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METHOD OF MEASUREMENT OF BUILDING AND CIVIL ENGINEERING WORKS

PART XXV TUNNELING

(Second Revision)

(Incorporating Amendment Nos. 1, 2, 3 & 4)

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

Price Group 2

Indian Standard

METHOD OF MEASUREMENT OF BUILDING AND CIVIL ENGINEERING WORKS

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(Second Revision)

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Indian Standard

METHOD OF MEASUREMENT OF BUILDING AND CIVIL ENGINEERING WORKS

PART XXV TUNNELING

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Part XXV) (Second Revision) was adopted by the Indian Standards Institution on 27 October 1971, after the draft finalized by the Civil Works Measurement Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 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.

0.3 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 revised in 1964.

0.4 *Clause deleted*

0.5 Wherever necessary, more information than is demanded by adherence to this standard may be given, provided the principles of measurements laid down in this standard are observed and it is in the interest of accuracy and practical estimating to do so.

0.6 This edition 3.4 incorporates Amendment No. 3 (April 1981) and Amendment No. 4 (January 1996). Side bar indicates modification of the text as the result of incorporation of the amendments. Amendment Nos. 1 & 2 had been incorporated earlier.

0.7 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 : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part XXV) covers the method of measurement of tunneling.

2. GENERAL RULES

2.1 Clubbing of Items — Items may be clubbed together and 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, width and height or depth or thickness.

2.3 Measurements — All work shall be measured net in decimal system as fixed in its place as given below

a) Linear dimensions shall be measured to the nearest 0.01 metre,

b) Areas shall be worked out to the nearest 0.01 square metre,

c) Cubic contents shall be worked to the nearest 0.01 cubic metre, and

d) The weight shall be measured to the nearest 0.1 kilogram.

2.4 Work to be Measured Separately — Work executed in the following conditions shall be measured separately:

a) Work in or under water, and

b) Work in compressed air.

2.4.1 Where springs are likely to be encountered the work shall be measured against a separate specific provision made for the purpose (*see* **2.5**).

2.5 Pumping where resorted to including bore well/well point dewatering shall each be measured separately for all stages of pumping, including intermediate stages unless otherwise stated, in kW hours or hp hours. Whenever pneumatic pumping is resorted to, it shall be measured in rated capacity of the compressor, in cubic metre of air delivered per hour.

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

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

2.7 *Clause deleted*

3. METHOD OF MEASUREMENT OF EXCAVATION

3.1 The item of tunnel excavation may be classified as follows:

a) Excavation in tunnel in hard rock not requiring supports.

b) Excavation in tunnel in all classes of soil, soft and hard rock [*see* IS : 1200 (Part 1)-1992*] requiring temporary or permanent supports during excavation.

NOTE — Supports shall be measured separately (*see* **4**).

3.2 The description of the item shall unless otherwise stated to be held to include drilling, blasting, ventilation, lighting, scaling and hauling of excavated material and depositing in the area earmarked and finally clearing the surface.

3.3 The quantity of excavation shall be measured in cubic metres and shall be the volume of the tunnel measured in solid contained within hypothetical line as decided by engineer-in-charge (also known as 'B' line or pay line) irrespective of whether or not the actual excavation falls within or beyond the said line subject to excavation up to the minimum excavation line ('A' line), 'A' line and 'B' line shall be as defined in IS 4880 (Part 2) : 1976 Code of practice for design of tunnels conveying water : Part 2 Geometric design (*first revision*).

Clause deleted

3.3.1 In case as determined by the engineer-in-charge the minimum excavation line is increased necessitating enlargement of the already excavated tunnel, separate measurement of the quantity of the excavation shall be made. The measurement shall be between the original 'B' line and the revised 'B' line that is established.

3.4 The layers of soft or disintegrated rock bedded with hard rocks or seems or faults required to be excavated beyond the pay line being removed by hand or pneumatic or other implements without requiring continuous and systematic blasting, shall be measured separately.

3.5 Cement consumed at the point of mixing for guniting/shotcreting required for protection of weak rock shall be measured separately on weight basis.

*Method of measurement of building and civil engineering works: Part 1 Earthwork (*fourth revision*).

4. METHOD OF MEASUREMENT OF SUPPORTS

4.1 Temporary Supports — The item of temporary supports, when erected, shall include furnishing, installing, maintenance and removing temporary supports including other connected materials, labour and equipment. The measurement of the temporary support shall be done on the basis of area supported by such support (peripheral length multiplied by linear dimension of tunnel).

4.2 Permanent Supports — The item of permanent supports shall consist of furnishing and installing the supports, complete with all bolts, nuts, butt plates, feather plates, dowels, wedges, tie rods, spikes, drift pins, temporary timber spreaders and concrete pedestals if any, logging, blocking and back packing with excavated material. All structural steel including riveted and welded, and nuts and bolts shall be measured in kilograms.

Clauses deleted

4.3 Grouting behind the supports and concrete lining shall be measured separately in terms of weight of cement consumed stating the material used.

4.4 In case precast concrete blocks as lagging are provided, so as to form the part of concrete lining, the same shall be measured separately [*see* IS : 1200 (Part II)-1974*]. The volume of such blocks shall be deducted from the volume of the concrete lining if these are placed within the 'B' line.

4.5 Space between the '**B**' line and precast concrete or structural steel lining filled by concrete shall be measured separately as below on the basis of weight of cement consumed:

a) Cement concrete placed manually for ledge beams, curbs, etc.

b) Cement concrete placed with mechanical aids such as pumps, placers, etc.

4.6 Rock bolt shall be measured on weight basis which shall be including wedges, nuts and butt plates.

4.7 Pipes provided for drainage purposes in lining shall be measured separately in running metres.

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

5. CONCRETE LINING

5.1 Measurement for the concrete lining shall be made of the quantity of concrete placed between the formwork or the outside surface of the steel shell when used and the pay line, which shall be 'B' line or pay line adopted for excavation at the place. The item of concrete lining shall be inclusive of formwork. No deduction shall be made for the volume of the reinforcement, but the volume of permanent steel supports (*see* **4.2**) where provided shall be deducted from the total volume of concrete lining [*see also* IS : 1200 (Part II)-1974 *].

5.1.1 *Clause deleted*

6. PRESSURE GROUTING OVER CONCRETE LINING

6.1 Grout Holes — The length of the grout holes drilled either for pack grouting or pressure grouting through concrete and also rock shall be measured in running metres. Grout holes drilled through plate steel liners shall, however, be measured in numbers separately.

6.2 Grout Pipes and Fittings — Grout pipes and fittings provided for grouting shall he measured in kilograms and the weight of all pipes and fittings shall be derived either by actual weighment or from known weights and lengths.

6.3 Water Pressure Testing — Measurement for water pressure testing shall, where necessary, be made separately for each hole and enumerated.

6.4 Grouting — Measurement for grouting shall be made on the basis of the weight of cement in the grout actually forced into the holes. Stone dust and/or other additions, if used, shall be measured separately in the loose dry state before mixing and shall be measured on volume basis of approved size and design.

*Method of measurement of building and civil engineering works: Part II Cement and concrete works (*Second revision*).

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Amendments Issued Since Publication

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