

**भारतीय मानक ब्यूरो**
BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG, NEW DELHI 110002

व्यापक परिचालन मसौदा

हमारा संदर्भ: सीईडी 44/टी-27

15 मार्च 2024

तकनीकी समिति : सिविल इंजीनियरिंग के कार्यों के मापन की पद्धतियाँ (जल संसाधन विकासको छोड़कर) विषय समिति, सीईडी - 44

प्राप्तकर्ता :

- क) सिविल इंजीनियरी विभाग परिषद्, सीईडीसी के सभी सदस्य
ख) सीईडी 44 व उसकी उपसमितियों, के सभी सदस्य
ग) रुचि रखने वाले अन्य निकाय

प्रिय महोदय/महोदया,

निम्नलिखित भारतीय मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 44 (25070)WC	भवन निर्माण और सिविल इंजीनियरिंग कार्यों की मापन पद्धतियाँ भाग 27 यांत्रिक उपकरणों द्वारा किया गया भूमि कार्य का भारतीय मानक कार्यकारी मसौदा [IS 1200 (भाग 27) का दूसरा पुनरीक्षण] ICS 17.020; 91.040.01; 93.010

कृपया इस मानक के मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजे कि यदि यह मानक के रूप में प्रकाशित हो तो इस पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं।

सम्मतियाँ भेजने की अंतिम तिथि : **15 अप्रैल 2024**

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को उपरिलिखित पते पर संलग्न फॉर्मेट में भेजें या divya.s@bis.gov.in पर ईमेल कर दें।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा सम्बन्धी त्रुटि हुई तो उपरोक्त प्रलेख को यथावत अंतिम रूप दिया जाएगा। यदि सम्मित तकनीकी प्रकृति की हुई विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रलेख को अंतिम रूप दे दिया जाएगा।

यह प्रलेख भारतीय मानक ब्यूरो की वेबसाइट www.bis.gov.in पर भी उपलब्ध हैं।

धन्यवाद।

भवदीय,

(दिव्या एस.)

सदस्य सचिव सीईडी 44

वैज्ञानिक 'डी'(सिविल इंजीनियरिंग)

ई-मेल: divya.s@bis.gov.in

संलग्न: उपरिलिखित



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

WIDE CIRCULATION DRAFT

15 March 2024

Our Ref: CED 44/T-27

TECHNICAL COMMITTEE: Method of Measurement of Works of Civil Engineering
(Excluding Water Resources Development)
Sectional Committee, CED 44

ADDRESSED TO:

- a) All Members of Civil Engineering Division Council, CEDC
- b) All Members of CED 44 and its Subcommittees
- c) All others interests

Dear Sir/Madam,

Please find enclosed the following document:

Doc No.	Title
CED 44 (25070)WC	Draft Indian Standard Standard Method of Measurement of Building and Civil Engineering Works Part 27 Earth Work done by Mechanical Appliances (Second Revision) ICS 17.020; 91.040.01; 93.010; 93.020

Kindly examine the draft standard and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as National Standard.

Last Date for comments: **15 April 2024**

Comments if any, may please be made in the enclosed format and mailed to the undersigned at the above address or preferably through e-mail to divya.s@bis.gov.in.

In case no comments are received or comments received are of editorial nature, you will kindly permit us to presume your approval for the above document as finalized. However, in case of comments of technical in nature are received then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in

Thanking you,

Yours faithfully,

(Divya S.)
Member Secretary CED 44
Scientist 'D' (Civil Engineering)
E-mail: divya.s@bis.gov.in

Encl: As above

FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A-4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work) {Please e-mail your comments to divya.s@bis.gov.in}

Doc. No.: CED 44 (25070)WD

Title: Draft Indian Standard Method of Measurement of Building and Civil Engineering Works
Part 27 Earth Work done by Mechanical Appliances
{*Second Revision* of IS 1200 (Part 27)}
ICS 17.020; 91.040.01; 93.010; 93.020

LAST DATE OF COMMENT: 15 April 2024**NAME OF THE COMMENTATOR/ ORGANIZATION:** _____

Clause/ Para/ Table/ Figure No. commented	Comments/Modified Wordings	Justification of Proposed Change

NOTE - Kindly insert more rows as necessary for each clause/table, etc

BUREAU OF INDIAN STANDARDS**DRAFT FOR COMMENTS ONLY**

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Draft Indian Standard

**METHOD OF MEASUREMENT OF BUILDING AND
CIVIL ENGINEERING WORKS
PART 27 EARTH WORK DONE BY MECHANICAL APPLIANCES**

{Second Revision of IS 1200 (Part 27)}

ICS 17.020; 91.040.01; 93.010

Method of Measurement of Works of Civil Engineering
Sectional Committee, CED 44

Last date of Comments
15 April 2024

FOREWORD

[formal clauses will be added later]

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 in the project. Methods followed for measurement are not uniform and considerable difference exists between practices followed by different construction agency and the State Government departments. While it is recognized that each system of measurement has to be specifically related to administrative and financial organizations within the department responsible for the work unification of the various systems at technical level has been accepted as very desirable specially as it permits a wider range of operation civil engineering contractors and eliminates ambiguities arising out of inadequate understanding of various systems followed.

Measurement of earth work basically related to the manual method of excavation, carriage and filling is covered in Part 1 of this standard. With the advent of machinery for this operation, many lacunae in the methodology for the measurement have become apparent and thus necessity has been felt to formulate a separate standard for measurement of earth work by mechanical appliances, and hence the standard, IS 1200 (Part 27) was published in 1992 and was revised in 2013.

This previous revisions of the standard had modified the provisions on types Of machines employed for earthwork, clarified clause 2.7(g), included a new clause on special plumbing and its measurement, revised the provision on classification of soil and hard rock, etc.

In this revision, the following significant modifications are being made:

- a) The procedure for measurement of linear dimensions in excavation activity has been modified.

- b) Theodolite and total station have been included in the list of equipment to be used for levelling.
- c) The girth of vegetation has been specified.
- d) The names of rocks classified as hard rocks have been mentioned.
- e) The provision for excavating hard rocks wherever blasting may not be feasible has been incorporated.
- f) The provision for measurement of excavated materials in tunnels have also been included.
- g) Consideration of working space while excavating has been included.
- h) Excavation in different combinations of soil and rock have been considered.
- j) Provision for carriage by manual labour and by animal/mechanical transport have been incorporated.

SP 27 : 1997 'Handbook on method of measurement of buildings works (first revision)' published earlier by the Committee covering the consolidated provisions of all the Parts of IS 1200 shall be revised after the revision of the other Parts of IS 1200.

For standards on method of measurement of river valley projects, the Indian Standards formulated by the Measurement and Cost Analysis of Works for River Valley Projects Sectional Committee, WRD 23 under the Water Resources Division Council of BIS may be referred.

This standard contributes to the Sustainable Development Goal 9 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation'.

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 measurement shall be rounded off in accordance with IS 2 : 2022 '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.

Draft Indian Standard

**METHOD OF MEASUREMENT OF BUILDING AND
CIVIL ENGINEERING WORKS
PART 27 EARTH WORK DONE BY MECHANICAL APPLIANCES**

{Second Revision of IS 1200 (Part 27)}

1 SCOPE

1.1 This standard (Part 27) covers the method of measurement of earthwork carried out by mechanical means in building and civil engineering works.

1.2 The machines employed for earthwork may be excavators, tractors, dozers, scrapers, graders, shovel loaders, drag lines dumpers, rollers, compactors and the like.

2 GENERAL RULES

2.1 Clubbing of Items

Items may be clubbed together provided, break up of the clubbed items are based on the detailed description of items stated in this standard.

2.2 Booking of Dimensions

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

2.3 Measurement

All works shall be measured net in decimal system as fixed in position as given below:

- a) The length and breadth of excavation or filling shall be measured to the nearest 0.01 m. The depth of cutting or height of filling shall be measured, correct to 0.005 m. Where any dimension is more than 25 m, it shall be measured nearest to 0.1 m;
- b) Areas shall be worked out to the nearest 0.01 m²; and
- c) Cubical contents shall be worked out to the nearest 0.01 m³.

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

- a) Work in or under water;
- b) Work in or under foul conditions;
- c) Work under tides; and
- d) Work under snow.

2.5 The bill of quantities shall fully describe the material workmanship and accurately represent the work to be executed.

2.6 The description of items shall include loading and unloading.

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

- a) Setting out of work, profiles, etc ;
- b) Site clearance, such as, cleaning grass and vegetation of girth up to 30 cm measured at height of 1 m above the natural ground level ;
- c) Unauthorized battering or benching of excavation;
- d) Excavation for insertion of planking or strutting;
- e) Unless otherwise specified removing slips or falls in excavation;
- f) Bailing out or pumping out water from excavations, due to rains; and
- g) Bailing out or pumping out water cumulated in excavated pits due to seepage of subsoil water.

2.8 Special pumping other than what is required for conditions given in **2.4** (a) when resorted to, shall each be measured separately for all stages of pumping including intermediate stages, unless otherwise stated, in stages against separate specific provisions made for this purpose.

3 CLASSIFICATION OF SOILS

3.1 The earth work shall be classified under the following categories and measured separately for each category.

3.1.1 Soil

It includes various types of soils, mud concrete, shingle and river or nallah bed boulders, soling of road, paths and hard core, macadam surface of any description, lime concrete, stone masonry, soft conglomerate and laterite when the stone can be detached from the matrix with picks and shovel.

3.1.2 Mud —A mixture of soil and water in fluid or weak solid state.

3.1.3 Foul Condition

Means a mixture of soil and sewage or night soil.

3.1.4 Ordinary/Soft Rock

This may be quarried and split with mechanical implements and includes lime stone, sand stone, cement concrete (plain reinforced and prestressed) below the ground level.

If required, light blasting may be resorted to for loosening the materials but this will not in any way entitle the material to be classified as 'Hard rock'.

3.1.5 Hard Rock

3.1.5.1 Hard rock can be excavated by machines and requires blasting, chiselling in, edging or any other agreed method and includes quartzite, granite, basalt, reinforced cement concrete (reinforcement to be cut through but not separated from concrete) below ground level and the like. Once hard rock is blasted, it can be considered as ordinary rock. Hard rock requiring controlled blasting, chiseling and shaping shall be measured separately.

3.1.5.2 Hard rock requiring blasting as described under **3.1.5.1** but where the blasting is prohibited for any reason and excavation has to be carried out by chiselling, wedging, plasma blasting, use of rock hammers and cutters or any other agreed method.

4 METHOD OF MEASUREMENT

4.1 The measurement of earthwork shall be done as per actual, limited to the approved excavation drawing having appropriate working space

4.1.1 In case of open footings up to the depth of 1.5 metres, all-round excavation of 30 cm beyond the outer dimension of footing shall be measured for payment to make allowances for centering and shuttering. Any additional excavation beyond this limit shall be at the risk and cost of the contractor and shall not be measured for payment.

4.1.2 In case of open footings/rafts at a depth of more than 1.5 metre, all-round excavation of 75 cm shall be measured for payment to make allowance for centering and shuttering. Additional excavation beyond this limit shall be at the risk and cost of the contractor and shall not be measured for payment.

4.2 The measurement to be taken with the appropriate equipment such as staff, dumpy level, theodolite, total station, etc. The level shall be recorded correct to 5 mm and depth of cuttings and heights of levels calculated correct to 5 mm. Cubical contents shall be done to the nearest place of decimals in cubic metres.

Where soil and ordinary or hard rock are mixed, the measurement of the excavation shall be recorded for the entire excavation. Excavated material of ordinary rock shall be stacked, separately measured and reduced by 50 percent to allow for voids to arrive at quantity payable under ordinary rock. The difference between the entire excavation and the quantity above (under ordinary rock) shall be payable as excavation in soil.

4.2.1 Where ordinary rock and hard rock are mixed, the measurement of the excavation shall be recorded for the entire excavation. The two kinds of rock shall be stacked separately and measured in stacks. The net quantity of the two kinds of rocks shall be arrived at by applying deduction of 50 percent to allow for voids in stacks. If the sum of net quantity of two kinds of rocks exceeds the total quantity of the excavated material, then the quantity for each type of rock shall be worked out from the total quantity in the ratio of net quantities in stack measurements of the two types of rocks. Where soil, ordinary rock and hard rock are mixed, the measurement of the excavation shall be recorded for the entire excavation. Excavated materials comprising hard rock and ordinary rock shall be stacked separately, measured, and each reduced by 50 percent to allow for voids to arrive at the quantity payable under hard rock and ordinary rock. The difference between the entire excavation and the sum of the quantities payable under hard rock and ordinary rock shall be paid for as excavation in soil.

4.3 Where it is not possible or convenient to take measurements from borrow pits or cuttings, volume of work done shall be worked out from filling. The actual measurement of the fill shall be calculated after taking the levels of the original grounds before start of the work, after site clearance and after compaction of fill at the optimum moisture content which should be specified in advance.

4.4 For measurement of excavated materials in tunnels where the quantity is to be measured by the carrying capacity in cubic metres of the haulage trucks/tippers taking due consideration of moisture content and void ratio.

4.4 Embankment

4.4.1 Forming embankments and filling shall be measured, in cubic metres, and shall include formation of slope. When the material is to be deposited in layers this shall be described stating thickness of such layer. The method of compaction shall be described. The measurement shall be taken in successive stages of 1.5 m stating commencing level.

4.4.2 Backfilling done by mechanical means should be calculated by deducting the volume of structure below the underground from the original measured volume of excavation done.

4.5 Lead

4.5.1 The lead for filling and removal shall be measured over the specified route or over the shortest practicable route to be traversed.

Carriage by manual labour shall be reckoned in units of 50 metres or part thereof.

Carriage by animal and mechanical transport shall be reckoned in one km unit. Distances of 0.5 km or more shall be taken as 1 km and distance of less than 0.5 km shall be ignored. However, when the total lead is less than 0.5 km, it will not be ignored but paid for separately in successive stages of 50 metres subject to the condition that the rate worked on this basis does not exceed the rate for initial lead of 1 km by mechanical/animal transport.

4.5.2 Travelling distance by reasonable path from centre of gravity of the excavated pond to centre of gravity of the dumping ground be taken as lead.

4.6 Soil heap when it has become consolidated due to passage of time or otherwise shall be so stated and measured separately.

4.7 Excavation in Trenches for Foundations and drains and for Pipes, Cables, etc.

4.7.1 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 authorized width shall be specified in each case (relevant Indian Standards, if any, may be consulted for guidance).

4.7.2 Excavation Trenches for Foundations and drains

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

4.8 Earth work excavation (including authorized working space) for pile caps shall be shown as a separate entity depending on actual site conditions in view of intricacies involved. No deduction shall be made in the measurement of earth work for the volume of piles and empty bore holes.

4.9 Lifts

In earth work done by mechanical means, lift shall not be measured separately.

4.10 The planking and strutting required to uphold the face of excavated earth shall be measured in square metre of face supported. The description shall include use and wastage of all works including waste struts, boards inclusive of fixing and removal. Planking and strutting required to be left permanently in position shall be measured separately.

4.11 Removing Trees

Trees exceeding 300 mm in girth measured at 1 m above natural ground level shall be pre-measured by numbers and shall deem to include removal and depositing within 50 m.