="0" style="margin-left: 40px;"> <tr> <td style="width: 20px;">I</td> <td style="width: 20px;">1</td> <td>Erection</td> </tr> <tr> <td></td> <td>2</td> <td>Servicing</td> </tr> <tr> <td></td> <td>3</td> <td>Dismantling</td> </tr> <tr> <td>II</td> <td>1</td> <td>Instrument hut for the Employer’s Representative</td> </tr> <tr> <td></td> <td>2</td> <td>Instrument cabinet for the Employer’s Representative</td> </tr> <tr> <td>III</td> <td>1</td> <td>Until completion of the Works</td> </tr> <tr> <td></td> <td>2</td> <td>After completion of the Works</td> </tr> </table>	I	1	Erection		2	Servicing		3	Dismantling	II	1	Instrument hut for the Employer’s Representative		2	Instrument cabinet for the Employer’s Representative	III	1	Until completion of the Works		2	After completion of the Works
I	1	Erection																					
	2	Servicing																					
	3	Dismantling																					
II	1	Instrument hut for the Employer’s Representative																					
	2	Instrument cabinet for the Employer’s Representative																					
III	1	Until completion of the Works																					
	2	After completion of the Works																					
<b>Erection of Instrument Hut</b>	<b>150</b>	The items for erection of instrument hut shall in accordance with the Preambles to Bill of Quantities General Directions include for:  <p style="margin-left: 40px;"><b>Item Coverage</b></p> <ul style="list-style-type: none"> <li>(a) preparation of site;</li> <li>(b) foundations, bases and hardstandings;</li> <li>(c) heating, power, water and lighting services;</li> <li>(d) security fence and lockable gates;</li> <li>(e) furnishings and fittings;</li> <li>(f) locks and keys.</li> </ul>																					
<b>Servicing Instrument Hut</b>	<b>151</b>	The items for servicing instrument hut shall in accordance with the Preambles to Bill of Quantities General Directions include for:  <p style="margin-left: 40px;"><b>Item Coverage</b></p> <ul style="list-style-type: none"> <li>(a) depreciation and maintenance of building, services and fences;</li> <li>(b) depreciation and maintenance of furnishings, fittings and supplies.</li> </ul>																					
<b>Dismantling Instrument Hut</b>	<b>152</b>	The items for dismantling instrument hut shall in accordance with the Preambles to Bill of Quantities General Directions include for:  <p style="margin-left: 40px;"><b>Item Coverage</b></p> <ul style="list-style-type: none"> <li>(a) receiving back from the Employer’s Representative and removing furnishings and fittings;</li> <li>(b) disconnecting, removing and sealing off disused services;</li> <li>(c) demolishing and removing off Site instrument hut, hardstandings, fences and gates;</li> </ul>																					

- (d) disposal of material (as this document paragraph 39);
- (e) reinstatement of the site.

**Erection of Instrument Cabinet 153** The items for erection of instrument cabinet shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) preparation of site;
- (b) foundations and bases;
- (c) power and water services;
- (d) locks and keys.

**Servicing of Instrument Cabinet 154** The items for servicing of instrument cabinet shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) depreciation and maintenance of cabinet and services;
- (b) depreciation and maintenance of fittings and supplies;
- (c) servicing.

**Dismantling of Instrument Cabinet 155** The items for dismantling of instrument cabinet shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) disconnecting, removing, and sealing off disused services;
- (b) removing instrument cabinet off Site;
- (c) breaking up and removal of foundations, and bases, and disposal of surplus material;
- (d) disposal of material (as this document paragraph 39);
- (e) reinstatement of the site.

**Instrumentation and Monitoring – Monitoring Equipment**

**Units 156** The unit of measurement shall be:

- (i) monitoring equipment ..... item.

**Itemisation 157** Separate items shall be provided for monitoring equipment in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Monitoring equipment
- II 1 Different types

**Monitoring Equipment 158** The items for monitoring equipment shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) installing, commissioning, calibrating and maintaining monitoring equipment in instrument hut or cabinet;
- (b) installing, commissioning, calibrating and maintaining monitoring equipment in vehicles for the Employer’s Personnel;
- (c) copies of reports and results and supplying to the Employer’s Representative;
- (d) instructing the Employer’s Personnel in the operation and maintenance of the instrumentation;

- (e) attendance during measurement carried out by the Employer's Representative;
- (f) removing on completion.

**Ground Water Lowering**

- Units**                      **159**    The unit of measurement shall be:
- (i) ground water lowering ..... item.
- Measurement**            **160**    The measurement of ground water lowering shall be the complete installation. Ground water lowering shall be separately measured only where ground water lowering is specifically required in the Contract.
- Itemisation**                **161**    Separate items shall be provided for ground water lowering in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I        1        Ground water lowering
- II       1        Different locations

- Ground Waer Lowering**   **162**    The items for ground water lowering shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item Coverage**
- (a) preparing, amending and submitting proposals to the Employer's Representative;
  - (b) installation, operation, maintenance and removal of plant;
  - (c) making arrangements with owners and occupiers of land temporarily acquired, and cost arising therefrom;
  - (d) diversion of rivers and the like;
  - (e) soakaways, lagoons and the like;
  - (f) measures to safeguard water supplies including liaising with water companies.

**Trial Pits**

- Units**                      **163**    The unit of measurement shall be:
- (i) Move equipment to trial pit location ..... number.
  - (ii) trial pits ..... cubic metre.
- Measurement**            **164**    The measurement of trial pits shall be the volume of the void, calculated on the basis of the horizontal area of the bottom of the excavation with the depth being measured from the bottom of the excavation to the level at which excavation is directed to be commenced.
- Itemisation**                **165**    Separate items shall be provided for trial pits in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I        1        Move equipment to trial pit location
- 2        Trial pits
- II       1        0 metres to 2 metres in depth

2 2 metres to 4 metres in depth, and so on in steps of 2 metres

**Trial Pits**                      **166**      The items for trial pits shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) bringing and setting up plant and equipment at location of trial pit;
- (b) excavation of acceptable material (as this document paragraphs 17 and 18);
- (c) excavation of unacceptable material (as this document paragraph 19);
- (d) excavation in Hard Material (as this document paragraph 23);
- (e) locating, working around and supporting pipes, cables, services, apparatus and the like;
- (f) attendance on the Employer's Representative and others for inspection and investigation purposes;
- (g) disposal of material (as this document paragraph 39);
- (h) backfilling and compaction;
- (i) reinstatement of surfaces.

**Breaking up and Perforation of Redundant Pavements**

**Units**                              **167**      The unit of measurement shall be:

- (i) breaking up of redundant pavements, perforation of redundant pavements ..... square metre.

**Measurement**                      **168**      The measurement of breaking up and perforation of redundant pavements shall be the areas stated in the Contract to be broken up or perforated and left in place. The depth of the pavement shall be the depth from the existing surface of the pavement to the underside of bituminous or cementitious material.

**Itemisation**                      **169**      Separate items shall be provided for breaking up and perforation of redundant pavements in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I            1            Breaking up of redundant pavements
- 2            Perforation of redundant pavements
- II           1            Different types of pavement
- III          1            Depth not exceeding 100 mm
- 2            Depth exceeding 100 mm but not exceeding 200 mm, and so on in steps of 100 mm

**Breaking up and Perforation of Redundant Pavements**                      **170**      The items for breaking up and perforation of redundant pavements shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) excavation in Hard Material (as this document paragraph 23);
- (b) taking precautions to avoid damage to property, structures, drains, sewers, services, instrumentation and the like.

**Perforation of Redundant Pavements Slabs, Basements and the like**

<b>Units</b>	<b>171</b>	The unit of measurement shall be: (i) perforation of redundant slabs, basements and the like ..... square metre.
<b>Measurement</b>	<b>172</b>	The measurement of perforation of redundant slabs, basements and the like shall be the areas stated in the Contract to be perforated and left in place.
<b>Itemisation</b>	<b>173</b>	Separate items shall be provided for perforation of redundant slabs, basements and the like in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 of the following:  <b>Group Feature</b> I        1        Perforation of redundant slabs, basements and the like II        1        Different types of slabs, basements and the like III       1        Thickness not exceeding 100 mm 2        Thickness exceeding 100 mm but not exceeding 200 mm, and so on in steps of 100 mm

<b>Perforation of Redundant Slabs, Basements and the like</b>	<b>174</b>	The items for perforation of redundant slabs, basements and the like shall in accordance with the Preambles to Bill of Quantities General Directions include for:
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<b>Item Coverage</b>	(a) excavation in Hard Material (as this document paragraph 23); (b) taking precautions to avoid damage to property, structures, drains, sewers, services, instrumentation and the like.
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**Rockfall Protection Netting**

<b>Units</b>	<b>175</b>	(a) The unit of measurement shall be: (i) Rockfall Protection Netting.....square metre (ii) Rock Scaling of cutting face.....square metre (iii) Dentition of weakened or weathered rock.....square metre
<b>Measurement</b>	<b>176</b>	The measurement of rockfall protection netting shall be the area contained within the outline of the rockfall protection netting as stated in the Contract.
	<b>177</b>	The measurement of Rock Scaling of cutting face shall be the area contained within the outline of the rockfall protection netting as stated in the Contract.
	<b>178</b>	The measurement of dentition of weakened or weathered rock shall be the area directed to be treated.

<b>Itemisation</b>	<b>179</b>	Separate items shall be provided for Rockfall Protection Netting in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> I        1        Rockfall Protection Netting
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- 2 Rock Scaling of cutting face
- 3 Dentition of weakened or weathered rock
- II 1 As specified Rockfall Protection Netting

**Rockfall Protection Netting**      **180**      The items for Rockfall Protection Netting shall in accordance with the Preambles to the Bill of Quantities General Directions include for:

**Item Coverage**

**Item Coverage**

- (a) design where specified under the contract;
- (b) provision of data and drawings;
- (c) certificates;
- (d) resubmissions and modifications;
- (e) amendments to the Works;
- (f) Rock scaling works, including light scaling and heavy scaling as outlined in the Contract;
- (g) excavation of unacceptable material (CC-RMP-00600 paragraph 19);
- (h) excavation in Hard Material (as CC-RMP-00600 paragraph 23);
- (i) disposal of material (CC-RMP-00600 paragraph 39);
- (j) Material and costs associated therewith;
- (k) Labour and costs associated therewith;
- (l) Plant and costs associated therewith;
- (m) Fixing rockfall protection netting to rock cutting face including associated ties and anchors;
- (n) boring, augering, lining, under-reaming, removing and disposing of material;
- (o) cables, wires or strands with couplers, binders and spacers;
- (p) anchorages, nails, bearing plates, reinforcing helices, grout inlets, vents and the like;
- (q) applying water under pressure and proving watertightness of boreholes;
- (r) flushing borehole, cleaning and preparation;
- (s) protective system (as CC-RMP-01900 paragraph 4);
- (t) grouting ground anchorages including fixed length and free stressing length.

**Cleaning Existing Drainage Systems**

**Units**      **181**      The unit of measurement shall be:

- (i) cleaning of drainage channels ..... linear metre

**Measurement**      **182**      The measurement of the cleaning of drainage channels shall be the individual lengths measured along the centre lines of the channel.

**Itemisation**      **183**      Separate items shall be provided for cleaning of drainage channels in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

		<b>Group Feature</b>
	I	1 Cleaning of Drainage Channel
<b>Cleaning Existing Drainage Systems</b>	<b>184</b>	<p>The items for cleaning existing drainage systems shall in accordance with the Preambles to Bill of Quantities General Directions include for:</p> <ul style="list-style-type: none"><li>(a) Loosening or breaking up material before or in the process of excavation;</li><li>(b) Upholding the sides;</li><li>(c) Selection and separation of materials;</li><li>(d) Forming and trimming side slopes;</li><li>(e) Trimming the bottom and sides;</li><li>(f) Grading beds of watercourses and working in and dealing with the flow of water;</li><li>(g) excavation of unacceptable material (CC-RMP-00600 paragraph 19);</li><li>(h) excavation in Hard Material (as CC-RMP-00600 paragraph 23);</li><li>(i) disposal of material (CC-RMP-00600 paragraph 39);</li><li>(j) Additional excavation the Contractor may require for working space;</li><li>(k) Waiting for frozen material to thaw.</li></ul>

## **2. References**

### **2.1 TII Publications (Standards) References**

CC-RMP-00010 Introduction to the Requirements for Measuring and Pricing


CC-RMP-00500 Requirements for Measuring and Pricing of Drainage and Service Ducts

CC-RMP-01700 Requirements for Measuring and Pricing of Structural Concrete

CC-RMP-01900 Requirements for Measuring and Pricing of Protection of Steelwork against Corrosion





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