
Series 1700: Structural Concrete

1 Surface impregnation of concrete shall be measured under Series 2000: Waterproofing for Structures.

In Situ Concrete

Units

2 The unit of measurement shall be:

- (i) in situ concrete cubic metre.

Measurement

3 No deduction shall be made for:

- (a) holes, ducts, pockets, sockets, mortices and the like not exceeding 0.15 cubic metres each in volume;
- (b) reinforcement;
- (c) individual chamfers, splays, rebates, recesses, drips, grooves and the like of 100 mm total girth or less when measured overall the faces of the individual feature formed in the concrete;
- (d) in the case of concrete with a patterned profile face, any indentations of 100 mm total girth or less when measured overall the faces of the indentations formed in the concrete;
- (e) cast in components not exceeding 0.15 cubic metres each in volume.

Itemisation

4 Separate items shall be provided for in situ concrete in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	In situ concrete.
II	1	Different design mixes.
	2	Different classes or grades.
III	1	Blinding concrete 75 mm or less in thickness.

In Situ Concrete

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

Item coverage

- (a) mix design;
- (b) trial mixes;
- (c) mixing, placing in or against any surface, including soil faces, compaction, finishing and unformed surface finishes;
- (d) curing and protection;
- (e) formwork (as this Series paragraph 15) to upper surfaces inclined at an angle of less than 15o to the horizontal;

- (f) trial panels;
- (g) falls, cambers, and shaped profiles;
- (h) construction joints, (whether or not shown on the Drawings) water bars and stops including formwork (as this Series paragraph 15);
- (i) weep pipes, pipe sleeves and the like;
- (j) holes, ducts, pockets, sockets, mortices and the like not exceeding 0.15 cubic metres each in volume including formwork (as this Series paragraph 15);
- (k) formwork (as this Series paragraph 15) to edges of blinding concrete 75 mm or less in thickness;
- (l) filling to overbreak and working space;
- (m) measures to control alkali - silica reaction;
- (n) air entrainment;
- (o) facilities and assistance for the Overseeing Organisation's cover meter survey;
- (p) admixtures and additives.

Precast Concrete

Definition

6 The term "precast" applies to a concrete unit cast on Site but not in its final position, and to concrete units manufactured off the Site.

Units

7 The units of measurement shall be:

- (i) precast members, slabs, segmental units, hinges, specially moulded blocks number.
- (ii) precast copings, capping units, plinths and the like of uniform cross section, culverts (excluding piped culverts measured under Series 500: Drainage) linear metre.
- (iii) precast facing units square metre.

Measurement

8 The measurement of precast facing units shall be the flat undeveloped area.

The measurements of culverts (excluding piped culvert measured under Series 500: Drainage) shall be the length measured at the invert level, along the centre line.

The measurement of precast copings, capping units, plinths and the like shall be the measurement along the centre line.

Itemisation

9 Separate items shall be provided for precast concrete in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Precast members, slabs, segmental units, hinges, specially moulded blocks.
	2	Precast copings, capping units and plinths and culverts.
	3	Precast facing units.
II	1	Different types.
III	1	Different sizes.
IV	1	Curved.

Precast Members, Slabs, Segmental Units, Hinges, Specially Moulded Blocks, Copings, Plinths, Capping Units and Facing Units

10 The items for precast members, slabs, segmental units, hinges, specially moulded blocks, copings, capping units, plinths and facing units shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) mix design;
- (b) trial mixes;
- (c) reinforcement (as this Series paragraph 26);
- (d) formwork (as this Series paragraphs 15, 16 and 21);
- (e) mixing, placing in or against any surface; including soil faces, compaction finishing and unformed surface finishes;
- (f) curing and protection;
- (g) individual chamfers, splays, rebates, recesses, drips, grooves, and the like;
- (h) holes, ducts, pockets, sockets, mortices and the like;
- (i) matching members;
- (j) marking members for identification and delivery in matching sequence;
- (k) lifting devices including removal and bearing plates;
- (l) temporary bracing or stays to prevent displacement;
- (m) trial panels;
- (n) bedding, jointing and pointing including cramps, dowels or other fixing devices;
- (o) caulking and sealing between and under units and members;
- (p) infilling to joints between adjacent units and members where the maximum width of the joint is less than 150 mm including surface finish and formwork;
- (q) cutting and trimming;
- (r) in the case of precast prestressed members and the like, and in the case

of precast and precast prestressed members and the like for incorporation in in situ post-tensioned prestressed construction, tendons (as this Series paragraph 37) and stressing (including partially stressing) and grouting internal tendons (as this Series paragraph 38);

- (s) in the case of facing units, units for top, bottom, ends, changes in direction, battering, waterproofing, weep pipes, pipe sleeves and the like;
- (t) air entrainment;
- (u) admixtures and additives;
- (v) measures to control alkali-silica reaction;
- (w) facilities and assistance for the Overseeing Organisation's cover meter survey.
- (x) awaiting Overseeing Organisation's approval of trial panels.

Surface Finish of Concrete - Formwork

Units

11 The units of measurement shall be:

- (i) formwork square metre.
- (ii) void formers linear metre.

Measurement

12 The measurement shall be the area of formwork which is in contact with the finished concrete but measured over the face of openings of 1 square metre or less and features described in (c) below.

Formwork shall not be measured to:

- (a) construction joints whether or not shown on the Drawings;
- (b) holes, ducts, pockets, sockets, mortices and the like, not exceeding 0.15 cubic metres each in volume;
- (c) individual fillets, chamfers, splays, drips, rebates, recesses, grooves and the like of 100 mm total girth or less when measured overall the faces in contact with the concrete;
- (d) edges of blinding concrete 75 mm or less in thickness;
- (e) upper surfaces of concrete inclined at an angle of less than 15° to the horizontal;
- (f) unformed surfaces.

Where concrete, other than blinding concrete 75 mm or less in thickness, is placed in structural foundations, formwork shall be measured to the sides of

such concrete foundations regardless of whether or not any formwork is used, except where it is expressly stated on the Drawings that the concrete is to be cast against the soil face.

For measurement of formwork:

- (i) “horizontal” shall include formwork horizontal or inclined at any angle up to and including 5° to the horizontal.
- (ii) “inclined” shall include formwork inclined at any angle more than 5° up to and including 85° to the horizontal.
- (iii) “vertical” shall include formwork inclined at any angle more than 85° up to and including 90° to the horizontal.
- (iv) “at any inclination” shall include formwork horizontal or inclined at any angle up to and including 90° to the horizontal.

13 The measurement of void formers shall be the length measured along the centre line of the void former, and shall be measured whether of a permanent or temporary nature.

Itemisation

14 Separate items shall be provided for formwork in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Formwork.
	2	Void formers.
II	1	Horizontal more than 300 mm wide.
	2	Inclined more than 300 mm wide.
	3	Vertical more than 300 mm wide.
	4	300 mm wide or less at any inclination.
	5	Curved of both girth and width more than 300 mm at any inclination.
	6	Curved of girth or width of 300 mm or less at any inclination.
	7	Domed.
	8	Void formers of different cross section.
III	1	Different classes of surface finish.
	2	Permanent formwork of different types.
	3	Void formers of different types.

Formwork

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

Item coverage

- (a) trial panels;
- (b) falsework, centering, fabricating, assembling, cutting, fitting, and fixing in position and taking measures to produce the required shapes of concrete;

- (c) forming cambers and falls;
- (d) linings and taking measures to produce the required finish to the surfaces of the concrete;
- (e) cutting and fitting around projecting members, pipes, reinforcement and the like;
- (f) individual fillets, chamfers, splays, drips, rebates, recesses, grooves and the like of 100 mm total girth or less when measured overall the faces in contact with the concrete;
- (g) maintaining in place until striking and allowing for any variation from the minimum period for striking arising from prevailing weather conditions;
- (h) striking, taking down and removing;
- (i) concrete provided in lieu of formwork to fill overbreak and working space.

Void Formers

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

Item coverage

- (a) fixing to avoid displacement during concreting operations;
- (b) capping or blocking off ends;
- (c) sealing ends and joints;
- (d) proving holes.

Surface Finish of Concrete - Patterned Profile Formwork

Definition

17 The term “patterned profile formwork” shall be formwork designed to produce a concrete face with a specified patterned profile comprising ribs, corrugations, troughs or other patterns in relief.

Formwork with a specified regular pattern of formwork joints shall not be classified as patterned profile formwork.

Units

18 The unit of measurement shall be:

- (i) patterned profile formwork square metre.

Measurement

19 The measurement shall be the flat undeveloped area of the patterned concrete required by the Contract and measured over the face of openings of 1 square metre or less and features described in (c) below. Patterned profile formwork shall not be measured to:

- (a) construction joints whether or not shown on the Drawings;
- (b) holes, ducts, pockets, sockets, mortices and the like, not exceeding 0.15 cubic metres each in volume;

- (c) individual fillets, chamfers, splays, drips, rebates, recesses, grooves and the like, not forming part of the pattern and of 100 mm total girth or less when measured overall the faces in contact with the concrete;
- (d) edge of blinding concrete 75 mm or less in thickness;
- (e) upper surfaces of concrete inclined at an angle of less than 15o to the horizontal.

For measurement of patterned profile formwork:

- (i) “horizontal” shall include patterned profile formwork horizontal or inclined at any angle up to and including 5o to the horizontal.
- (ii) “inclined” shall include patterned profile formwork inclined at any angle more than 5o up to and including 85o to the horizontal.
- (iii) “vertical” shall include patterned profile formwork inclined at any angle more than 85o up to and including 90o to the horizontal.
- (iv) “at any inclination” shall include patterned profile formwork horizontal or inclined at any angle up to and including 90o to the horizontal.

Itemisation

20 Separate items shall be provided for patterned profile formwork in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Patterned profile formwork.
II	1	Horizontal.
	2	Inclined.
	3	Vertical.
	4	Curved at any inclination.
III	1	Different types.

Patterned Profile Formwork

21 The items for patterned profile formwork shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) formwork (as this Series paragraph 15).

Steel Reinforcement for Structures

Units

22 The units of measurement shall be:

- (i) bar and helical reinforcement tonne.
- (ii) fabric reinforcement square metre.
- (iii) dowels number.

Measurement

23 The mass of plain bar reinforcement 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 as the nominal rolling mass of the reinforcement. Steel bar supports to reinforcement where described in the Contract shall be measured as reinforcement.

No allowance shall be made for the mass of welds and mechanical connections.

24 Fabric reinforcement shall be measured as the area of work covered, the BS reference being stated.

Itemisation

25 Separate items shall be provided for steel reinforcement for structures in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Bar reinforcement.
	2	Fabric reinforcement of different BS references.
	3	Helical reinforcement.
	4	Dowels of different diameters and lengths.
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.
V	1	Bars threaded through holes in members.
VI	1	Different types of deformed bars.

Reinforcement

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

Item coverage

- (a) cleaning, cutting and bending;
- (b) binding with wire or other material;
- (c) supports, cover blocks and spacers (except for steel bar supports to reinforcement where shown on the Drawings);
- (d) extra fabric reinforcement at laps;
- (e) welding;
- (f) mechanical connections.

Dowels

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

Item coverage

- (a) drilling or forming holes and pockets, casting in and grouting;
- (b) protective caps, sleeves and wrappings.

Reinforcement for Reinforced and Anchored Earth Structures

Units

28 The units of measurement shall be:

- (i) vertical rods, strip and bar reinforcing elements linear

- metre.
(ii) sheet, grid, mesh reinforcing elements square metre.

Measurement

29 The measurement of vertical rods shall be the length from the top surface of the strip footing to the top of the facing unit or the top of the rod whichever is the higher.

The measurement of strip and bar reinforcing elements shall be the overall length including connections and, where applicable, the turn down for end anchorages. Provided that where a strip element comprises more than one leg measurement shall be of all legs, the number of legs measured being stated in the item description.

Measurement of sheet, grid or mesh reinforcing elements shall be the summation of the areas of each layer.

Itemisation

30 Separate items shall be provided for reinforcement for reinforced and anchored earth structures in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Vertical rods of nominal size 16 millimetres and under.
	2	Vertical rods of nominal size 20 millimetres and over.
	3	Strip and bar reinforcing elements of different cross-sections or load carrying capacity.
	4	Sheet, grid, mesh reinforcing elements of different references.
II	1	Different materials.
III	1	Vertical rods of different lengths.
	2	Strip and bar reinforcing elements of different lengths.

Vertical Rods

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

Item coverage

- (a) cleaning and cutting;
- (b) measures to prevent displacement including adjustments and removal;
- (c) protective treatment including tubes and grouting.

Strip, Bar, Sheet, Grid or Mesh Reinforcing Elements

32 The items for strip, bar, sheet, grid or mesh reinforcing elements shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) examining and checking steel for segregation, laminations, cracks and surface flaws;
- (b) cutting, marking off, drilling, notching, machining, bending, connection within the length and preparing for connection to vertical rod facing unit or capping unit;
- (c) marking elements for identification;

- (d) protective system (as Series 1900 paragraph 4);
- (e) extra sheeting, grid or mesh at laps;
- (f) bolts, nuts, washers and connecting to facing units;
- (g) threading over of fixing to vertical rods;
- (h) casting in ends to in situ capping units.

In Situ Post-tensioned Prestressing for Structures

Units

33 The unit of measurement shall be:

- (i) tendons, stressing and grouting, protective covering to external tendons number.

Definition

34 For the purpose of this Series a tendon is defined as all the permanent components of a system which imparts a compressive load to a concrete member through a single anchorage or bearing plate at each end of the system.

Measurement

35 Lengths of tendons shall be measured along the line of the tendon between the outside faces of those parts of the anchorage units cast into the concrete. Tendons shall be grouped so that no member of the group differs in length from the stated length by more than 5%.

Itemisation

36 Separate items shall be provided for in situ post-tensioned prestressing for structures in accordance with Chapter II paragraphs 3 and 4 and the following:

Group Feature		
I	1	Tendons.
	2	Stressing and grouting internal tendons.
	3	Stressing external tendons.
	4	Final stressing and grouting tendons of members supplied partially prestressed.
II	1	Tendons for in situ concrete construction.
	2	Tendons for segmental construction.
III	1	Tendons of different types.
IV	1	Tendons of different stated lengths.
V	1	Protective covering of different types or size to external tendons.

Tendons

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

Item coverage

- (a) forming, installing and sealing tendon ducts, sheaths and duct formers to profile supporting or between precast segmental units;
- (b) steel bars, cables, wires or strands with couplers, tagging, binders, spacers and proving that tendons are free to move between anchorages in ducts;
- (c) tendon anchorages, bearing plates, reinforcing helices, grout inlets, vents and other components except where these are supplied complete

- with precast members or segments;
- (d) electrical bonding and proving electrical continuity of structure;
- (e) forming recesses in the concrete for anchorages and jack seatings;
- (f) allowing for variations of length in tendons contained in the same bill item;
- (g) cutting;
- (h) cleaning ducts;
- (i) marking, labelling, grouting and vent points with tendon identification.
- (j) photographing and anchorage on removal of end caps;
- (k) replacement and sealing of end caps against ingress of contamination

**Stressing and Grouting
Internal Tendons, Stressing
External Tendons and Final
Stressing and Grouting
Tendons of Members
Supplied Partially
Prestressed**

38 The items for stressing and grouting internal tendons, stressing external tendons and final stressing and grouting tendons of members supplied partially prestressed shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item coverage

- (a) checking the accuracy of load measuring equipment and adjusting;
- (b) applying prestress in one or more stages;
- (c) gripping and trimming tendons;
- (d) taking observations and compiling a record of stressing and grouting operations and supplying one copy to the Overseeing Organisation;
- (e) in the case of internal tendons, grouting trials, grouting, sealing vent holes and end anchorages, treating ends of tendons and filling anchorages and jack seating recesses with in situ concrete (as this Series paragraph 5);
- (f) in the case of external tendons, tying or binding to main structure and sealing at joints;
- (g) accommodating and adjusting for differences between tendons included in the same bill item;
- (h) calculation in respect of the required jacking force and extension;
- (i) releasing tension and re-tensioning where pull-in is greater than that agreed by the Overseeing Organisation;
- (j) flushing-out of grout.

**Protective covering to
External Tendons**

(39) The items for protective covering to external tendon shall in accordance with the Preambles to Bill of Quantities General Directions include for

- (a) tying or bonding to main structure;
- (b) sealing at joints

Grouting Trials

(40) The items for grouting trials shall in accordance with the Preambles to Bill of Quantities General Directions include for:

Item Coverage

- (a) excavation in any material (as series 600 paragraphs 17,18,19 and 23);
- (b) concrete (as this Series paragraph 5 and 10);
- (c) formwork (as this Series paragraph 15);
- (d) reinforcement (as this Series paragraph 26);
- (e) tendons (as this Series paragraph 37)
- (f) Stressing and grouting (as this Series paragraph 38);
- (g) Protective covering to external tendons (as this Series paragraph 39);
- (h) Pressure testing of systems;
- (i) Cutting and sectioning of member;
- (j) Reporting of results to Engineer and photographs
- (k) Retrials as instructed by Engineer
- (l) Breaking up and disposal;

