QS MASTERCLASS
Measuring Concrete Foundations & Beds

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This article aims to cover the measurement of the common items encountered in in-situ concrete foundations to a building. The method of measurement is SMM7 and the basic principle is that the net volume is measured. E10.M1 lists the items for which no deduction is made. The work is split between reinforced and unreinforced or plain concrete stating the mix in all cases.

It is assumed that you have a structural engineer’s design for the foundations giving width and depth of continuous foundations, sizes of isolated foundation, thicknesses of beds, reinforcement and joint information.

The main measurement difference between plain and reinforced concrete work is that reinforced concrete requires not only the reinforcement but also formwork to be measured to allow for accurate casting of the work to maintain the concrete cover of the reinforcement as designed by the engineer.

The measurement is logically split between foundations and beds.

### MEASURING CONCRETE FOUNDATIONS

**Plain concrete foundations** are categorised as either continuous or isolated.

**Reinforced concrete foundations** are as plain but also include ground beams.

**Continuous foundations** include column bases and the like in the length of the foundation, or attached to it, the principle being that the work would be cast in the same mix and batch of concrete and there would be no difference in the cost of either the labour or material.

**Isolated foundations** include isolated column bases pile caps and machine bases.

To begin measuring collect together similar items, foundations of the same width and depth, isolated foundations of the same size and depth as shown below. Continuous foundations should be measured on the centre line. Then schedule the remaining tems.

<table>
<thead>
<tr>
<th>Concrete Foundations</th>
<th>450 x 800</th>
<th>600 x 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/A-J</td>
<td>14.80</td>
<td>3/A-D</td>
</tr>
<tr>
<td>2/A-M</td>
<td>16.40</td>
<td>6/A-D</td>
</tr>
<tr>
<td>M/1-4</td>
<td>8.45</td>
<td>C/1-4</td>
</tr>
<tr>
<td>A/1-6</td>
<td>9.75</td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>49.40</strong></td>
<td><strong>24.85</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pile Caps</th>
<th>1200 x 1200 x 850</th>
<th>1500 x 1500 x 850</th>
<th>2400 x 2400 x 850</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>14</strong></td>
<td><strong>16</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>
MEASURING CONCRETE FOUNDATIONS

Take-off all the items under each classification, measured in cubic metres, stating if they are poured against earth or unblinded hardcore and if they are sloping whether it is less than or greater than 15 degrees as E10.1.1-5.

Formwork is measured to the sides of the ground beam or foundation. Bases and pile caps are included with foundations. Formwork less than 1 metre high is measured in linear metres stating the height in stages of 250mm. Formwork over 1 metre high is measured in square metres. Plain vertical formwork is so described, other profiles are to have a dimensioned description. Any formwork which has to be left in due to the nature of the construction or is designed as permanent formwork shall be so described. No deduction is made for passings of formwork to ground beams, that is to say where the beams cross or intersect no deduction is made to the formwork.

If site conditions are such that steps are designed in the foundation then formwork is measured to the step at the top of the foundation. The item is described as step in top surface and is measured in the same height stages as formwork to foundations.

Bar reinforcement is measured in Tonnes, its location in the structure is not required to be stated. It is classified by diameter of bar and whether straight, bent or curved. Ideally the structural engineer will have produced bar bending schedules giving details of the reinforcement required. The bending schedules will give, amongst other information, the diameter, overall length and total number of each bar design required. The information should be scheduled out collecting together the bars by diameter. Once the total length for each diameter has been calculated it should be multiplied by the standard weight/metre to arrive at the total weight. More often than not bending schedules are not available and the engineer will give a guide weight of reinforcement per cubic metre of concrete for various locations in the structure thus enabling a weight to be calculated.

Fabric reinforcement is measured in m² and is classified by mesh reference and weight per m². Fabric which is laid in strips in one width is still measured in m² but has to be measured separately stating the width as E30.4.1.2. This rule applies to fabric in the bottom of foundations.

MEASURING CONCRETE BEDS

Concrete beds are measured in cubic metres, stating if they are poured against earth or unblinded hardcore and if they are sloping whether it is less than or greater than 15 degrees as E10.1.1-5. The beds are grouped together in stages of not exceeding 150mm thick, 150-450mm thick and exceeding 450mm thick.

Where reinforced foundations are designed it is usual for a bed of weak mix concrete to be laid prior to the foundation to blind the surface of the ground and facilitate the placing of the reinforcement. This blinding bed is measured as described above.

Formwork is measured to the edges of the bed. It is classified in the same way as formwork to foundations as E20.2.1 etc.
MEASURING SUNDRIES

Any mortices in foundations or beds for holding down bolts etc or holes through the slab are included in the formwork section of the measurement as E20.26/27.

They are enumerated; the girth is given in stages of not exceeding 500mm, 500mm – 1.00m and thereafter in stages of 1.00m; the depth is given in stages of not exceeding 250mm, 250-500mm, 500mm – 1.00m and then over 1.00m. The shape of the mortice, when viewed on plan is stated, either rectangular, circular, or irregular with dimensions. As previously stated, any formwork which is to be left in or designed as permanent is to be so described. Holes are defined as having an areas not exceeding 5 m2.

Holes with a greater area are not measured under this rule and the formwork is measured as formwork to edge of bed as E20.2

Where the engineer has designed joints in the beds these are measured as linear items as E40. They are described as a composite item including filler, reinforcement, sleeves, waterstops etc, stating the dimensions. The classification is either plain, requiring no formwork, formed, requiring formwork or cut. The depth of the joint is stated in staged of 150mm. Curved work is so described. Any sealant required is measured separately in metres stating the dimensions, method of application and any preparation. Angles and intersections of waterstops are enumerated where they are welded or purpose made.

Worked finishes in the surface of the concrete are measured in accordance with E41. The specification will usually state the requirement and it measured in m2 stating the finish and whether the surface is sloping, to falls or crossfalls.

Cutting chases, rebates, holes and mortices, as opposed to those produced using formwork, are measured in this section. Chases and rebates are measured in metres. Where a specific size is required this is stated, if not then depth stages of 50mm up to 150mm are used, over 150mm the depth is stated. Making good should be included in the description and work in reinforced concrete shall be so described. Mortices and holes follow basically the same principles except they are enumerated and the depth stages are 100mm increments up to 300mm deep, over 300mm the depth is stated.

Cast in accessories are measured in accordance with E42. Items such as anchor bolts, anchor boxes, anchor fixing bolts, dowels etc are enumerated, channels etc are linear. They are described by type and dimensions are stated.

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