इंटरनेट मानक

Disclosure to Promote the Right To Information

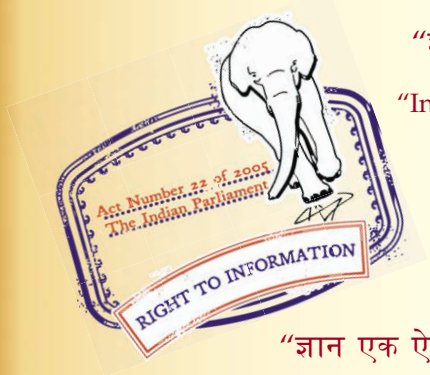
Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 1200-1 (1992): Methods of measurement of building and civil engineering works, Part 1: Earthwork [CED 44: Methods of Measurement of Works of Civil Engineering]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"



"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

PROTECTED BY COPYRIGHT

IS 1200 (Part 1) : 1992
(Reaffirmed 2002)

भारतीय मानक

भवन निर्माण और सिविल इंजीनियरी कार्यों की मापन पद्धतियाँ

भाग 1 मिट्टी-कार्य

(चौथा पुनरीक्षण)

Indian Standard

METHODS OF MEASUREMENT OF BUILDING AND CIVIL ENGINEERING WORKS

PART 1 EARTHWORK

(Fourth Revision)

First Reprint MAY 1994

UDC 69.003.12:69.021.13:624.13

© BIS 1992

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1992

Price Group 2

Methods of Measurement of Works of Civil Engineering (Excluding River Valley Projects) Sectional Committee, CED 44

FOREWORD

This Indian Standard (Part 1) (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Methods of Measurement of Works of Civil Engineering (Excluding River Valley Projects) Sectional Committee had been approved by the Civil Engineering Division Council.

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

Among various civil engineering items, measurement of buildings was the first to be taken up for standardization and this standard having provisions relating to building work was first published in 1958 and was subsequently revised in 1964. In its second revision, the standard was issued in different parts corresponding to different trades in building and civil engineering works. The third revision of the standard was published in 1974.

This fourth revision has been brought out to incorporate the changes found necessary in light of usage of this standard and the suggestions made by various bodies implementing it.

For the purpose of deciding whether particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a measurement, 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

METHODS OF MEASUREMENT OF BUILDING AND CIVIL ENGINEERING WORKS

PART 1 EARTHWORK

(Fourth Revision)

1 SCOPE

This standard (Part 1) covers the method of measurement of earthwork in building and civil engineering works.

2 GENERAL RULES

2.1 Clubbing of Items

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

2.2 Booking of Dimensions

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

2.3 Measurements

Unless otherwise stated hereinafter all work shall be measured net in decimal system, as fixed in position as given below:

a) Each dimension shall be measured to the nearest 0·01 m;

b) Areas shall be worked out to the nearest 0·01 m^2; and

c) Cubical contents shall be worked out to the nearest 0·01 m^3.

2.4 Work to be Measured Separately

Work executed in the following conditions shall be measured separately:

a) Work in or under water,

b) Work in or under foul situations,

c) Work under tidal conditions, and

d) Work in snow.

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

2.5 Bills of Quantities

The bills of quantities shall fully describe the materials and workmanship, and accurately represent the work to be executed.

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

a) Setting out works, profiles, etc;

b) Site clearance, such as cleaning grass and vegetation;

c) Unauthorized battering or benching or excavation;

d) Forming (or leaving) 'dead men' and 'tell tales' in borrow pits and their removal after measurements;

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

f) Excavation for insertion of planking and strutting;

g) Unless otherwise specified, removing slips or falls in excavations; and

h) Bailing out or pumping of water in excavation from rains.

2.7 Special pumping other than what is required for conditions given in **2.4** (a) and included in **2.6** (h) and tube well/well point dewatering where resorted to, shall each be measured separately for all stages of pumping, including intermediate stages unless otherwise stated, in K.W. Hrs, or HP Hrs, against separate specific provision(s) made for the purpose.

3 CLASSIFICATION

The materials to be excavated shall be classified as follows unless otherwise specified.

a) *Soft/Loose Soil* — Generally any soil which yields to the ordinary application of pick and shovel, or to *PHAWRA*, rake or other ordinary digging implement; such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay peat, etc.

b) *Hard/Dense Soil* — Generally any soil which requires the close application of picks, or jumpers or scarifiers to loosen; such as stiff clay, gravel, cobblestone, water bound macadem and soling of roads.

NOTE — Cobblestone is the rock fragment usually rounded or semi-rounded having maximum diameter in any one direction between 80 mm and 300 mm.

c) *Mud* — A mixture of soil and water in fluid or weak solid state.

d) *Soft/Disintegrated Rock (Not Requiring Blasting)* — Rock or boulders which may be quarried or split with crowbars. This will also include laterite and hard conglomerate.

e) *Hard Rock (Requiring Blasting)* — Any rock or boulder for the excavation of which blasting is required.

NOTE — Boulder is a rock fragment usually rounded by weathering disintegration and exfoliationor abrasion by water or ice, having maximum diameter in any direction of more than 300 mm, round lying loose on the surface or embedded in river bed. soil, talus, slope wash and terrace material of dissimilar origin.

f) *Hard Rock (Blasting Prohibited)* — Hard rock requiring blasting as described under (e) but where blasting is prohibited for any reason and excavation has to be carried out by chiselling, wedging or any other agreed method.

NOTE — A broad classification of soil and rock for earthwork suitable for conditions generally occurring in practice has been provided where necessary, further sub-classification may be done to suit individual cases depending on the properties of the substrate.

4 METHOD OF MEASUREMENT OR VARIOUS TYPES OF EXCAVATION

4.1 The measurement of earthwork shall be done in cubic metres, unless otherwise mentioned. The measurements to be taken shall be those of the authorized dimensions from which soil has been taken out and shall be measured without allowance for increase in bulk.

4.2 Excavation in Earthwork Including Rock Cutting

The measurement of excavation in earthwork including rock cutting shall be made as follows:

a) Where the excavation is in trenches or from borrow pits in fairly uniform ground, the measurements of cutting trenches or borrow pits shall be made. 'Dead men' or 'tell-tales' may be left at suitable intervals to determine the average depth of excavation.

b) Where the ground is not uniform, levels shall be taken before the start, after site clearance and after the completion of the work and the quantity of excavation in cutting computed from these levels.

c) Where soft/disintegrated rock and hard rock are mixed the measurement for the total quantity shall be made by method (a) and/or (b) given above. The hard rock excavated shall be stacked and measured in stack. The quantity of the hard rock excavated shall be arrived at by applying pre-accepted deductions (stated as a percentage) for voids. From the total quantity of the mixture the quantity of hard rock excavated thus arrived at shall be deducted to work out the quantity of the soft/disintegrated rock excavated.

d) Where hard/dense soil, soft/disintegrated rock and hard rock are mixed, the measurement for the total quantity shall be made by methods (a) and/or (b) given above. If possible after the removal of the hard/dense soil the levels of the exposed rocks urface should be taken and the quantity of the hard/dense soil removed, worked out from the difference between the original levels and new levels. If this is not possible the excavation should be completed leaving tell-tales and from the cross-section of these tell-tales, the area of the hard/dense soil excavated should be worked out and then the volume of the hard/dense soil excavated arrived at. Quantity of hard dense soil should then be deducted from the total quantity of hard rock and soft/disintegrated rock. The quantities of hard rock and soft/disintegrated rock should then be separated as in (c) above by stacking the hard rock separately.

e) Where soft/loose soil, hard/dense soil, soft/disintegrated rock and hard rock are mixed, the measurements of the entire quantity shall be made by methods (a) and/or (b) given above. The separate quantities of soft/loose soil and hard/dense soil shall be worked out from the cross-section based on dead men or tell-tales as mentioned in (d) in case of hard/dense soil. The total quantity of soft/loose and hard/dense soil shall then be deducted from the total excavation to arrive at the total quantity of rock excavated. The quantities of soft/disintegrated rock and hard rock excavated be worked out separately as in case of (c) above.

4.2.1 Wherever it is not possible or convenient to take measurements from borrow pits or cutting, excavation shall be worked out from 'filling' (*see* **4.3**).

4.2.2 Dressing or trimming sides of excavations and levelling or grading and ramming of bottoms shall be described with the item of excavation except in the case of rough excavation (*see* **4.5**).

4.2.3 All excavation shall be measured in successive stages of 1·5 m stating the commencing level. This shall not apply to cases where no lift is involved as in hillside cutting.

4.2.4 All excavation shall generally be described as 'excavate and get out'. Getting out shall include throwing the excavated earth at least one metre or 1/3 depth (*see* Note) of excavation whichever is more clear of edge of the excavation. The subsequent disposal of surplus excavated material shall either be stated as a separate item or included with the item of excavation stating the lead.

NOTE — In special cases where disposal area is limited or where application of this requirement is impracticable, the person in-charge may adopt a berm of reduced width in any case not less than 600 mm provided the material being excavated is sufficiently stable and shoring is designed to carry the additional loads.

4.2.5 In case of the following works, authorized quantities (calculated on the basis of authorized working space) or those actually excavated, whichever, are less, shall be measured:

a) In work which requires formwork;

b) In work which will be covered externally with a damp proof covering;

c) In work which will be covered externally with protective masonry work of brick, stone, precast concrete, etc;

d) Trenches which are to receive post tensioned concrete ground beams;

e) Special works like guniting, etc; and

f) In work which requires workmen to operate from outside.

4.2.5.1 Authorised working space shall be special in each case. Where authorised working space is not so specified the following shall apply:

600 mm measured from the face of substructure (including protective measures, if any) at lowest level, where extra working space is required. In addition, for item (d) given in **4.2.5** (d) the extra length at each end shall be 1·5 m.

4.2.6 Battering and benching shall be specified and measured along with main item of excavation.

4.3 Filling

4.3.1 Actual measurement of fill shall be calculated by taking levels of the original ground before start of the work after site clearance and after compaction of the fill at suitable intervals and the quantity of fill computed from these levels.

4.3.2 Deductions shall be made from actual measurements in all cases of fills except for floors as in **4.12** to arrive at net measurement of filling based on pre-accepted or specified deduction (stated as percentage) for voids.

4.3.3 If the filling is obtained from the borrow pits it shall be measured from the borrow pits as 'excavation' (*see* **4.2**).

4.4 Surface Dressing

Trimming of natural ground, excavated surface and filled up area to remove vegetation and/or small inequalities not exceeding 150 mm deep shall be described as surface dressing and measured in square metres.

4.5 Rough Excavation

Excavation not requiring dressing of sides and bottom and reduction to exact levels, such as winning earth from borrow pits, hillside cutting, etc, shall be described as rough excavation and measured in cubic metres.

4.6 Surface Excavation

Excavation exceeding 1·5 m in width as well as 10 m^2 on plan but not exceeding 300 mm in depth shall be described as 'surface excavation' and measured in square metres.

4.7 Excavation Over Area

Excavation exceeding 1·5 m in width as well as 10 m^2 on plan, and 300 mm in depth shall be described as excavation over areas and measured in cubic metres.

4.8 Excavation in Trenches for Foundations and for Pipes, Cables, etc

Excavation in trenches for foundations and for pipes, cables, etc, not exceeding 1·5 m in width and for shafts, wells, cesspits and the like not exceeding 10 m^2 on plan shall be so described and measured in cubic metres.

4.8.1 The authorized quantities (calculated on the basis of authorized width) or those excavated whichever are less shall be measured in case of excavation for pipes, cables, etc. For the purpose of calculating the contents, cross-sections shall be taken at suitable intervals. The authorised width shall be specified in each case. (Relevant Indian Standards, if any, may be consulted for guidances).

4.8.2 *Excavation Trenches for Foundations*

For depth exceeding 1 m, an allowance of 50 mm/m depth for each side of trench shall be added to the specified width.

4.9 Post Holes

Independent post holes (or similar holes), each not exceeding 0·5 m^3, shall be enumerated and the description shall include return, fill and ram and removal of surplus spoil.

4.10 Return, Fill and Ram

Returning, filling and ramming of excavated earth where not described with the item of excavation shall be measured in cubic metres and shall include spreading in layers not exceeding 200 mm in depth, watering, well ramming and levelling.

4.11 Embankments

Forming embankments and filling to make up levels shall be measured in cubic metres and shall include the formation of slopes. If the material is to be deposited in layers, this shall be described stating the thickness of such layers. The method of consolidation shall be described. The measurement shall be taken in successive stages of 1·5 m stating commencing level. In case of special soils like marine clay, the allowance for change in the original levels due to load of an embankment shall be specified.

4.12 Filling under floors shall be measured in cubic metres and shall include spreading in layers not exceeding 200 mm in depth watering, well ramming and levelling.

5 LEAD AND LIFT

5.1 Lead

The distance for removal shall be measured over the shortest practicable route and not necessarily the route actually taken. Distances not exceeding 250 m shall be measured in units of 50 m. Distance exceeding 250 m and not exceeding 500 m shall be measured as a separate item. Leads beyond 500 m shall be measured in units of 500 m, that is, there will be one item for lead exceeding 500 m and not exceeding 1 000 m, another item for lead exceeding 1 000 m and not exceeding 1500 m and so on up to 5 km. Where the lead exceeds 5 km, it will be measured in units of 1 km, half km and above be reckoned as one and less than half kilometre shall be ignored.

5.1.1 The description of items shall include loading and unloading.

5.1.2 If spoil heaps requiring re-handling have become consolidated due to passage of time or any other reason, it shall be so stated and such heaps shall be measured separately.

5.1.3 For the purpose of measurements of lead, the area excavated shall be divided into suitable blocks and for each block the distance from the centre of the block to centre of placed earth pertaining to this block shall be taken as lead.

5.2 Lift

Lift shall be measured from ground level. Excavation up to 1·5 m depth below ground level and depositing excavated material on the ground shall be included in the item of earthwork for various kinds of soil. Extra lift shall be measured in unit of 1·5 m or part thereof. Obvious lifts shall only be measured; that is lifts inherent in the lead due to ground slope shall not be measured (except for lead up to 250 m).

When earth has to be carried over a bank/ obstruction and dumped beyond it, the lift shall be the difference in level between the centre of gravity of the excavated earth and the top of bank/construction.

6 PLANKING AND STRUTTING

6.1 The planking and strutting required to uphold the face of excavated earth, etc, shall be measured in square metres of face supported, and grouped; separately in stages of 1·5 m.

6.1.1 The description shall include use and waste of all necessary timber work, including wales, struts and open or close poling boards, their fixing and subsequent removal.

6.1.2 Planking and strutting to the following shall be measured separately:

a) Trenches;

b) Areas (the description shall include use and waste of raking shores); and

c) Shafts, wells, cesspits, manholes and the like.

6.1.3 Where tightly driven close butt jointed sheeting is necessary as in the case of running sand, the item shall be measured separately and the packing of cavities behind sheeting with suitable material shall be included in description of the item

6.1.4 Planking and strutting required to be left permanently in position shall be measured separately.

7 REMOVING TREES AND HEDGES

7.1 Clearing of shrubs, brushwood, small trees not exceeding 300 mm girth shall be measured in square metres, and shall deem to include removal and disposal. The girth shall be measured at 1 m above ground level.

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

7.3 Cutting down trees of 300 mm girth and over up to 1 000 mm girth shall be enumerated as one item. The cutting down of trees exceeding 1 000 mm in girth shall be enumerated stating the girth. The girth shall be measured at one metre above ground level. The item shall include lopping of branches and removal and disposal.

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

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc : No CED 44 (5037)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	{331 01 31, 331 13 75
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	{37 84 99, 37 85 61, 37 86 26, 37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	{53 38 43, 53 16 40, 53 23 84
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	{235 02 16, 235 04 42, 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	{632 92 95, 632 78 58, 632 78 91, 632 78 92

Branches : AHMADABAD, BANGALORE, BHOPAL, BHUBANESHWAR, COIMBATORE, FARIDABAD, GHAZIABAD, GUWAHATI, HYDERABAD, JAIPUR, KANPUR, LUCKNOW, PATNA, THIRUVANANTHAPURAM.

Reprography Unit, BIS, New Delhi, India