***भारतीय मानक***

***Indian Standard***

**IS 10077 : 2024**

**संकुचन कारकों के निर्धारण के लिए**

**उपकरण — विशिष्टि**

*( पहला पुनरीक्षण )*

**Equipment for Determination of Shrinkage Factors — Specification**

( *First Revision* )

ICS 93.020; 13.080.20

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भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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**October 2024 Price Group X**

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 shrinkage factors of soils covered in IS 2720 (Part 6) : 1972 'Methods of test for soils: Part 6 Determination of shrinkage factors (*first revision*)'.

This standard was first published in 1982. 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. The requirement of conformity of Polymethyl methacrylate (acrylic) sheets to IS 14753 : 1999 'Polymethyl methacrylate (PMMA) (acrylic) sheets' has been added.
2. 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 B.

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***

**EQUIPMENT FOR DETERMINATION OF SHRINKAGE FACTORS ― SPECIFICATION**

(*First Revision*)

**1 SCOPE**

This standard covers the requirements of equipment for the apparatus used for determination of shrinkage limit, shrinkage ratio, shrinkage index and volumetric shrinkage of soils.

**2 REFERENCES**

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 are given in Annex A.

**3** **DIMENSIONS**

Dimensions and tolerances of different equipment shall be as detailed in Fig. 1 to 6.Except where tolerances are specifically mentioned against the dimensions, all dimensions shall be taken as nominal dimensions and tolerances as given in IS 2102 (Part 1) shall apply.

**~~4~~ MATERIALS**

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

**Table 1 Materials of Construction for Parts of Equipment**

(*Clause* 4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl No.**(1) | **Equipment**(2) | **Material**(3) | **Special requirement, if any**(4) | **Relevant Grade/Conforming to Indian Standard**(5) |
| i) | Evaporating dish | Porcelain | - | IS 2837 (Part 2) |
| ii) | Spatula |  |  |  |
| a) Blade | Steel | Polished | IS 2507 |
| b) Handle | Wood | Painted | IS 620 |
| iii) | Shrinkage dish | Stainless steel | - | Grade X07Cr18Ni9 ofIS 6911 |
| iv) | Prong plate |  |  |  |
| a) Prong | 1) Brass | - | IS 319 |
| 2) Stainless steel | - | Grade X07Crl8Ni9 ofIS 6911 |
| b) Plate | Acrylic plastic | - | IS 14753 |
| v) | Plain plate | Acrylic plastic | - | IS 14753 |
| vi) | Glass cup | Glass | - | IS 878 |

**5** **CONSTRUCTION**

**5.1 Evaporating Dish**

Theevaporating dish shall be as detailed in Fig 1. The inside of the evaporating dish shall be smooth.

****

FIG. 1 EVAPORATING DISH

**5.2** **Spatula**

The spatula shall be as detailed in Fig. 2. A wooden handle shall be fixed as shown in Fig 2.

~~~~

All dimensions in millimetres.

FIG. 2 SPATULA

**5.3 Shrinkage Dish**

Theshrinkage dish shall be as detailed in Fig. 3. The internal corner between the bottom and the vertical sides shall be rounded into a smooth concave curve of approximately 3 mm radius.

****

All dimensions in millimetres.

FIG. 3 SHRINKAGE DISH

**5.4** **Glass Cup**

The glass cup shall be as detailed in Fig. ~~4~~.



All dimensions in millimetres.

FIG. 4 GLASS CUP

**5.5** **Prong Plate**

Theprong plate shall be as detailed in Fig. 5. The plate shall be plain. Three prongs as detailed in Fig. 5 shall be fixed to the plate at 120° to each other and at a spacing of 30 mm (centre to centre).



All dimensions in millimetres.

FIG. 5 DETAILS OF PRONG

**5.6 Plain Plate**

The plain plate shall be of size 75 mm square and of 3 mm thickness. The plate shall be plain (*see* Fig. 6).



All dimensions in millimetres.

FIG. 6 PLAIN PLATE

**5.7 Other Accessories**

The equipment shall also have the following other accessories:

a) Straight edge, 150 mm long and 25mm wide as per IS 2220.

b) Measuring cylinder of 25 ml capacity as per IS 878.

**6 MARKING**

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

a) Name of the manufacturer or his registered trade-mark or both;

b) Type of material used; and

c) 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.

**ANNEX A**

(*Clause* 2)

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 319 : 2007 | Free cutting brass bars, rods and section — Specification (*fifth revision*) |
| IS 620 : 1985 | Specification for wooden tool handles general requirements (*fourth revision*) |
| IS 878 : 2008 | Laboratory glassware — Graduated measuring cylinders (*second revision*) |
| IS 2102 (Part 1) : 1993 | General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications (*third revision*) |
| IS 2220 : 1990 | Engineering metrology — Steel straightedges — Specification (*first revision*) |
| IS 2507 : 1975 | Specification for cold rolled steel strips for springs (*first revision*) |
| IS 2837 (Part 2) : 1977 | Specification for porcelain crucibles and basins: Part 2 Basins (*first revision*) |
| IS 6911 : 2017 | Stainless steel plate, sheet and strip — Specification (*second revision*) |
| IS 14753 : 1999 | Polymethyl methacrylate (PMMA) (acrylic) sheets |

**ANNEX B**

(*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*) |
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| 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*) |
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| 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*) |
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| 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*) |
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| 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*) |
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| 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*) |
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| Power Grid Corporation of India  Limited, Gurugram | **Representative** |
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| RITES Limited, Gurugram | Shri Koshy Vaidyan Shri Sumeet Mahajan (*Alternate*) |
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| 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*) |
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| 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 |