IS 9401 (Part 13) : 1992
(Reaffirmed 1997)

भारतीय मानक

नदी घाटी परियोजनाओं के कार्य मापन की पद्धतियाँ (बाँध और सम्बद्ध संरचनाएं)

भाग 13 भू और भरे बाँध

Indian Standard

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

PART 13 EARTH AND FILL DAMS

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Price Group 2

FOREWORD

This Indian Standard (Part 13) was adopted by the Bureau of Indian Standards, after the draft finalized by the Measurement of Works of River Valley Projects Sectional Committee had been approved by the River Valley Division Council.

In the measurement of works of river projects a large diversity of methods exist at present according to local practices. This lack of uniformity creates complications regarding measurements and payments. Keeping in view the large amount of financial outlay involved in river valley projects and also the fact that the authorities responsible for completing these projects, are of the state level or national level, it is felt that a suitable methodology is needed for adopting uniform practices towards the measurement of works so that the scope of complications and misinterpretation of items of work is reduced, as far as possible. This standard is being formulated in various parts so as to cover each type of work separately. This part is intended to provide a uniform basis for measuring the work done in respect of earth and fill dams.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

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

PART 13 EARTH AND FILL DAMS

1 SCOPE

1.1 This standard (Part 13) covers the method for measurement of earth and fill dams.

2 REFERENCES

2.1 The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	*Title*
9401 (Part 1) : 1982	Method of measurement of works in river valley projects (Dams and appurtenant structures) : Part 1 Excavation for foundation
9401 (Part 2) : 1982	Method of measurement of works in river valley projects (Dams and appurtenant structures) : Part 2 Dewatering
9401 (Part 3) : 1980	Method of measurement of works in river valley projects (Dams and appurtenant structures) : Part 3 Grouting
9401 (Part 6) : 1984	Method of measurement of works in river valley projects (Dams and appurtenant structures) : Part 6 Ventilation pipes and other embedded materials
9401 (Part 8) : 1985	Method of measurement of works in river valley projects (Dams and appurtenant structures) : Part 8 Instrumentation

3 GENERAL

3.1 In booking dimensions the order shall be consistent and generally in the sequence of length, breadth or width and height or depth or thickness.

3.2 Items may be clubbed together provided that the break-up of the clubbed items is agreed to be on the basis of the detailed descriptions of the items stated in the standard.

3.3 All work shall be measured net in the decimal system. Dimension shall be measured to the nearest 0·01 m areas shall be worked out to the nearest 0·01 m^2 and cubic contents shall be worked out to the nearest 0·01 m^3.

3.4 Work executed in the following conditions shall be measured separately:

a) Work in or under water

b) Work in or under foul positions/conditions

c) Work under tides

3.4.1 The levels of high and low water tides where occurring shall be stated.

3.5 The items of work shall fully describe the material and workmanship and accurately represent the work to be executed.

3.6 The following work shall not be measured separately and allowance for the same shall be deemed to have been made in the description of the main item:

a) Setting out work, profiles, bench marks, etc;

b) Site clearance such as cleaning grass and vegetation;

c) Unauthorized battering or benching of excavation;

d) Preparation of borrow areas;

e) Forming (or leaving) steps or ramps in the sides of deep excavation and their removal after measurement;

f) The labour and material required for taking cross sections; and

g) Bailing or pumping out of water in excavation from rain, if not measured separately.

NOTE — Dewatering, if measured separately, shall be according to Part 2 of this standard (*see* **2.1**).

4 CLASSIFICATION

4.1 The materials to be excavated from borrow areas shall be broadly classified as follows:

a) Those requiring blasting, and

b) Those that can be excavated without blasting.

5 EARTHWORK AND FILL

5.1 The measurement of earthwork and fill shall be done in cubic metres. The measurement taken shall be those of the authorized dimensions.

5.2 Irregular areas shall be divided into a number of figures of known area like triangles, rectangles, etc. The remaining part, which cannot be formed into regular figures may be evaluated by taking out average height drawn on a common base, by Simpson's Rule. In case of irregular volume the volume shall be determined by prismodial formulae.

The measurement of each classification of material (fill) shall be measured separately.

The actual measurement of fill shall be calculated by taking levels at suitable intervals (normally at 15 m or closer) of the original ground before the start of the work after site clearance and stripping, where required, and after compaction of the fill as envisaged in the schedule of work and the quantity of fill computed from these levels. Deductions shall be made from actual measurements in all classes of fills to arrive at a net measurement of filling based on pre-accepted deductions (stated as a percentage).

The compacted earthfill (done by means of rollers, etc) shall be measured separately in cubic metres and shall include formation of slope lines. The actual measurement shall be done as mentioned above and no deduction shall be made for settlement, shrinkage, etc. The volume of structures, specially compacted earthfill (*see* **5.2.1**) and other works, which are measured separately, shall be deducted. If any tests are to be conducted in respect of material or finished work the same shall be specified and included in the item.

5.2.1 The specially compacted earthfill (in which rollers, etc, cannot be used) shall be measured in cubic metres separately as mentioned above.

5.3 The item shall include treatment of foundation, laying of layers in uniform specified thickness with specified degree of compaction, removal of roots and vegetations, breaking clods and dressing, preparation of slopes, watering and conducting specified tests with all leads and lifts.

6 EXCAVATION IN FOUNDATION

6.1 It shall be measured according to Part 1 of this standard (*see* **2.1**).

7 STRIPPING AND BENCHING

7.1 The stripping and benching measured, shall be of the actual work done which shall include all items like excavation, dressing of benches and foundations, rehandling and removal of materials from site.

8 CUT-OFF TRENCH

8.1 The measurement shall be made as in **5** as per actual work done and shall include items of work including excavation of earth, transportation, breaking clods, picking of roots levelling and laying, watering and compaction. It shall include leads and lifts of disposal and shoring where necessary.

9 FOUNDATION GROUTING

9.1 The method of measurement shall be according to Part 3 of this standard (*see* **2.1**).

10 CLAY BLANKET, ETC

10.1 The work shall be measured as in **5**, the gross quantity of hearting, casing, clay blanket, etc, as the case may be, shall be based on these cross sections, in which also shall be indicated separate zones of hearting, casing, clay blanket, filter material, pitching, etc, for facility of arriving at the correct quantity of hearting and casing, etc, that went into the embankment.

11 FILTER

11.1 Measurement of filter shall be done by volume in cubic metres. The description shall indicate the type of material, the method of tamping to the requisite dimensions and shall include supply of material and labour necessary for completing the work. The excavation, if any, shall be measured separately as in **5**.

12 RIPRAP

12.1 The measurement of riprap shall be made in volume in cubic metres of the quantity placed. The description of item shall include all operations, type of material and method of placing. Excavation, if done, shall be measured separately as in **5**.

13 TURFING

13.1 It shall be measured in square metres. The description of items shall include all operations including supply and transportation of materials, growing grass or vines after placing rich soil of specified thickness and, if required, watering after placing specified quantity of manure.

14 DRAINAGE SYSTEM

14.1 Horizontal Drain

The perforated pipe for horizontal drain shall be measured according to Part 6 of this standard (*see* **2.1**). The excavation shall be measured separately as in **5.**

14.2 Vertical Drain

Drilling of drainage holes shall be measured in linear metres of the depth from the inside face of the concrete, including the portion of the holes formed by pipe inserts, if used. The description of the item shall include types of the pipes and all labour required to complete the work.

14.3 Rock Toe

It shall be measured in cubic metres of the volume placed to the lines and grades as shown in the drawing. The description of the item shall include all materials, operations including the labour required for forming and transportation with all lead and lift.

14.4 Toe Drain

The measurement of toe drain shall be in linear metres. The description of item shall include the type of the material used, the method of embedding in filter, preparing and placing bedding materials under and around the pipe/tiles, making joints to the pipe and placing backfill in trenches outside the limits of the dam embankment. Excavation, if necessary, shall be measured separately as in **5.**

15 RELIEF WELL

15.1 The measurement of relief wells shall be in linear metres of the depth of the well. The description of the item shall specify the type of material used, type of various well screen, bottom plug, bedding, gravel pack, making of the well structure, and placing backfill in the excavated area outside the embankment. Excavation, if required, shall be measured separately as in **5.**

16 INSTRUMENTATION

16.1 Instrumentation as applicable shall be measured according to Part 8 of this standard (*see* **2.1**).

17 REMOVAL OF TREES AND HEDGES

Clearing areas of shrubs, brush-wood and small trees not exceeding 30 cm in girth, shall be measured in square metres and shall be deemed to include removal and disposal.

Cutting down trees exceeding 30 cm girth and over up to 100 cm, shall be enumerated as one item. The cutting down of trees exceeding 100 cm girth shall be enumerated separately stating the girth. The girth shall be measured at 1 m above ground level. The item shall include lopping of branches as well as removal and disposal.

Cutting down hedges and removal of fences shall be fully described and measured in running metres and shall be deemed to include removal and disposal.

Digging out of roots, including stacking shall be measured separately and enumerated.

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