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*Indian Standard*

METHOD OF MEASUREMENT OF BUILDING  
AND CIVIL ENGINEERING WORKS

PART 27 EARTH WORK DONE BY MECHANICAL APPLIANCES

( Second Reprint AUGUST 1997 )

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Price Group 1

## FOREWORD

This Indian Standard 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 payment in the project. Methods followed for measurements are not uniform and considerable difference exists between the practices followed by one construction agency and the State Government Departments. While it is recognised that each system of measurement has to be specifically related to the 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 wider section of operation civil engineering contractors and eliminates ambiguities arising out of inadequate understanding of various system followed.

Measurement of earth work basically related to the manual method of excavation, carriage and filling is covered in Part I. 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.

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 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***METHOD OF MEASUREMENT OF BUILDING  
AND CIVIL ENGINEERING WORKS****PART 27 EARTH WORK DONE BY MECHANICAL APPLIANCES****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 tractors, dozers, scrapers, graders, shovel loaders, drag lines dumpers and other like.

**2 GENERAL RULES****2.1 Clubbing of Items**

Items may be clubbed together provided the break up of clubbed items are based on the detailed description of items stated in the 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) Each dimensions shall be measured to the nearest 0.01 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 m<sup>2</sup>, and
- c) Cubical contents shall be worked out to the nearest 0.01 m<sup>3</sup>.

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

- a) work in or under water,
- b) Work in or under foul position,
- 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,
- c) Unauthorized battering or benching of excavation,
- d) Excavation for insertion of planting or strutting,
- e) Unless otherwise specified removing slips or falls in excavation,
- f) Bailing out or pumping out of water in excavation from rains,
- g) Bailing out or pumping out of water when measured under ground, and
- h) Slings pipes electric cables, etc, met during excavation.

**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 below the ground level. Shingle and river or nallah bed boulders soling of road, paths and hard core, mecadam surface of any description, lime concrete, stone masonry below the ground level, 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 sewerage or night soil.

**3.1.4 Rock**

This may be quarried and split with mechanical implements and includes lime stone, cement concrete, plain, reinforced and prestressed, below the ground level. If it require. blasting may be resorted to for measuring the material.

### 3.1.5 *Hard Rock*

Hard rock can be excavated by machines and requires blasting chiselling in edging or in another agreed method. Once hard rock is blasted, it can be considered as ordinary rock.

## 4 METHOD OF MEASUREMENT

4.1 The measurement of earthwork shall be done in cubic meters unless otherwise mentioned.

4.2 The measurement to be taken with staff and level. The level shall be recorded to 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 ordinary rock and soil is 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 dome of the quantity payable under ordinary rock shall be payable as excavation in ordinary soil.

4.3 Where it is not possible or convenient to take measures 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 desired density which should be specified in advance.

### 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 consolidation shall be described. The measurements 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 by machinery. The leads exceeding 500 m should be measured in units of 500 m. Where the lead exceeds 5 km it shall be measured in units of 1 km. Half km and above should be reckoned as one and less than half km ignored.

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

### 4.7 *Lifts*

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

4.8 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.

### 4.9 *Removing Trees*

4.9.1 Trees exceeding 30 cm in girth measured at one metre above ground level shall be premeasured by numbers and shall deem to include removal and depositing within 50 m.

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