*भारतीय मानक*

**संसंजनहीन मृदा की घनत्व सूंचक (आपेक्षिक घनत्व) के निर्धारण**

**के लिए साँचे और उपसाधन ― विशिष्टि**

**(*पहला पुनरीक्षण*)**

*Indian Standard*

**Moulds and Accessories for Determination of Density**

**Index (Relative Density) of Cohesionless Soils — Specification**

(*First Revision*)

ICS 93.020; 13.080.20



Soil and Foundation Engineering Sectional Committee, CED 43

**FOREWORD**

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Soil and Foundation Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

There are a series of standards on methods of testing of soils. It has been recognized that reliable and inter-comparable test results can be obtained only with the standard testing equipment capable of giving the desired level of accuracy. With this objective, a series of specifications covering the requirements of equipment used for testing soils have been published to encourage their development and manufacturing in the country.

The equipment covered in this standard is used in the apparatus for determination of density index of cohesionless soils covered in IS 2720 (Part 14) : 1983 ‘Methods of test for soils: Part 14 Determination of density index (relative density) of cohesionless soils’ using vibratory table.

This standard was first published in 1984. The present revision has been taken up with a view to incorporate the modifications found necessary as a result of experience gained in the use of this standard. Also, in this revision, the standard has been brought into latest style and format of Indian Standards, and references to Indian Standards, wherever applicable have been updated. The other major modifications incorporated in this revision of the standard are given below:

1. Considering that copper alloy is not used for manufacturing materials and aluminium is not a suitable material for making moulds, these materials have been deleted from the list of permitted materials for making mould.
2. IS 782 : 1978 has been removed from the cross-referred standards as it has been withdrawn.
3. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act, 2016*.

This standard contributes to the Sustainable Development Goal 9 - Industry, Innovation and Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The composition of the Committee responsible for formulation of the standard is given in Annex A.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*). 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***

**MOULDS AND ACCESSORIES FOR DETERMINATION OF DENSITY**

 **INDEX (RELATIVE DENSITY) OF COHESIONLESS SOILS ― SPECIFICATION**

(*First Revision*)

**1 SCOPE**

This standard covers the requirements of two types of moulds, guide sleeves, surcharge base plate with handle and surcharge weights, used for the laboratory determination of density index (relative density) of cohesionless free draining soils using vibratory table.

**2 REFERENCE**

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated are valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 292 : 1983 | Specification for leaded brass ingots and casting (*second revision*) |
|  |  |
| IS 513 (Part 1) : 2016 | Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose (*sixth revision*) |
|  |  |
| IS 2102 (Part 1) : 1993 | General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications (*third revision*) |

**3 DIMENSIONS**

Dimensions with tolerance of different components of equipment shall be as detailed in Fig. 1 to 5. Except where tolerances are specifically mentioned against the dimensions, all dimensions shall be taken as nominal dimensions and the tolerances to the dimensions shall be as given in IS 2102 (Part 1) and shall be of medium class.

**4 MATERIALS**

The materials of construction for the various component of the equipment shall be as given in Table 1.

**Table 1 Materials of Construction for Different Components**

(*Clause* 4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl No.** | **Equipment** | **Materials** | **Special Requirements, If Any** | **Conforming to Indian Standard** |
| (1) | (2) | (3) | (4) | (5) |
| i) | Mould | Brass orMild steel | ―Cadmium plated | IS 292IS 513 (Part 1) |
| ii) | Guide sleeve | Mild steel | Cadmium plated | IS 513 (Part 1) |
| iii) | Surcharge base plate with handle | Mild steel | Cadmium plated |  |
| iv) | Surcharge weight:a) Body b) Filling | Mild steelLead | Cadmium plated – | IS 513 (Part 1) |

**5 CONSTRUCTION**

**5.1 Mould**

The mould shall be smooth from inside and shall have two handles either cast integral with the body or welded. The moulds shall be of capacity 3 000 cm3 and 15 000 cm3 as detailed in Fig. 1.



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Size of Mouldcm3 | A | B | C | D | E | F |
| 3 000 | 150 ± 0.05 | 169.77 ± 0.05 | 180 | 180 | 10 | 30 |
| 15 000 | 280 ± 0.05 | 243.60 ± 0.05 | 310 | 225 | 15 | 50 |

All dimensions in millimetres.

FIG. 1 MOULD

**5.2 Guide Sleeve**

The inside of the sleeve shall be finished smooth and one sleeve shall be provided with each mould. Two of the three set screws on the clamp assembly shall be provided with lock nuts. The details of guide sleeve for two capacities of mould are given in Fig. 2.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Size of Mouldcm3 | A | B | C | D |
| 3 000 | 150 ± 0.05 | 300 | 6 | 35 |
| 15 000 | 280 ± 0.05 | 200 | 10 | 38 |

All dimensions in millimetres.

FIG. 2 GUIDE SLEEVE

**5.3 Surcharge Base Plates with Handles**

The surcharge base plate as detailed in Fig. 3 shall be provided with each mould. The details of handle for both sizes are given in Fig. 4.

**5.4 Surcharge Weight**

The surcharge weight as detailed in Fig. 5 shall be provided with each mould. The body shall be filled with lead from bottom to have a specified weight as mentioned in Fig. 5.

**6 MARKING**

**6.1** The following information shall be clearly and indelibly marked on each part of the equipment:

1. Name of the manufacturer or his registered trade-mark or both;
2. Type of material used;
3. Size of the mould; and
4. Date of manufacture.

**6.2** **BIS Certification Marking**

The product conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.



3A SURCHARGE BASE PLATE 3A SURCHARGE BASE PLATE

 (FOR MOULD 3 000 cm3) (FOR MOULD 15 000 cm3)

All dimensions in millimetres.

FIG. 3 SURCHARGE BASE PLATE



A = 275 mm for mould of capacity 3 000 cm3

 A = 200 mm for mould of capacity 15 000 cm3

All dimensions in millimetres.

FIG. 4 LIFTING HANDLE



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Size of Mouldcm3 | A | B | C | Total Weight Required kg |
| 3 000 | 100 ± 0.05 | 6 | 225 | 24.7 ± 0.2 |
| 15 000 | 250 ± 0.05 | 10 | 150 | 86.0 ± 0.5 |

FIG. 5 SURCHARGE WEIGHT

**ANNEX A**

(*Foreword*)

**COMMITTEE COMPOSITION**

Soil and Foundation Engineering Sectional Committee, CED 43

| *Organization* | *Representative(s)* |
| --- | --- |
|
| In Personal Capacity, *473, Vinayak Apartments, BHEL Housing Society, Plot No. C-58/19, Sector 62, Noida, Uttar Pradesh* - *201301* | Shri C. Pushpakaran **(*Chairperson*)** |
| AFCONS Infrastructure Limited, Mumbai | Dr Sunil Basarkar Dr Lakshmana Rao Mantri (*Alternate-I*) Shri Budhmal Jain (*Alternate-II*) |
| AIMIL Limited, New Delhi | Shri Rohitash Barua  Smt Aarti Bhargava (*Alternate-I*) Shri Anil Singh (*Alternate-II*) |
| Bharat Heavy Electricals Ltd, New Delhi | Shri T. M. S. Rao Shri Vikram S. (*Young Professional*) |
| CEM Engineers and Consultants Pvt Ltd, Bhubaneswar | Shri Ashok Basa Shri Dilip Basa (*Alternate*) |
| Cengrs Geotechnica Pvt Ltd, Noida | Shri Sanjay Gupta Shri Ravi Sundaram (*Alternate*) Shri Sorabh Gupta (*Young Professional*) |
| Central Board of Irrigation and Power, New Delhi | Director |
| Central Electricity Authority,  New Delhi | Shri Baleshwar Thakur  Shri Deepak Singh Raghuvansi (*Alternate*) |
| Central Public Works Department, New Delhi | Shri Nagendra Prasad Shri Amrendra Kumar Jalan (*Alternate*) |
| Central Soil and Materials  Research Station, New Delhi | Dr Manish Gupta  Ms Swapna Varma (*Alternate*) |
| CSIR-Central Building Research  Institute, Roorkee | Shri Manojit SamantaDr S. Ganesh Kumar (*Alternate*)Shri Kaushik Pandit (*Young Professional*) |
| CSIR-Central Road Research  Institute, New Delhi | Dr Kanwar Singh Dr P. S. Prasad (*Alternate*) |
| CSIR-Structural Engineering  Research Centre, Chennai | Dr P. Kamatchi Smt R Sreekala (*Alternate*) Dr A. Thirumalaiselvi (*Young Professional*) |
| D-CAD Technologies,  New Delhi | Dr K. G. Bhatia  |
| Delhi Development Authority,  New Delhi | Shri Arun Kumar Shri Harindar Pal (*Alternate*) |
| Delhi Technological University,  New Delhi | Prof. Ashok Kumar Gupta  |
| Engineers India Limited,  New Delhi | Shri V. K. Panwar Shri Sampat Raj (Alternate-I) Shri Anil Banoth (*Young Professional*) |
| Geodynamics Ltd, Vadodara | Dr Ravikiran Vaidya Shri Sujan Kulkarni (*Alternate*) |
| Geological Survey of India,  Kolkata  | Dr Timir Baran Ghosal Shri Prashant Tukaram Ilamkar (*Alternate*) |
| Ground Engineering Limited,  New Delhi | Shri Ashok Kumar Jain  Shri Neeraj Kumar Jain (*Alternate*) |
| Hindustan Construction Company  Limited, Mumbai | **Representative**  |
| Indian Geotechnical Society,  New Delhi | Prof H. N. Ramesh Dr Anil Joseph (*Alternate*) Prof D. Neelima Satyam (*Alternate-II*) |
| Indian Institute of Science,  Bengaluru | Prof Jyant KumarProf G. Madhavi Latha (*Alternate*) |
| Indian Institute of Technology  Delhi, New Delhi  | Dr G. V. Ramana Dr J. T. Shahu (Alternate-I) Dr Prashanth Vangla (*Young Professional*) |
| Indian Institute of Technology  Kanpur, Kanpur  | Prof Priyanka Ghosh |
| Indian Institute of Technology  Madras, Chennai | Prof Subhadeep Banerjee Prof Ramesh K Kandasami (*Alternate*) |
| Indian Institute of Technology  Bombay, Mumbai | Prof Deepankar Choudhury Prof Dasaka Murty (*Alternate*) |
| Indian Institute of Technology  Roorkee, Roorkee | Dr Mahendra Singh Dr Vishwas A. Sawant (*Alternate*) |
| Indian Road Congress, New Delhi | Secretary General  Director (T) (*Alternate*) |
| Indian Society of Earthquake  Technology, Roorkee | Prof B. K. Maheswari Prof Vasant A. Matsagar (*Alternate*) |
| ITD Cementation India Ltd, Kolkata | Shri Manish Kumar  Shri Aminul Islam (*Alternate*) |
| Jadhavpur University, Kolkata  | Prof Sibapriya Mukherjee  Prof Ramendu Bikas Sahu (*Alternate*) |
| Keller Ground Engineering Pvt Ltd, Chennai | Shri V. V. S. Ramadas Shri Madan Kumar Annam (*Alternate*) |
| L&T GeoStructure Private Limited, Chennai | Shri M. KumaranShri A. Vetriselvan (*Alternate*) |
| Military Engineer Services,  Engineer-in-Chief's Branch,  Integrated HQ of MoD (Army), New Delhi | Shri Manoj BapnaShri Ajay Kumar Sinha (*Alternate*) |
| MECON Limited, Ranchi | Shri Shankar Ray Shri Ayush Srivastava (*Alternate*) |
| Ministry of Ports, Shipping and  Waterways, New Delhi | Shri H. N. Aswath Shri Anil Pruthi (*Alternate*) |
| Mumbai Port Trust, Mumbai | Dy Chief Engineer (Design) Superintending Engineer (Design) (*Alternate*) |
| Nagadi Consultants Pvt Limited,  New Delhi | Dr V. V. S. Rao  Shri N. Santosh Rao (*Alternate*) |
| National Capital Region Transport  Corporation, New Delhi | Shri Jitender Kumar |
| National High Speed Rail  Corporation Ltd, Mumbai | **Representative**  |
| National Institute of Disaster Management, New Delhi | Dr Chandan Ghosh Dr Amir Ali Khan (*Alternate*) |
| NTPC Limited, Noida | Shri Mohit Jhalani |
| Power Grid Corporation of India  Limited, Gurugram | **Representative** |
| Research Designs and Standards  Organization (Ministry of  Railways), Lucknow | Shri Sameer Singh  Shri S. K. Ojha (*Alternate*) |
| RITES Limited, Gurugram | Shri Koshy Vaidyan Shri Sumeet Mahajan (*Alternate*) |
| Safe Enterprises, Mumbai | Shri Vikram Singh Rao  Shri Suryaveer Singh Rao (*Alternate*) |
| STUP Consultants Pvt Ltd, Mumbai | Shri Anirban Sengupta Shri Yogesh Waingankar (*Alternate*) |
| Tata Consulting Engineers Limited, Mumbai | Shri Sanjeev Gupta  Shri B. N. Nagaraj (*Alternate*) |
| Telangana State Research  Laboratories, Hyderabad | Shri A. G. Manoj Kumar Shri Ashirwadam Jakkula (*Alternate-I*) Smt M. Manjula (*Alternate-II*)  |
| The Pressure Piling Co (I) Pvt  Limited, Mumbai | Shri V. C. Deshpande  Shri Pushkar V. Deshpande (*Alternate*) |
| Unique Geocivil Services Pvt Ltd,  Surat | Shri Nehal H. Desai Shri Hitesh H. Desai (*Alternate-I*) Shri Dhruval D. Shah (*Alternate-II*) |
| In Personal Capacity, *1-B, Villakkupattam Palace, First Floor, 48, New Avadi Road, Kilpauk, Chennai 600010* | Dr V. Balakumar |
| BIS Directorate General | Shri Dwaipayan Bhadra, Scientist ‘E’/ Director and Head (Civil Engineering) [Representing Director General (*Ex-officio*)] |
| *Member Secretary*Shri Dheeraj DamachyaScientist ‘B’ / Assistant Director (Civil Engineering), BIS |