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# Requirements for Measuring and Pricing of Piling and Embedded Retaining Walls

CC-RMP-01600

October 2016

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<b>TII Publication Title</b>	<i>Requirements for Measuring and Pricing of Piling and Embedded Retaining Walls</i>
<b>TII Publication Number</b>	<i>CC-RMP-01600</i>

<b>Activity</b>	<i>Construction &amp; Commissioning (CC)</i>	<b>Document Set</b>	<i>Standards</i>
<b>Stream</b>	<i>Requirements for Measuring and Pricing (RMP)</i>	<b>Publication Date</b>	<i>October 2016</i>
<b>Document Number</b>	<i>01600</i>	<b>Historical Reference</b>	<i>Series MM 1600</i>

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## TII Publications



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<b>Set:</b>	Standards

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# 1. Piling and Embedded Retaining Walls

## Piling Plant

- Units**                      **1**        The units of measurement shall be:
- (i)        establishment of piling plant ..... item.
  - (ii)       moving piling plant ..... number.
- Measurement**           **2**        The establishment of piling plant shall be measured once only to each structure. Any additional establishment of piling plant to suit the Contractor's method of working shall not be measured. The measurement of moving piling plant shall be measured once only to each pile.
- 3**        Moving of piling plant shall not be measured for steel sheet piling.

## Itemisation

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

Group	Feature
I	1        Establishment of piling plant
	2        Moving piling plant
II	1        Precast concrete piles
	2        Bored cast-in-place piles
	3        Driven cast-in-place piles
	4        Steel bearing piles
	5        Steel sheet piles
III	1        Different types
IV	1        Different cross-sections
V	1        Preliminary piling as a separate operation in advance of the main piling
	2        Main piling
VI	1        Different locations

- Establishment of Piling Plant**    **5**        The items for the establishment of piling plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item coverage**
- (a) bringing plant and equipment to the site of the structure;
  - (b) erecting and setting up plant and equipment including site preparation, levelling and access ramps;
  - (c) dismantling and removing plant and equipment from Site on completion.

- Moving Piling Plant**            **6**        The items for moving piling plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item coverage**
- (a) moving and setting up plant and equipment at each pile position including site preparation, levelling and access ramps.

## Precast Concrete Piles

- Units**                      **7**        The units of measurement shall be:
- (i)        precast concrete piles, driving, lengthening, driving lengthened piles ..... linear metre.
  - (ii)       stripping precast concrete pile heads ..... number.

- Measurement**
- 8** The measurement of precast concrete piles shall be the lengths required by the Contract. The jointing of segmental piles shall not be measured.
- 9** The measurement of driving precast concrete piles shall be the length of each pile measured along the axis from the toe to:
- (a) the Existing Ground Level or the level of the underside of the pile cap or ground beam (ignoring any blinding layer) whichever is the lower, provided that where a particular level is specified from which driving shall commence then the measurement shall be to that specified level; or
  - (b) the site joint of piles to be lengthened, provided that the site joint after completion of the driving is below the level determined in accordance with the preceding sub-paragraph.
- 10** The measurement of lengthening precast concrete piles shall be the lengths of the added concrete ordered by the Employer.  
 The measurement of lengthening precast segmental piles shall be the length of the added segment ordered by the Employer.
- 11** The measurement of driving lengthened precast concrete piles shall be the length from the site joint to the level determined in accordance with subparagraph 9(a) above.
- 12** The length classification for those items listed in sub-paragraph 7(i) above shall be based on the appropriate measured lengths determined in accordance with paragraphs 8 to 11 above inclusive.
- Itemisation**
- 13** Separate items shall be provided for precast concrete piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
- | <b>Group</b> | <b>Feature</b>  |
|--------------|---|
| I            | 1 Precast concrete piles  |
| II           | 1 Driving precast concrete piles  |
|              | 2 Lengthening precast concrete piles  |
|              | 3 Driving lengthened precast concrete piles   |
|              | 4 Stripping pile heads  |
| III          | 1 Vertical  |
|              | 2 Raking  |
| IV           | 1 Different types   |
| V            | 1 Different materials   |
| VI           | 1 Different cross-sections  |
| VII          | 1 Piles not exceeding 5 metres in length  |
|              | 2 Piles exceeding 5 metres in length but not exceeding 10 metres and so on in steps of 5 metres |
| VIII         | 1 Preliminary piling as a separate operation in advance of the main piling                      |
|              | 2 Main piling   |
- Precast Concrete Piles** **14** The items for precast concrete piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
- Item coverage**
- (a) design;
  - (b) certificates;

		(c) provision of data and drawings;
		(d) resubmissions and modifications;
		(e) amendments to the Works;
		(f) precast members, and the like (CC-RMP-01700 paragraph 9);
		(g) pile shoes, tapered points, prefabricated joints and joint fitments;
		(h) measures for reduction of friction.
<b>Driving Precast Concrete Piles</b>	<b>15</b>	The items for driving precast concrete piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) pre-boring or jetting;
		(b) handling, pitching and driving to a set or level;
		(c) taking observations and compiling the record of each pile and supplying one copy to the Employer;
		(d) moving plant and equipment back and redriving risen piles.
<b>Lengthening Precast Concrete Piles</b>	<b>16</b>	The items for lengthening precast concrete piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) design;
		(b) certificates;
		(c) provision of data and drawings;
		(d) resubmissions and modifications;
		(e) amendments to the Works;
		(f) stripping concrete;
		(g) forming connection with the old work including splicing, tying, connecting or welding reinforcement;
		(h) in situ concrete (CC-RMP-01700 paragraph 4);
		(i) formwork (CC-RMP-01700 paragraph 14);
		(j) reinforcement (CC-RMP-01700 paragraph 25);
		(k) precast members and the like (CC-RMP-01700 paragraph 9), joints and fitments;
		(l) lost time, moving plant and equipment, standing time and disruption caused by the process of lengthening including waiting for concrete to achieve a specified strength.
<b>Driving Lengthened Precast Concrete Piles</b>	<b>17</b>	The items for driving lengthened precast concrete piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) driving to a set or level;
		(b) taking observations and compiling the record of each pile and supplying one copy to the Employer;
		(c) moving plant and equipment back and driving lengthened piles;
		(d) moving plant and equipment back and redriving risen piles.
<b>Stripping Precast Concrete Pile Heads</b>	<b>18</b>	The items for stripping precast concrete pile heads shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) cutting off, removing and disposing of surplus;

- (b) exposing reinforcement;
- (c) bending projecting reinforcement.

### Cast-in-place Piles

- | <b>Units</b>                       | <b>19</b>  | The units of measurement shall be: <ul style="list-style-type: none"> <li>(i) pile shafts, empty bores ..... linear metre.</li> <li>(ii) enlarged bases ..... number.</li> </ul>   |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|------------------------------------|--|--|--------------|----------------|---|---------------|--|---------------|--|------------------|----|------------|--|----------|-----|-------------------|----|-----------------------|---|----------------------------|----|--|--|--|-----|--|--|---------------|
| <b>Measurement</b>                 | <b>20</b>  | The measurement of pile shafts shall be the length of the pile measured along the axis from the toe of the shoe or the bottom of the excavation, including any enlarged base, whichever is appropriate to the specified finished level of the concrete pile head.<br><br>Where an empty bore is specified above a pile shaft, the length classification of the pile shaft shall be based on the overall bored or driven depth including the empty bore.  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | <b>21</b>  | Empty bores shall only be measured where a particular level is specified from which boring or driving shall commence and shall be the length of empty bore or drive measured from the specified finished level of the concrete pile head, to that particular commencing level.   |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| <b>Itemisation</b>                 | <b>22</b>  | Separate items shall be provided for cast-in-place piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following: <table border="0" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: left;"><b>Group</b></th> <th style="text-align: left;"><b>Feature</b></th> </tr> </thead> <tbody> <tr> <td>I</td> <td>1 Pile shafts</td> </tr> <tr> <td></td> <td>2 Empty bores</td> </tr> <tr> <td></td> <td>3 Enlarged bases</td> </tr> <tr> <td>II</td> <td>1 Vertical</td> </tr> <tr> <td></td> <td>2 Raking</td> </tr> <tr> <td>III</td> <td>1 Different types</td> </tr> <tr> <td>IV</td> <td>1 Different materials</td> </tr> <tr> <td>V</td> <td>1 Different cross-sections</td> </tr> <tr> <td>VI</td> <td>1 Pile shafts not exceeding 5 metres in length</td> </tr> <tr> <td></td> <td>2 Pile shafts exceeding 5 metres in length but not exceeding to 10 metres and so on in steps of 5 metres</td> </tr> <tr> <td>VII</td> <td>1 Preliminary piling as a separate operation in advance of the main piling</td> </tr> <tr> <td></td> <td>2 Main piling</td> </tr> </tbody> </table> | <b>Group</b> | <b>Feature</b> | I | 1 Pile shafts |  | 2 Empty bores |  | 3 Enlarged bases | II | 1 Vertical |  | 2 Raking | III | 1 Different types | IV | 1 Different materials | V | 1 Different cross-sections | VI | 1 Pile shafts not exceeding 5 metres in length |  | 2 Pile shafts exceeding 5 metres in length but not exceeding to 10 metres and so on in steps of 5 metres | VII | 1 Preliminary piling as a separate operation in advance of the main piling |  | 2 Main piling |
| <b>Group</b>                       | <b>Feature</b>   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| I                                  | 1 Pile shafts  |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | 2 Empty bores  |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | 3 Enlarged bases   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| II                                 | 1 Vertical   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | 2 Raking   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| III                                | 1 Different types  |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| IV                                 | 1 Different materials  |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| V                                  | 1 Different cross-sections   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| VI                                 | 1 Pile shafts not exceeding 5 metres in length   |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | 2 Pile shafts exceeding 5 metres in length but not exceeding to 10 metres and so on in steps of 5 metres |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| VII                                | 1 Preliminary piling as a separate operation in advance of the main piling                               |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
|                                    | 2 Main piling  |  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |
| <b>Pile Shafts and Empty Bores</b> | <b>23</b>  | The items for pile shafts and empty bores 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) pre-boring or jetting;</li> <li>(b) casing or lining;</li> <li>(c) boring or augering to a given level and removing and disposing of surplus material;</li> <li>(d) driving to a given set or level with or without pile shoe;</li> <li>(e) excavation, removal, and disposal of material (CC-RMP-00600 paragraphs 17, 18, 19, 23 and 39);</li> <li>(f) support fluid and disposal;</li> </ul>  |              |                |   |               |  |               |  |                  |    |            |  |          |     |                   |    |                       |   |                            |    |  |  |  |     |  |  |               |

		(g) protection for personnel, and apparatus for entering the empty bore for the inspection of pile excavation or inside of pile casing;
		(h) taking observations and maintaining the boring or driving record and concreting or grouting record of each pile and supplying one copy to the Employer;
		(i) precautions to prevent ingress of surface water and foreign matter;
		(j) in situ concrete and precast members, and the like (CC-RMP-01700 paragraphs 4 and 9) and stripping concrete to required level and exposing reinforcement;
		(k) taking undisturbed soil samples from the bore at any level;
		(l) filling of empty bore and around the top of piles and subsequent removal and disposal;
		(m) systems for monitoring construction of the piles;
		(n) measures for reduction of friction.
<b>Enlarged Bases</b>	<b>24</b>	The item for enlarged bases shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) excavation, including under-reaming, removal and disposal of material (CC-RMP-00600 paragraphs 17, 18, 19, 23 and 39);
		(b) in situ concrete (CC-RMP-01700 paragraph 4);
		(c) taking measures required because of the presence of water.
<b>Reinforcement for Cast-in-place Piles</b>		
<b>Units</b>	<b>25</b>	The unit of measurement shall be:
		(i) bar and helical reinforcement ..... tonne.
<b>Measurement</b>	<b>26</b>	The mass of plain bar reinforcement to cast-in-place piles shall be calculated on the basis that the nominal density of steel is 0.00785 kilogrammes per square millimetre of cross-sectional area per linear metre; the mass of deformed bar reinforcement shall be calculated on the basis of the nominal rolling mass of the reinforcement.
<b>Itemisation</b>	<b>27</b>	Separate items shall be provided for reinforcement for cast-in-place piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
		<b>Group Feature</b>
	I	1 Bar reinforcement
		2 Helical reinforcement
	II	1 Nominal size 16 millimetres and under
		2 Nominal size 20 millimetres and over
	III	1 Different types and grades of steel
	IV	1 Bars not exceeding 12 metres in length
		2 Bars exceeding 12 metres in length but not exceeding 13.5 metres and so on in steps of 1.5 metres
<b>Reinforcement for Cast-in-Place Piles</b>	<b>28</b>	The items for reinforcement for cast-in-place piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) reinforcement (CC-RMP-01700 paragraph 25);
		(b) bending projecting reinforcement.



## Steel Bearing Piles

- Units**                      **29**      The units of measurement shall be:
- (i)      steel bearing piles, driving, lengthening pieces, driving lengthened steel bearing piles ..... linear metre.
  - (ii)     welding on lengthening pieces ..... number.
  - (iii)    cutting or burning off surplus ..... number.
- Measurement**            **30**      The measurement of steel bearing piles shall be the length required by the Contract.
- 31**      The measurement of driving steel bearing piles shall be the length of the pile measured along the axis from the toe to:
- (a) the Existing Ground Level or the level of the underside of the pile cap or ground beam (ignoring any blinding layer) whichever is the lower, provided that where a particular level is specified from which driving shall commence then the measurement shall be to that specified level; or
  - (b) the site joint of piles to be lengthened, provided that the site joint after completion of the driving is below the level determined in accordance with the preceding sub-paragraph.
- 32**      The measurement of lengthening pieces for steel bearing piles shall be the additional length ordered by the Employer.
- 33**      The measurement of driving lengthened steel bearing piles shall be the length from the site joint to the level determined in accordance with subparagraph 31(a) above.
- 34**      The length classification for those items listed in sub-paragraph 29(i) above shall be based on the appropriate measured lengths determined in accordance with paragraphs 30 to 33 above inclusive.
- Itemisation**              **35**      Separate items shall be provided for steel bearing piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
- | <b>Group</b> |   | <b>Feature</b>  |
|--------------|---|---|
| I            | 1 | Steel bearing piles   |
|              | 2 | Lengthening pieces for steel bearing piles  |
| II           | 1 | Driving steel bearing piles   |
|              | 2 | Driving lengthened steel bearing piles  |
|              | 3 | Welding on lengthening Pieces   |
|              | 4 | Cutting or burning off surplus  |
| III          | 1 | Vertical  |
|              | 2 | Raking  |
| IV           | 1 | Different types   |
| V            | 1 | Piles not exceeding 5 metres in length  |
|              | 2 | Piles not exceeding 5 metres in length but not exceeding 10 metres and so on in steps of 5 metres |
| VI           | 1 | Preliminary piling as a separate operation in advance of the main piling                          |
|              | 2 | Main piling   |

<b>Steel Bearing Piles and Lengthening Pieces for Steel Bearing Piles</b>	<b>36</b>	The items for steel bearing piles and lengthening pieces for steel bearing piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) fabrication (CC-RMP-01800 paragraph 6) and slinging holes; (b) protective system (CC-RMP-01900 paragraph 4); (c) measures for reduction of friction.
<b>Driving Steel Bearing Piles and Driving Lengthened Steel Bearing Piles</b>	<b>37</b>	The items for driving steel bearing piles and driving lengthened steel bearing piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) pre-boring or jetting; (b) handling, pitching and driving to a set, level or penetration; (c) taking observations and compiling the record of each pile and supplying one copy to the Employer; (d) moving plant and equipment back and re-driving risen piles.
<b>Welding on Lengthening Pieces</b>	<b>38</b>	The items for welding on lengthening pieces shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) stripping protective system and preparing the head of the driven pile to receive additional length; (b) cleaning the affected area and applying protective system; (c) lost time, moving plant and equipment, standing time and disruption caused by the process of lengthening; (d) inspection of welds.
<b>Cutting or Burning off</b>	<b>39</b>	The items for cutting or burning off surplus shall in accordance Surplus with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) achieving profile; (b) cleaning the affected area and applying protective system; (c) disposal of material (CC-RMP-00600 paragraph 39).
<b>Proof Loading of Piles</b>		
<b>Units</b>	<b>40</b>	The units of measurement shall be: (i) establishment of proof loading equipment ..... item. (ii) proof loading of piles ..... number.
<b>Measurement</b>	<b>41</b>	The establishment of proof loading equipment shall be measured once only to each structure. Any additional establishment of proof loading equipment to suit the Contractor's method of working shall not be measured.  Measurement of proof loading of piles shall be the number required by the Contract.
<b>Itemisation</b>	<b>42</b>	Separate items shall be provided for proof loading of piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Establishment of proof loading equipment
- II 1 Piles of different types
- III 1 Preliminary piles
  - 2 Main piles
- IV 1 Maintained load
  - 2 Constant rate load
  - 3 Dynamic load
- V 1 Vertical
  - 1 Raking

**Establishment of Proof Loading Equipment 43**

The items for establishment of proof loading equipment shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item coverage**

- (a) bringing plant and equipment to the site of each structure;
- (b) erecting and setting up plant and equipment including site preparation, levelling and access ramps;
- (c) dismantling and removing plant and equipment from the Site on completion.

**Proof Loading of Piles 44**

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

**Item coverage**

- (a) setting up rigs, kentledge, cable anchorages, anchor piles, reference bench marks and the like;
- (b) moving and setting up plant and equipment at each position including site preparation, levelling and access ramps;
- (c) setting up, operating and maintaining instruments and apparatus;
- (d) constructing temporary pile caps and subsequent removal;
- (e) applying and re-applying the proof load and releasing;
- (f) taking readings, measurements and observations;
- (g) preparation and supply of record sheets.

**Steel Sheet Piles**

**Units 45**

The units of measurement shall be:

- (i) steel sheet piling, driving, lengthening pieces, driving lengthened steel sheet piling ..... square metre.
- (ii) corner, junction, special steel sheet piles ..... linear metre (measured extra over steel sheet piling)
- (iii) lengthening pieces to corner, junction, special steel sheet piles ..... linear metre (measured extra over lengthening pieces to steel sheet piling)
- (iv) driving corner, junction, special steel sheet piles ..... linear metre (measured extra over driving steel sheet piling)
- (v) driving lengthened corner, junction, special steel sheet piles ..... linear metre (measured extra over driving lengthened steel sheet piling)
- (vi) welding on lengthening pieces ..... linear metre.
- (vii) cutting or burning off surplus ..... linear metre.
- (viii) walings, ties ..... tonne.

- Measurement**
- 46** The measurement of steel sheet piling shall be the plane (undeveloped) horizontal length along the centre line of the piling multiplied by the pile length as required by the Contract.
- 47** The measurement for driving steel sheet piling shall be the plane (undeveloped) horizontal length along the centre line of the piling multiplied by the depth from the toe to:
- (a) the Existing Ground Level, provided that where a particular level is specified from which driving shall commence then the measurement shall be to that specified level; or
  - (b) the site joint of piles to be lengthened provided that the site joint after completion of the driving is below the level determined in accordance with the preceding sub-paragraph.
- 48** The measurement of lengthening pieces to steel sheet piling shall be the plane (undeveloped) horizontal length along the centre line of the piling multiplied by the additional length ordered by the Employer.
- 49** The measurement for driving lengthened steel sheet piling shall be the plane (undeveloped) horizontal length along the centre line of the piling multiplied by the depth from the site joint to the level determined in accordance with sub-paragraph 47(a) above.
- 50** The length classification for those items listed in sub-paragraphs 45(i) to (v) above shall be based on the appropriate measured lengths determined in accordance with paragraphs 46 to 49 above inclusive.
- 51** The measurement of welding on lengthening pieces and cutting or burning off surplus shall be the plane (undeveloped) horizontal length along the centre line of the piling.
- 52** The measurement of those items listed in paragraph 45(viii) shall be the computed mass of the finished member comprising plates, rolled sections, shear connectors, stiffeners, ties, cleats, packs, splice plates and all fittings, without allowance for tolerances for rolling margin and other permissible deviations from standard masses or nominal dimensions and excluding the masses of welds, couplings, turnbuckles, bolts, nuts, washers, rivets and protective coatings. No deductions shall be made for notches, cope holes, bolt and rivet holes, and the like, which are less than 0.03 square metres.
- The computed mass of rolled and cast steel shall be determined from the dimensions shown on the drawings on the following basis:
- (a) rolled or cast steel, 7850 kilogrammes per cubic metre.
- Itemisation**
- 53** Separate items shall be provided for steel sheet piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
- Group Feature**
- I
    - 1 Steel sheet piles
    - 2 Corner, junction, special steel sheet piles
    - 3 Lengthening pieces to steel sheet piles
    - 4 Lengthening pieces to corner, junction, special steel sheet piles
  - II
    - 1 Driving
    - 2 Welding on lengthening pieces
    - 3 Cutting or burning off surplus

	III	1	Walings
		2	Ties
	IV	1	Different types
	V	1	Piles not exceeding 5 metres in length
		2	Piles exceeding 5 metres in length but not exceeding 10 metres and so on in steps of 5 metres
	VI	1	In main construction
		2	In anchorages
<b>Steel Sheet Piling, Corner, Junction, Special Steel Sheet Piles and Lengthening Pieces to Steel Sheet Piling, Corner Junctions, Special Steel Sheet Piles</b>	<b>54</b>		The items for steel sheet piling, corner, junction, special steel sheet piles and lengthening pieces to steel sheet piling, corner, junctions, special steel sheet piles shall in accordance with the Preambles to Bill of Quantities General, Directions include for:
<b>Item coverage</b>			(a) fabrication (CC-RMP-01800 paragraph 6), slinging holes and tapered points;
			(b) protective system (CC-RMP-01900 paragraph 4);
			(c) drainage holes and the like up to 200 mm in diameter and making good to protective system;
			(d) measures for reduction of friction.
<b>Driving Steel Sheet Piling, Corner, Junction, Special Steel Sheet Piles and Driving Lengthened Steel Sheet Piling, Corner Junctions, Special Steel Sheet Piles</b>	<b>55</b>		The items for driving steel sheet piling, corner, junction, special steel sheet piles and driving lengthened steel sheet piling, corner, junctions, special steel sheet piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>			(a) handling, pitching and driving to a set, level or penetration;
			(b) moving and setting up plant and equipment at each pile position including site preparation or levelling;
			(c) taking observations and compiling the record of the piling and supplying one copy to the Employer;
			(d) moving plant and equipment back and redriving risen piles.
<b>Welding on Lengthening Pieces</b>	<b>56</b>		The items for welding on lengthening pieces shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>			(a) welding on lengthening pieces (as this document paragraph 38).
<b>Cutting or Burning off Surplus</b>	<b>57</b>		The item for cutting or burning off surplus shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>			(a) cutting or burning off surplus (as this document paragraph 39).
<b>Walings and Ties</b>	<b>58</b>		The items for walings and ties shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item coverage**
- (a) fabrication (CC-RMP-01800 paragraph 6);
  - (b) excavation of acceptable material (CC-RMP-00600 paragraphs 17 and 18);
  - (c) excavation of unacceptable material (CC-RMP-00600 paragraph 19);
  - (d) excavation in Hard Material (CC-RMP-00600 paragraph 23);
  - (e) backfilling and compaction;
  - (f) disposal of material (CC-RMP-00600 paragraph 39);
  - (g) threading, couplings, turnbuckles and the like;
  - (h) protective system (CC-RMP-01900 paragraph 4);
  - (i) marking and drilling piles and making good to protective system.

**Embedded Retaining Wall Plant**

- Units**                      **59**      The unit of measurement shall be:
- (i) establishment of embedded retaining wall plant ..... item.
- Measurement**              **60**      The establishment of embedded retaining wall plant shall be measured once only for each embedded retaining wall.
- Itemisation**                **61**      Separate items shall be provided for embedded retaining wall plant in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group    Feature**

- I            1      Establishment of embedded retaining wall plant
- II           1      Diaphragm walls
- 2      Hard/hard secant pile walls
- 3      Hard/soft secant pile walls
- 4      Contiguous bored pile walls
- III          1      Different locations

- Establishment of Embedded Retaining Wall Plant**              **62**      The items for the establishment of embedded retaining wall plant shall in accordance with the Preambles to Bill of Quantities General Directions include for:

- Item coverage**
- (a) bringing plant and equipment to the site of the embedded retaining wall;
  - (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;
  - (e) guide walls.

**Diaphragm Walls**

- Units**                        **63**      The unit of measurement shall be:
- (i) diaphragm walls, empty excavation ..... square metre.
- Measurement**              **64**      The measurement of the diaphragm walls shall be the area of the vertical section through the centre line of the wall as required by the

Contract. All lengths of walls comprising T-shaped, L-shaped or other shaped panels in plan, shall be measured and included in the calculated area. Empty excavation shall only be measured where a particular level is specified from which excavation shall commence and shall be the area of the vertical section through the centre line of the empty excavation between the specified commencing level and the specified finished level of the top of the wall.

**Itemisation**

**65** Separate items shall be provided for diaphragm walls in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- I 1 Diaphragm walls
- 2 Empty excavation
- II 1 Different thicknesses of walls
- III 1 Diaphragm walls 0 metres to 5 metres in depth
- 2 Diaphragm walls 0 metres to 10 metres in depth and so on in steps of 5 metres

**Diaphragm Walls and Empty Excavation**

**66** The items for diaphragm walls and empty excavation shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item coverage**

- (a) excavation of acceptable material (CC-RMP-00600 paragraphs 17 and 18);
- (b) excavation of unacceptable material (CC-RMP-00600 paragraph 19);
- (c) excavation in Hard Material (CC-RMP-00600 paragraph 23);
- (d) backfilling and compaction;
- (e) support fluid and disposal;
- (f) in situ concrete (CC-RMP-01700 paragraph 4);
- (g) trimming concrete at top of wall;
- (h) records and supplying one copy to the Employer;
- (i) sealing;
- (j) cutting chases, recesses, holes, mortices and the like;
- (k) disposal of material (CC-RMP-00600 paragraph 39);
- (l) filling of empty excavation and its subsequent removal and disposal;
- (m) cleaning and treatment of faces.

**Secant Pile Walls**

**Units**

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

- (i) secant pile walls, empty bores ..... square metre.

**Measurement**

**68** The measurement of the secant pile walls shall be the area of the vertical section through the centre line of the wall as required by the Contract. Empty bores shall only be measured where a particular level is specified from which boring shall commence and shall be the area of the vertical section through the centre line of the empty boring between the specified commencing level and specified finished level of the top of the wall.

**Itemisation**                      **69**      Separate items shall be provided for secant pile walls in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group    Feature**

- |     |   |   |
|-----|---|---|
| I   | 1 | Hard/hard secant pile walls   |
|     | 2 | Hard/soft secant pile walls   |
|     | 3 | Empty bores   |
| II  | 1 | Different diameters of piles  |
|     | 2 | Different spacings and overlap of piles at commencing level                     |
| III | 1 | Secant pile walls 0 metres to 5 metres in depth                                 |
|     | 2 | Secant pile walls 0 metres to 10 metres in depth and so on in steps of 5 metres |

**Hard/Hard and Hard/Soft Secant Pile Walls and Empty Bores**                      **70**      The items for hard/hard and hard/soft secant pile walls and empty bores shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item Coverage**

- (a) pre-boring or jetting;
- (b) casing or lining;
- (c) boring or augering to a given level and removing and disposing of surplus material;
- (d) excavation, removal, and disposal of material (CC-RMP-00600 paragraphs 17, 18, 19, 23 and 39);
- (e) support fluid and disposal;
- (f) taking observations and maintaining the boring record and concreting or grouting record of each pile and supplying one copy to the Employer;
- (g) precautions to prevent ingress of surface water and foreign matter;
- (h) in situ concrete and precast members and the like (CC-RMP-01700 paragraphs 4 and 9) and stripping concrete to required level and exposing reinforcement;
- (i) trimming concrete at top of wall;
- (j) formwork (CC-RMP-01700 paragraph 14);
- (k) taking undisturbed soil samples from the bore at any level;
- (l) filling of empty bore and around the top of piles and subsequent removal and disposal;
- (m) systems for monitoring construction of the piles;
- (n) measures for reduction of friction;
- (o) cleaning and treatment of faces.

**Contiguous Bored Pile Walls**

**Units**                                      **71**      The unit of measurement shall be:

- (i)      contiguous bored pile walls, empty bores ..... square metre.

**Measurement**                      **72**      The measurement of the contiguous bored pile walls shall be the area of the vertical section through the centre line of the wall as required by the Contract. Empty bores shall only be measured where a particular level is specified from which boring shall commence and shall be the area of the vertical section through the centre line of the empty boring



between the specified commencing level and the specified finished level of the top of the wall.

**Itemisation**

**73**

Separate items shall be provided for contiguous bored pile walls in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

**Group Feature**

- |     |   |   |
|-----|---|---|
| I   | 1 | Contiguous bored pile walls   |
|     | 2 | Empty bores   |
| II  | 1 | Different diameters of piles  |
|     | 2 | Different spacings of piles   |
| III | 1 | Contiguous bored pile walls 0 metres to 5 metres in depth                                 |
|     | 2 | Contiguous bored pile walls 0 metres to 10 metres in depth and so on in steps of 5 metres |

**Contiguous Bored Pile Walls and Empty Bores**

**74**

The items for contiguous bored pile walls and empty bores shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item coverage**

- (a) pre-boring or jetting;
- (b) casing or lining;
- (c) boring or augering to a given level and removing and disposing of surplus material;
- (d) excavation, removal, and disposal of material (CC-RMP-00600 paragraphs 17, 18, 19, 23 and 39);
- (e) support fluid and disposal;
- (f) taking observations and maintaining the boring record and concreting or grouting record of each pile and supplying one copy to the Employer ;
- (g) precautions to prevent ingress of surface water and foreign matter;
- (h) in situ concrete and precast members and the like (CC-RMP01700 paragraphs 4 and 9) and stripping concrete to required level and exposing reinforcement;
- (i) trimming concrete at top of wall;
- (j) formwork (CC-RMP-01700 paragraph 14);
- (k) taking undisturbed soil samples from the bore at any level;
- (l) filling of empty bore and around the top of piles and subsequent removal and disposal;
- (m) additional measures for water retention;
- (n) systems for monitoring construction of the piles;
- (o) measures for reduction of friction;
- (p) cleaning and treatment of faces.

## Reinforcement for Embedded Retaining Walls

<b>Units</b>	<b>75</b>	The unit of measurement shall be: (i) bar and helical reinforcement ..... tonne. (ii) rolled sections ..... tonne.
<b>Measurement</b>	<b>76</b>	The mass of plain bar reinforcement to embedded retaining walls shall be calculated on the basis that the nominal density of steel is 0.00785 kilogrammes per square millimetre of cross-sectional area per linear metre; the mass of deformed bar reinforcement shall be calculated on the basis of the nominal rolling mass of the reinforcement.  The mass of rolled sections shall be calculated on the basis that the density of steel is 7850 kilogrammes per cubic metre.
<b>Itemisation</b>	<b>77</b>	Separate items shall be provided for reinforcement for embedded retaining walls in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:  <b>Group Feature</b> I 1 Bar reinforcement 2 Helical reinforcement 3 Rolled sections II 1 Nominal size 16 millimetres and under 2 Nominal size 20 millimetres and over III 1 Different types and grades of steel IV 1 Bars or sections not exceeding steel 12 metres in length 2 Bars or sections exceeding 12 metres in length but not exceeding 13.5 metres and so on in steps of 1.5 metres  Note: Group I Feature 3 Rolled Sections shall not be separately identified by any Group II Feature.
<b>Reinforcement for Embedded Retaining Walls</b>	<b>78</b>	The items for reinforcement for embedded retaining walls shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) reinforcement (CC-RMP-01700 paragraph 25); (b) bending projecting reinforcement; (c) rolled sections (CC-RMP-01800 paragraphs 6 and 9); (d) guides and hole spacers.
<b>King Post Wall Plant</b>		
<b>Units</b>	<b>79</b>	The units of measurement shall be: (i) establishment of piling plant for king posts ..... item. (ii) moving piling plant for king posts ..... number.
<b>Measurement</b>	<b>80</b>	The establishment of piling plant for king posts shall be measured once only for each king post wall.
<b>Itemisation</b>	<b>81</b>	Separate items shall be provided for piling plant for king posts in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

		<b>Group Feature</b>
		I 1 Establishment of piling plant for king posts
		2 Moving piling plant for king posts
		II 1 Bored cast-in-place piles
		2 Driven cast-in-place piles
		III 1 Different types
		IV 1 Different diameters
		V 1 Different locations
<b>Establishment of Piling Plant for King Posts</b>	<b>82</b>	The items for establishment of piling plant for king posts shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) establishment of piling plant (as this document paragraph 5).
<b>Moving Piling Plant for King Posts</b>	<b>83</b>	The items for moving piling plant for king posts shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>		(a) moving piling plant (as this document paragraph 6).
<b>King Posts</b>		
<b>Units</b>	<b>84</b>	The unit of measurement shall be:
		(i) king post pile shafts, empty bores ..... linear metre
<b>Measurement</b>	<b>85</b>	The measurement of king post pile shafts shall be the length of the pile measured along the axis from the toe of the shoe or the bottom of the excavation, whichever is appropriate, to the specified finished level of the concrete pile head.
		Where an empty bore is specified above a pile shaft, the length classification of the pile shaft shall be based on the overall bored or driven depth including the empty bore.
	<b>86</b>	Empty bores shall only be measured where a particular level is specified from which boring or driving shall commence and shall be the length of empty bore or drive measured from the specified finished level of the concrete pile head, to that particular commencing level.
<b>Itemisation</b>	<b>87</b>	Separate items shall be provided for king post piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:
		<b>Group Feature</b>
		I 1 King post pile shafts
		2 Kind post empty bores
		II 1 Vertical
		2 Raking
		III 1 Different types
		IV 1 Different materials
		V 1 Different cross-sections
		VI 1 King post pile shafts not exceeding 5 metres in length
		2 King post pile shafts exceeding 5 metres in length but not exceeding 10 metres and so on in steps of 5 metres
<b>King Post Pile Shafts and Empty Bores</b>	<b>88</b>	The items for king post pile shafts and empty bores shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item coverage** (a) pile shafts and empty bores (as this document paragraph 23).

### Reinforcement for King Post Piles

**Units** **89** The units of measurement shall be:  
(i) bar and helical reinforcement ..... tonne.  
(ii) rolled section members ..... tonne.  
(iii) precast concrete members ..... linear metre.

**Measurement** **90** The mass of plain bar reinforcement to king post piles shall be calculated on the basis that the nominal density of steel is 0.00785 kilogrammes per square millimetre of cross-sectional area per linear metre; the mass of deformed bar reinforcement shall be calculated on the basis of the nominal rolling mass of the reinforcement.

The mass of rolled section members shall be calculated on the basis that the density of steel is 7850 kilogrammes per cubic metre.

The measurement of precast concrete members shall be the length required by the Contract.

**Itemisation** **91** Separate items shall be provided for reinforcement for king post piles in accordance with Section 3 of CC-RMP-00010 paragraphs 3 and 4 and the following:

#### Group Feature

- |     |   |  |
|-----|---|--|
| I   | 1 | Bar reinforcement  |
|     | 2 | Helical reinforcement  |
|     | 3 | Rolled section members   |
|     | 4 | Precast concrete members   |
| II  | 1 | Nominal size 16 millimetres and under  |
|     | 2 | Nominal size 20 millimetres and over   |
| III | 1 | Different grades of steel and types of steel and concrete  |
| IV  | 1 | Bars or members not exceeding 12 metres in length  |
|     | 2 | Bars or members exceeding 12 metres in length but not exceeding 13.5 metres and so on in steps of 1.5 metres |

Note: Group I Features 3 and 4 shall not be separately identified by any Group II Feature.

**Reinforcement for King Post Piles** **92** The items for reinforcement for king post piles shall in accordance with the Preambles to Bill of Quantities General Directions include for:

**Item coverage**

- (a) reinforcement (CC-RMP-01700 paragraph 25);
- (b) bending projecting reinforcement;
- (c) rolled section members (CC-RMP-01800 paragraphs 6 and 9);
- (d) guides and hole spacers;
- (e) precast concrete members (CC-RMP-01700 paragraph 9).

### King Post Walling

**Units** **93** The unit of measurement shall be:  
(i) king post walling ..... square metre.

**Itemisation** **95** The measurement shall be the superficial area of king post walling required by the Contract.

		<b>Group</b>	<b>Feature</b>
		I	1 King post walling
		II	1 Different types
		III	1 Different thicknesses
<b>King Post Walling</b>	<b>96</b>		The items for king post walling shall in accordance with the Preambles to Bill of Quantities General Directions include for:
<b>Item coverage</b>			(a) excavation, removal and disposal of material (CC-RMP-00600 paragraphs 17, 18, 19, 23 and 39); (b) preservation of timber.

## **2. References**

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

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

CC-RMP-00600 Requirements for Measuring and Pricing of Earthworks


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

CC-RMP-01800 Requirements for Measuring and Pricing of Structural Steelwork

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







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