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METHOD OF MEASUREMENT OF WORKS IN RIVER VALLEY PROJECTS (DAMS AND APPURTENANT STRUCTURES)

PART IV CONCRETE WORKS

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Method of Measurement of Works of River Valley Projects, BDC 69

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Indian Standard

METHOD OF MEASUREMENT OF WORKS IN RIVER VALLEY PROJECTS (DAMS AND APPURTENANT STRUCTURES)

PART IV CONCRETE WORKS

0. FOREWORD

0.1 This Indian Standard (Part IV) was adopted by the Indian Standards Institution on 29 January 1980, after the draft finalized by the Method of Measurement of Works of River Valley Projects Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 In measurements of quantities in construction of river valley projects a large diversity of methods exists at present, according to local practices. This lack of uniformity creates complication regarding measurements and payments. The estimator is also left in doubt as to the true meaning and intention of items in the schedule of work. This standard is intended to provide a uniform basis for measuring concrete works in the construction of river valley projects.

0.2.1 The provisions contained in this standard will generally have precedence over the provisions in IS : 1200 (Part II)-1974*. However, the provisions of both the standards may be considered complimentary and supplementary to each other.

0.3 In reporting the result of measurements made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960†.

1. SCOPE

1.1 This standard (Part IV) covers the method of measurement of concrete works in river valley projects (dams and appurtenant structures).

2. GENERAL

2.1 The purpose of measurement of proposed work is preparation of bill of quantities for estimating and tendering. The purpose of measurement of executed work is assessment of value of work for payment. In either case the method of measurements should be such that it is fairly quick, reasonably accurate and amenable to check at any time.

*Method of measurement of building and civil engineering works : Part II Concrete works (*third revision*).

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

2.2 In case of measurement of proposed work, the dimensions are scaled or read from drawings and then worked up, that is, reduced to length, area, or volume in recognized units of measurements for the particular item. In case of assessment of executed work, the dimensions are measured in the field. Calculations of length, area, volume, weight, etc, are made on the basis of these dimensions and payments are made acoordingly. Where measurement of a number of units are the same it is the usual practice to take measurements of one unit and multiply the calculated length, area or volume by the number of units.

2.3 Measurements shall be taken to nearest centimetre including of levels. Fractions less than half shall be disregarded and fractions half and above are to be regarded as unity. Areas shall be worked out to nearest 0·01 m^2 and cubic contents shall be worked out to nearest 0·01 m^3. However, in measurement of repetitive nature, this practice shall be applied to the total of the item and not to individual unit. It is essential that measurements shall be as accurate as possible.

2.4 Measurements are closely linked with detailed drawings, description of items and specifications of the work. These should, therefore, be very clear and properly worded and the order of precedence shall be sanctioned drawings, approved specifications and specified description of items.

3. MEASUREMENT OF IRREGULAR AREAS AND VOLUMES

3.1 The irregular area shall be divided into a number of figures of known area, say, triangles, rectangles, etc. The remaining part (which cannot be formed into a triangle or a regular figure) may be evaluated by taking out average height drawn on a common base by *Simpsons Rule.*

3.2 In case of an irregular volume, the volume shall be determined by the *Prismoidal formula.*

4. MEASUREMENT OF CONCRETE WORKS

4.1 General

4.1.1 The concrete shall be fully described giving the strength at 28 days (grade of concrete), size of aggregate and location of placement of concrete.

4.1.2 If any tests are to be conducted both for material and for finished work, the same shall be specified and it shall be clarified if the same are to be separately measured or otherwise.

4.1.3 Any treatment of finished face of concrete beyond the ordinary process of laying shall be stated clearly. The measurement of work shall be in square metres.

4.1.4 Different types of concrete works, such as plain, reinforced and prestressed concrete having different strengths and sizes of aggregates shall be measured separately.

4.1.5 No deduction shall be made for the following:

a) Any opening of embedded material up to 0·05 m^2 in area;

b) Plates or the like where thickness does not exceed 100 mm and bearing does not extend over the entire area;

c) Blocks for holdfasts, holding down bolts and the like;

d) Reinforcement, rolled steel embedments, prestressing cable ducts, and prestressing anchorages; and

e) For chamfers provided, if any, less than 50 × 50 mm.

4.1.6 Works shall be measured under different categories in stages of 3 m stating the height above ground level or depth below ground level as the case may be, indicating the ground level.

4.2 Formwork and Centering — Formwork and centering may be measured separately or included in the concrete work but the method of measurement shall be clearly specified.

4.3 Reinforcement — Reinforcement may be measured separately or included in concrete work. In the later case, the item shall be fully described including the supply of reinforcement as percentage to the gross volume of concrete. In such cases, items identical in all other respects but varying in reinforcement percentages shall be measured separately.

4.4 Special Treatments — The concrete processed in a special manner, such as cooled, heated, cellular, expensive and heat-resisting concrete shall be fully described and measured separately.

4.4.1 *Special Coating* — Special coatings like felts shall be measured separately.

4.5 Concrete Work

4.5.1 The unit of measurement for mass concrete shall be in cubic metres.

4.5.2 Necessary staging, shoring, hoisting, etc (other than formwork if the same is measured separately), laying, ramming, vibrating, use of slurry if required, cleaning off, chipping, etc, shall be included in the item of work.

4.5.3 The measurement shall be made to the neat lines of structure as shown in the drawing or actually executed whichever is less.

4.5.4 In case of structures having base area 500 m^2 and above, the measurement shall be made according to pre-work and post-work levels dividing the area into small grids of 3 m square.

4.5.5 In measurement volume of embedded pipes, recesses, passages, chambers, openings, cavities, depressions, drains and niches and other metal works excluding reinforcement, bolts and HT cables, etc, having a cross-sectional area more than 0·05 m^2 shall be deducted.

4.5.6 For slurry or cement mortar required in construction joints, no separate measurement for its use shall be made as these form part of concrete.

4.6 Concrete in Foundation — The measurement of concrete in foundations shall be in cubic metres.

4.7 Extra Lift

4.7.1 An item of extra lift measured in cubic metres shall be given for all concrete works above 3 metres from the ground level in stages of 3 metres each inclusive of necessary staging, shoring, hoisting, etc.

4.7.2 Similarly, an item of extra descending measured in cubic metres shall be given for all concrete works more than 3 metres from the ground level and in stages of 3 metres each including necessary staging, shoring, etc.

4.8 Piers, Abutments, Columns, etc — Concrete work in piers, abutments, columns, etc, shall be fully described and measured in cubic metres as per following categories:

a) Rectangular or polygonal on plan,

b) Curved on plan to any radius, or

c) Any other type.

4.9 Channels in Concrete — The measurement shall be in running metres specifying the shape, width and average depth.

4.10 Concrete Walls — The measurement of concrete walls shall be in cubic metres.

4.11 Concrete in Beams, Braces, etc — Beams, braces, cantilevers, etc, shall be measured in cubic metres.

4.12 Concrete Casings in RSJ — The measurement shall be in cubic metres for the following cases and deduction shall be according to **4.1.5** and **4.5.5**.

4.13 Facing Work

4.13.1 Face work over finished concrete shall be measured in square metres with the description of the type of face blocks, mortar, bond and method of pointing. The volume of face block shall not be included in the main concrete work.

4.13.2 If stone face blocks are to be dressed, it shall be specified.

4.14 Strings, Cornices, etc — Strings, cornices and other similar projections shall be measured in running metres beyond the face of the concrete walls or beams with detailed description of the work to be done.

4.15 Band — Concrete work in bands shall be measured in running metres stating the thickness, if the width is less than 25 cm; otherwise in square metre.

4.16 Concrete in Suspended Slab

4.16.1 Concrete slabs used in floors and roofs shall be measured in cubic metres.

4.16.2 Sloped roofs and slabs shall be indicated and measured separately.

4.17 Concrete for Wells

4.17.1 The concrete for well kerb, plugging, well steining and well caps shall be measured in cubic metres specifying the grade of concrete to be used in each case.

4.17.2 The unit of measurement for sinking of wells shall be in running metres specifying the external diameter of the well as also the thickness of the steining including supply, erection, working of all plants, kenteledges, bailing out of water and sinking through different kinds of strata to be separately specified. The measurement shall be taken from the bottom of the kerb up to bottom of well cap.

4.18 Railing — Concrete work in railing shall be measured in running metres specifying the design and height of the railing.

4.19 Additives in Concrete — If any additive is required to be used for making concrete, the same shall be described stating quantity of the additives to be used and measured separately in litres or kilograms in addition to the quantity of concrete.

4.20 Guniting — Guniting shall be fully described and finished surface measured in square metres specifying the thickness.

4.21 Block-Outs

4.21.1 Block-outs in concrete work shall be measured in running metres specifying the shape of the block-outs including dimensions.

4.21.2 Filling work required to be done in block-outs shall be described in detail and measured in running metres.

4.22 Cutting Grooves — Cutting grooves shall be measured in running metres specifying the shape and size of cutting.

4.23 Cutting of Openings — Cutting of openings shall be measured in cubic metres and item shall include provision for fixing and removal of existing support and temporary support.

4.24 Surface Cutting — Cutting of existing concrete surface (plain or reinforced) without damaging the structure shall be measured in square metres stating depth of cutting.

4.25 Toothing and Bonding — When new concrete works are to be bonded to existing concrete works, an item of labour and material in cutting, toothing and bonding shall be measured in square metres.

4.26 Concrete in Diaphragm Wall

4.26.1 Concrete in diaphragm wall shall be measured in square metres (one vertical face only) specifying the thickness inclusive of cost of excavating trench, constructing the diaphragm wall; grouting of joints between adjacent points of diaphragm wall, supply of materials, labour, etc, and performance of all tests required to check the effectiveness of the diaphragm wall. The measurement shall be made for the area of the diaphragm wall excluding the top 0·5 metre required for trimming. The method of construction shall be specified clearly.

4.26.2 Wherever double walls with partitions are provided, they shall also be measured as described in **4.26.1** giving details of cross sections. This shall also indicate and include the type and method of filling in the spaces between the walls.

4.27 Miscellaneous Items — There will always be some locations or situations where prescribed measurement practices may not be possible to the adopted. In all such cases the quantity of concrete manufactured for placing in such locations and situations and actually placed shall be taken as the measurement in cubic metres. A few such situations are:

a) Bottom plugging of wells under water;

b) Concrete under deep water; and

c) Concrete in or under foul situations.