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**METHOD OF
MEASUREMENT OF BUILDING AND
CIVIL ENGINEERING WORKS**

PART II CONCRETE WORKS

(Third Revision)

(Incorporating Amendment Nos. 1 & 2)

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BUREAU OF INDIAN STANDARDS
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Indian Standard
**METHOD OF
 MEASUREMENT OF BUILDING AND
 CIVIL ENGINEERING WORKS**
PART II CONCRETE WORKS
(Third Revision)

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Indian Standard
METHOD OF
MEASUREMENT OF BUILDING AND
CIVIL ENGINEERING WORKS

PART II CONCRETE WORKS

(*Third Revision*)

0. FOREWORD

0.1 This Indian Standard (Part II) (Third Revision) was adopted by the Indian Standards Institution on 20 September 1974, after the draft finalized by the Civil Works Measurement Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Measurement occupies a very important place in planning and execution of any civil engineering work from the time of first estimates to final completion and settlement of payments of the project. The methods followed for measurement are not uniform, and considerable differences exist between practices followed by one construction agency and another and also between various Central and State Government departments. While it is recognized that each system of measurement has to be specifically related to the administrative and financial organizations within the department responsible for work, a unification of the various systems at the technical level has been accepted as very desirable, especially as it permits a wider circle of operation for civil engineering contractors and eliminate ambiguities and misunderstandings arising out of inadequate understanding of various systems followed.

0.3 Among various civil engineering items, measurement of building had been first to be taken up for standardization and this standard having provisions relating to all building works, was first published in 1958 and revised in 1964.

0.4 In the course of usage of this standard by various construction agencies in the country, several clarifications and suggestions for modifications were received and as a result of study, the Sectional Committee responsible for this standard decided that its scope, besides being applicable to building, should be expanded so as to cover also method of measurement applicable to other civil engineering works like industrial and river valley project works.

0.5 Since various trades are not related to one another, the Sectional Committee decided that each type of trade as given in IS : 1200-1964*

*Method of measurement of building works (*first revision*).

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be issued in different parts which will be helpful to the specific users in various trades. This part covering method of measurements of concrete works applicable to building as well as civil engineering works was, therefore, issued as a second revision in 1968.

0.6 This part is, therefore, intended to provide comprehensive guidance for measurement of concrete construction in wide field of building and civil engineering works including bridges, industrial structures, etc, taking into account in a large measure advanced practice of concrete construction. This, third revision, has been done so as to keep the provision as per latest practices.

0.7 This edition 4.2 incorporates Amendment No. 1 (December 1981) and Amendment No. 2 (February 1984). Side bar indicates modification of the text as the result of incorporation of the amendments.

0.8 For the purpose of deciding whether a particular requirement of this standard is complied with, final value, observed or calculated, expressing the result of a measurement, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) covers the method of measurement of concrete works in building and civil engineering works.

NOTE — The method of measurement of concrete work in roads, piling, wells and tunneling is covered respectively in IS : 1200 (Part XVII)†, IS : 1200 (Part XXIII)‡, IS : 1200 (Part XXIV)§ and IS : 1200 (Part XXV)¶.

2. GENERAL RULES

2.1 Clubbing of Items — Items may be clubbed together provided the break-up for such items is agreed to be on the basis of the detailed description of items stated in this standard.

2.2 Bill of Quantities/Items of Work — Items of work shall fully describe the materials and workmanship to represent work to be executed.

2.3 Description of Items — The description of each item shall, unless otherwise stated, be held to include where necessary, conveyance and delivery, handling, unloading, storing, fabrication,

*Rules for rounding off numerical values (*revised*).

†Method of measurement of building and civil engineering works: Part XVII Road work including airfield pavements (*second revision*).

‡Method of measurement of building and civil engineering works: Part XXIII Piling (*second revision*).

§Method of measurement of building and civil engineering works: Part XXIV Well foundations (*second revision*).

¶Method of measurement of building and civil engineering works: Part XXV Tunneling (*second revision*).

lowering, hoisting, all labour for finishing to required shape and size, setting, fitting and fixing in position, straight cutting and waste, disposal of packings, etc.

2.4 Dimensions — Unless otherwise stated all work shall be measured net in decimal system as fixed in its place as given in **2.4.1** to **2.4.3**. Any work done extra over the specified dimensions shall be ignored.

2.4.1 Dimensions shall be measured to nearest 0.01 m except for the thickness of slab which shall be measured to nearest 0.005 m.

2.4.2 Areas shall be worked out to nearest 0.01 square metre.

2.4.3 Cubic contents shall be worked out to nearest 0.01 cubic metre.

2.5 Booking of Dimensions — In booking dimensions, order shall be consistent and generally in sequence of length, width and height or depth or thickness.

2.6 Works to be Measured Separately — Works executed in following conditions shall be measured separately:

- a) Work in or under water,
- b) Work in liquid mud,
- c) Work in or under foul positions,
- d) Work under tides, and
- e) Work in snow.

2.6.1 In the case of work under tides the levels of high and low water tides shall be stated.

2.7 Measurement in Stages — Works shall be measured under the following categories in convenient stages stating the height or depth:

- a) Below ground/datum level, and
- b) Above ground/datum level.

NOTE — The ground/datum level shall be defined in each case.

3. LIME CONCRETE AND MUD CONCRETE

3.1 Works of lime concrete and mud concrete shall be fully described and measured in cubic metres.

4. CEMENT CONCRETE WORKS

4.1 General

4.1.1 Concrete works shall be measured under the following categories. Works in plain/reinforced/prestressed concrete shall each

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be measured separately. Works in precast and cast *in situ* concrete shall be kept separate:

- a) Bridges;
- b) Dams and spillways;
- c) Barrages and weirs;
- d) Canal works;
- e) Tunnels and shafts;
- f) Harbour, docks and marine works;
- g) Special structures, such as power house, overhead water reservoir, chimneys and shafts, towers, silos and similar other structures;
- h) Buildings; and
- j) Other structures not covered by (a) to (h) above.

4.1.2 *Units of Measurement* — Unless otherwise stated all concrete work shall be measured in cubic metres.

4.1.3 *Formwork* — Unless otherwise stated formwork shall be measured separately under IS : 1200 (Part V)-1972*.

4.1.4 *Finishes* — Fair finishing of exposed surfaces of concrete including hacking or roughening surfaces of concrete shall be included in the description. Special finishes other than those obtained through formwork shall be so described and measured separately in square metres.

4.1.5 *Reinforcement* — Unless otherwise stated reinforcement shall be measured separately [*see* IS : 1200 (Part VIII)-1974†]. Where concrete and reinforcement are measured as a composite item they shall be fully described indicating that supply of reinforcement is included in the item; in such cases items identical in other respects but varying in reinforcement shall be measured separately.

4.1.6 *Special Concrete* — Concrete processed in special manner, such as cooled, heated, cellular, expansive and heat resisting shall be fully described and measured separately.

4.1.7 All plain, rebated, grooved, locking and tongued joints shall be included in the description.

4.1.8 No deductions shall be made for the following:

- a) Ends of dissimilar materials for example, beams, posts, girders, rafters, purlins, trusses, corbels and steps up to 500 cm² in cross-section;

*Method of measurement of building and civil engineering works: Part V Formwork (*second revision*).

†Method of measurement of building and civil engineering works: Part VIII Steel and iron work (*third revision*).

- b) Opening up to 0.1 m^2 or as specified;
- c) Volume occupied by reinforcement;
- d) Volume occupied by pipes, conduits, sheathing, etc, not exceeding 100 cm^2 each in cross-sectional area or as specified;
- e) Small voids, such as the shaded portions in Fig. 1, when these do not exceed 40 cm^2 each in cross-section;
- f) Moulds, drip moulding, chamfers, splays rounded or coved angles, beds, grooves and rebates up to 10 cm in width or 15 cm in girth; and
- g) Stops, mitres, returns, rounded ends, junctions, dishings, etc, in connection with linear or super labours.

NOTE — In calculating area of an opening, the thickness of any separate lintel or sill shall be included in the height. No extra labour for forming such openings or voids shall be measured.

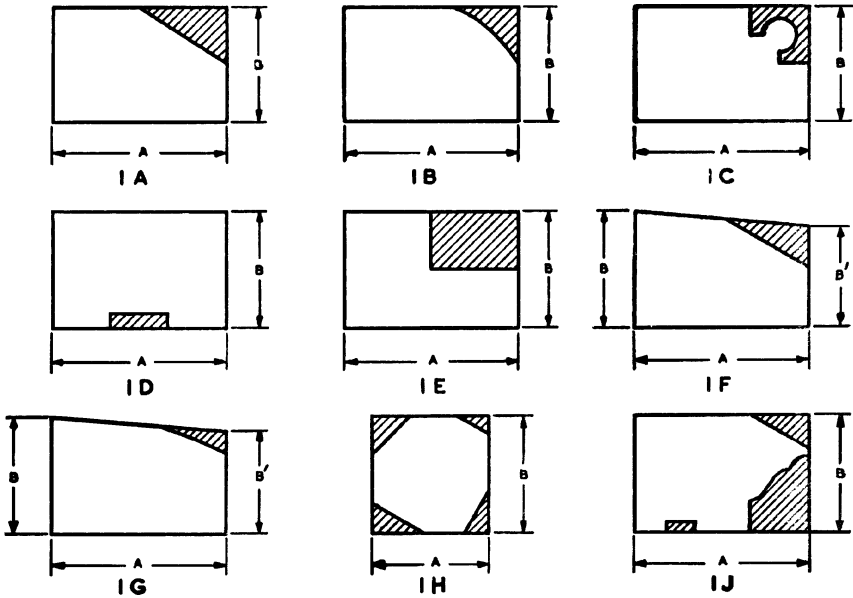


FIG. 1 SHADED PORTION SHOWING SMALL VOIDS

4.2 Reinforced/Plain Cement Concrete (Cast *In Situ*)

4.2.1 Concrete cast *in situ* shall be classified as follows:

- a) Foundations, footings, bases for columns;

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- b) Walls (any thickness) including attached pilasters, buttresses, plinth and string courses, fillets, etc;
- c) Slabs, supported on wall/beams/columns, landings, balconies, canopies, bridge slabs;
- d) Slabs other than those specified in (c);
- e) *CHAJJAS* including portions bearing on the wall;
- f) Lintels, shelves, beams and bressumers;
- g) Columns, piers, abutments, pillars, posts and struts;
- h) Staircase including stringer beams but excluding landings;
- j) Balustrades, newels and railing;
- k) Spiral staircases (including landing);
- m) Arches;
- n) Domes, vaults;
- p) Shell roof, arch rib and folded plates;
- q) Chimneys and shafts;
- r) Canal lining;
- s) Ballast walls, retaining walls, return walls;
- t) Concrete filling to precast components;
- u) Kerbs, steps and the like;
- v) String or lacing courses, parapets, copings, bed block, anchor blocks, plain, window sills and the like;
- w) Cornices and moulded window sills; and
- y) Louvers, fins, fascia.

NOTE — All projections, etc, shall be included in the main items.

4.2.2 *Concrete in Columns and Beams*

4.2.2.1 Columns shall be measured from top of column base to underside of first floor slab and subsequently from top of floor slab to underside of floor slab above.

4.2.2.2 In case of columns for flat slabs, flare of column shall be included with column for measurement.

4.2.2.3 Beams shall be measured from face to face of columns and shall include haunches, if any, between columns and beams. The depth of beams shall be measured from bottom of slab to bottom of the beam except in case of inverted beam where it shall be measured from top of slab to top of beam.

4.2.3 *Concrete in CHAJJAS* — The *CHAJJA* shall be measured inclusive of bearing. When *CHAJJA* is combined with lintel, beam or slab, it shall be measured as clear projection.

NOTE — The projected reinforced cement concrete member of average thickness not exceeding 100 mm shall be treated as *CHAJJA*; exceeding 100 mm shall be measured as slab [see 4.2.1 (c)].

4.2.3.1 Whenever vertical fin(s)/facia(s) and *CHAJJAS* are combined, *CHAJJAS* shall be measured clear between fin(s)/facia(s). The vertical fin(s) and facia(s) shall be measured through.

4.2.4 *Forming Cavity in Wall*

4.2.4.1 Forming of cavity shall be measured in square metres. The description shall state the width of cavity, the material, size, shape of ties and their number per square metre.

4.2.4.2 Measurements of cavity shall be taken along a plane at centre of cavity; deduction being made for all openings and solid portion of walls.

4.2.4.3 Labour and material for closing cavities at the jambs, sills and heads of openings shall be described and measured separately in running metres.

4.2.4.4 Items shall include use of cores for keeping cavity clear, uniform, and forming the requisite weep and vent holes.

4.2.5 *Concrete Casing to Beams and Steel Stanchions*

4.2.5.1 Concrete casing to steel joists or beams, steel stanchions, etc, shall be measured in cubic metres.

4.2.5.2 Volume occupied by joists shall not be deducted except in the case of boxed stanchions or girders, in which case boxed portion only shall be deducted.

4.2.6 *Surface Channels*

4.2.6.1 Concrete in channel shall be measured in cubic metres. Volume of channel shall be deducted from the concrete. Where shape of cross-section is round, elliptical or oval, area of section shall be taken as three-fourth of the width at top, multiplied by average depth at centre.

4.2.6.2 Forming channels in concrete shall be measured in running metres and inner girth stated.

4.2.6.3 Channel, finished fair or formed in spade finish to receive lining of brick, concrete or stone, etc, shall be measured separately.

4.3 Reinforced/Plain Concrete—Precast — Precast concrete works shall include use of mould, finishing faces and supply of reinforcement as described. Mix and ingredients of setting mortar, providing and fixing inserts, if required, for fixing at site and finishing shall be stated. Alternatively, reinforcement may be measured separately. Unless otherwise stated hoisting and setting in position shall be included in item. The work shall be classified and measured as indicated in Table 1. Each item of work shall be fully described.

TABLE 1 MEASUREMENT REINFORCED/PLAIN CONCRETE — PRECAST COMPONENT

(Clause 4.3)

(1)	(2)	(3)
SL No.	CLASSIFICATION	METHOD OF MEASUREMENT
i)	Wall panel, floor/roof slabs	In square metres
ii)	Beams unit and columns, trusses, etc	In running metres or numbers
iii)	Channel unit and purlins	In running metres or numbers
iv)	String or lacing courses, copings, bed plates, anchor blocks, plain window sills, shelves louvers, steps, staircases, etc	In running metres or numbers
v)	Kerbs, edgings, etc	In running metres or numbers
vi)	Solid blockwork	In cubic metres or square metres
vii)	Hollow blockwork	In cubic metres or square metres
viii)	Light weight partitions	In square metres stating the thickness
ix)	Door/window frames	In running metres stating the size
x)	Waffle units	In square metres or numbers
xi)	Water tank	In numbers
xii)	<i>JALLIES</i>	In square metres of opening filled stating thickness
xiii)	Fencing posts	In numbers or cubic metres
xiv)	Folded slab	In cubic metres

4.3.1 Plain and moulded work shall be measured separately.

4.3.2 Any finishing work on precast component shall be fully described and measured separately in square metres.

4.3.3 *Fencing Posts*

4.3.3.1 Concrete fencing posts, corner posts, straining or terminal posts and struts shall be classified according to size as follows:

- a) Those having an average sectional area not exceeding 100 cm^2 ,
- b) Those having an average sectional area exceeding 100 cm^2 but not exceeding 250 cm^2 , and
- c) Those of an average area over 250 cm^2 .

4.3.3.2 The item shall include forming of chamfered or rounded angles, and flat, splayed, rounded or mitred tops. Holes for wire or nails and/or building in fastenings shall also be included.

4.4 Prestressed Concrete — Cast *In situ* — Prestressed concrete work cast *in situ* shall be fully described.

4.4.1 Concrete in structural members, such as columns, beams and slabs shall each be measured separately.

4.4.1.1 Members cast in sections (that is not in one continuous operation) shall be fully described.

4.4.2 Forming and grouting or sealing ducts or grooves shall be measured in running metres fully describing size and other particulars of sleeves (or sheathing), temporary supports required in formation of ducts and composition of grout.

4.4.3 Forming and grouting the air-holes at ends, middle or sides or in any other position of ducts shall be included in the description of item.

4.4.4 Filling in the jacking or anchoring recesses shall be described stating finish to exposed surface or filling and measured separately in cubic metres.

4.4.5 Supplying, fixing and tensioning steel wires/strands/or cables (measured between anchorages) shall be measured in kilograms stating ultimate strength and proof stress and size of wire or cable. Each size shall be measured separately. No allowance shall be made for extra lengths in anchorages or elsewhere. The number of strands in each cable, type of central core, and type of sheathing if any to wires shall be stated. De-greasings, straightening, cutting to lengths and assembling wires and cables, cones, wedges, anchor-plates, spacers, distance pieces and other expandable items shall be deemed to be included with main item.

4.5 Prestressed Concrete — Precast — Prestressed concrete precast works shall be fully described.

4.5.1 Formwork or moulds for precast units and for forming anchorage pockets shall be deemed to be included with items.

4.5.2 Precast units shall be enumerated stating number, size, length, method of fixing and bedding. Unless otherwise stated, hoisting, transportation, assembly and setting in position shall be included in item. The classification shall be as follows:

- a) Pre-tensioned in the mould;
- b) Post-tensioned on ground after casting;
- c) Cast in section, assembled and post-tensioned before erection;
- d) Post-tensioned after hoisting but capable of self-support;
- e) Cast in sections for assembly *in situ* and post-tensioned after erection; and
- f) Post-tensioned after hoisting but requiring support until tensioning is completed.

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4.5.3 Cores, wires, strands and cables for post-tension members shall be measured as in 4.4.5. In case of pre-tension members, these items shall be included in the main item.

4.6 Miscellaneous Items

4.6.1 *Expansion Joints* — Expansion joints in floors, roofs and walls shall be described as including all formwork and labour necessary to form joint and shall be measured in running metres stating depth and width of joint. Alternatively, these may be measured in square metre stating the width of the joint.

4.6.1.1 Material used in filling and or for covering shall be fully described and measured separately in running metres.

4.6.1.2 Where sheet of copper, brass, aluminium or of any other material is used, it shall be fully described and measured in running metres.

4.6.2 Damp-proof course in concrete shall be described and measured in square metres stating thickness. Item shall include formwork and fair finish to edges and also levelling and preparing of brickwork or stone masonry to receive damp-proof course. Horizontal and vertical damp-proof courses shall each be measured separately.

4.6.3 *Waterproofing Concrete*

4.6.3.1 Waterproofing material used for waterproofing of concrete shall be described stating quantity of material to be used and measured separately in litres or kilograms.

4.6.3.2 Surface treatment of concrete shall be measured in square metres stating number of coats or dressings and proportion of waterproofing material to water.

4.6.4 *Guniting* — Guniting shall be fully described and finished surface measured in square metres.

4.6.5 *Pack/Pressure Grouting*

4.6.5.1 *Grout Holes* — The length of grout holes drilled either for pack grouting or pressure grouting through concrete shall be measured in running metres. Grout holes drilled through plate steel liners shall, however, be enumerated separately.

4.6.5.2 *Grout Pipes and Fittings* — Grout pipes and fittings provided for grouting shall be measured in kilograms and weight of all pipes and fittings shall be derived either by actual weighment or from known weights and lengths.

4.6.5.3 *Water Pressure Testing* — Measurement for water pressure testing shall, where necessary, be made separately for each hole and enumerated.

4.6.5.4 Measurement for grouting shall be made on basis of the weight of cement in grout actually forced into holes. Stone dust and other additions, if used, shall be measured separately in loose dry state before mixing and shall be measured by boxes of approved size and design.

4.6.6 *Grouting Stanchion Bases* — Cement grouting under plates of stanchion or precast concrete column or steel grillages shall be measured in square metres and its mix stated.

4.6.7 *Holding Down Bolts* — Grouting in of holding down bolts and the temporary boxings or wedges to form holes for the same shall be enumerated. Depth and height of the hole and mix shall be stated and grouting included in description.

4.6.8 *Cutting in Concrete*

4.6.8.1 Work involving cutting, or sinking into existing concrete shall be classified as follows:

- a) Grooves, chases and like shall be measured in running metres stating girth; and
- b) Holes, mortices and openings shall be measured per centimetre of depth of cutting and shall be classified as follows:
 - 1) Up to 250 cm^2 in area, and
 - 2) Exceeding 250 cm^2 and up to and including 0.1 m^2 area.

NOTE — Area shall be reckoned as the net area required and not necessarily the area actually cut.

4.6.8.2 Cutting opening exceeding 0.1 m^2 in area shall be measured in cubic metre and items shall include provision for fixing and removal of existing support and temporary support.

4.6.8.3 Cutting of existing reinforced cement concrete surfaces and exposing reinforcement without damaging the same shall be measured in square metres stating depth.

4.6.9 *Toothing and Bonding* — Where new concrete walls are bonded to existing walls an item of labour and material in cutting, toothing and bonding shall be measured in square metres.

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