***भारतीय मानक***

***Indian Standard***

**IS 9259 : 2024**

**संघट्ट पद्धति द्वारा मृदा की तरल सीमा के निर्धारण के लिए कासाग्रांडे उपकरण — विशिष्टि**

*( पहला पुनरीक्षण )*

**Casagrande Apparatus for Determination of Liquid Limit of Soils by Impact Method — Specification**

*( First Revision )*

ICS 13.080.20; 93.020

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भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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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 for determination of liquid limit of soils by impact method as covered in IS 2720 (Part 5) : 1985 ‘Methods of test for soils: Part 5 Determination of liquid and plastic limit (s*econd revision*)’.

This standard covers the minimum requirements for the apparatus. The apparatus may also be manufactured with a revolution counter to indicate the number of falls of cup automatically and/or a motorized driving arrangement to give approximately 120 rev/min.

This standard was first published in 1979. 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 title of the standard has been modified from ‘Specification for liquid limit apparatus for soils’ to ‘Casagrande apparatus for determination of liquid limit of soils by impact method ― Specification’ considering that the apparatus for determination of liquid limit by cone penetration method is separately covered in IS 11196 : XXXX ‘Equipment for determination of liquid limit of soils by cone penetration method — Specification (*first revision*)’ (*under preparation*);
2. Relevant grade of vulcanized rubber for making base feet and base of the apparatus as per the revised IS 5192 (Part 1) : 1994 ‘Natural rubber compounds ― Specification: Part 1 For moulded products (*second revision*)’ has been specified; and
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 the formulation of this 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.

*Indian Standard*

CASAGRANDE APPARATUS FOR DETERMINATION OF LIQUID LIMIT OF SOILS BY IMPACT METHOD ― SPECIFICATION

*( First Revision )*

**1 SCOPE**

This standard covers the requirements of Casagrande apparatus used for the of liquid limit of soils by impact method.

**2 REFERENCES**

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were 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 edition of these standards.

**3 DIMENSIONS**

Thedimensions, with tolerances, of different components of Casagrande apparatus, that is, liquid limit device, grooving tool and gauge block shall be as detailed in Fig. 1 to Fig. 3. The dimensions against which tolerances are not specifically mentioned shall be taken as nominal dimensions and tolerances thereon shall be as given in IS 2102 (Part 1) shall apply.

**4 LIQUID LIMIT DEVICE**

**4.1 Materials**

The materials of construction for different components of the liquid limit device shall be given in Table 1. All parts made of brass shall be chrome plated.

**Table 1 Materials for Different Components of Liquid Limit Device**

(*Clause* 4.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl No.** | **Part** | **Material** | **Special Requirement** | **Conforming to Indian Standard** |
| (1) | (2) | (3) | (4) | (5) |
| i) | Base | Vulcanized rubber | Resilience1): 30 percent to 40 percent | Grade Z80 of  IS 5192 (Part 1) |
| ii) | Base feet | Vulcanized rubber | Resilience1): 30 percent to 40 percent | Grade Z80 of  IS 5192 (Part 1) |
| iii) | Cup | Sheet brass | – | IS 410 |
| iv) | Cam housing | Cast brass | – | IS 292 |
| v) | Sliding carriage |  | – | IS 292 |
| vi) | Cam | Brass | – | IS 4170 |
| vii) | Pin | Brass | – | IS 4170 |
| viii) | Handle | Brass | – | IS 4170 |
| ix) | Handle knob | Brass | – | IS 4170 |

1) The resilience of the materials shall be determined in accordance with IS 3400 (Part 11).

**4.2 Construction**

The liquid limit device shall be constructed in accordance with Fig. 1. It shall consist of a base carrying a sliding carriage assembly to which a cup shall be hinged. The cup shall be suspended in such a way that it may be raised and dropped through a height of 10 mm with the help of a lead screw provided at the back of the sliding carriage. For ease of operation, the handle to rotate the cam shall be provided for right-hand operation. The base feet shall be fixed to the base, and both shall be made of the same material. The cup shall have dimensions as detailed in Fig. 1. The inside of the cup shall be finished smooth. The cup shall have a brass follower block brazed to it for being suspended from the sliding carriage with the help of a brass pin. It shall be suspended from the top bracket with the help of the brass pin in such a way that it falls freely without having much play at its hinge. The sliding carriage shall have two grooves to facilitate adjustment of fall of the cup to 10 mm. The contract face of the cam shall be smoothly curved. The sliding carriage shall be secured to the top of the cam housing with two knurled head screws made of brass. The handle shall be fixed to the cam shaft. The handle knob shall have free rotating movement.

**5 GROOVING TOOLS AND GAUGE BLOCK**

**5.1** Grooving tools shall be of three types, namely, Type A, Type B and Type C (*see* Fig. 2).

**5.2 Materials**

The materials of construction for the three different types of the grooving tools and of the gauge block shall be as given in Table 2.

**Table 2 Materials for Grooving Tools and Gauge Block**

(*Clause* 5.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl No.** | **Part** | **Material** | **Special Requirement** | **Conforming to Indian Standard** |
| (1) | (2) | (3) | (4) | (5) |
| i) | Grooving tool,  Type A | Sheet brass  or  Cast brass | Smooth finish | IS 410  or  IS 292 |
| ii) | Grooving tool,  Type B: |  |  |  |
|  | a) Handle | Brass rod | Smooth finish | IS 4170 |
|  | b) Tool | Cast brass | Smooth finish | IS 292 |
| iii) | Grooving tool,  Type C: |  |  |  |
|  | a) Tool | Sheet brass | Smooth finish | IS 410 |
|  | b) Handle | Brass wire | Smooth finish | IS 4413 |
| iv) | Gauge block | Cast brass | Smooth finish | IS 292 |

A blueprint of a mechanical device

Description automatically generated

DETAILS OF CUP

All dimensions in millimetres.

Fig. 1 Liquid Limit Device

A blueprint of a mechanical design

Description automatically generated

|  |  |  |
| --- | --- | --- |
| TYPE A | TYPE B | TYPE C |

All dimensions in millimetres.

Fig. 2 Grooving Tools

**5.3 Construction**

**5.3.1** The shapes and dimensions of the grooving tools shall be in accordance with Fig. 2. In the case of Type B grooving tool, the handle shall be of such a shape and dimensions that it serves for the gauge block.

**5.3.2** The shape and dimensions of the gauge block shall be in accordance with Fig. 3. The gauge block shall be finished smooth.

A drawing of a rectangular object

Description automatically generated

All dimensions in millimetres.

Fig. 3 Gauge Block

**6 MARKING**

**6.1** The liquid limit device, the grooving tools and the gauge block of the Casagrande apparatus shall be clearly marked with the following information:

1. Name of manufacturer or his registered trade-mark or both;
2. Type (where applicable); and
3. Date of manufacture.

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

The product(s) 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)

**LIST OF REFERRED STANDARDS**

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| IS 292 : 1983 | Specification for leaded brass ingots and casting (*second revision*) |
| IS 410 : 1977 | Specification for cold rolled brass sheet, strip and foil (*third revision*) |
| IS 2102 (Part 1) : 1993/ISO 2768-1 : 1989 | General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications (*third revision*) |
| IS 3400 (Part 11) : 2021/ISO 4662 : 2017 | Methods of test for vulcanized rubbers: Part 11 Determination of rebound resilience (*second revision*) |
| IS 4170 : 1967 | Specification for brass rods for general engineering purposes |
| IS 4413 : 1981 | Specification for brass wires for general engineering purposes (*first revision*) |
| IS 5192 (Part 1) : 1994 | Natural rubber compounds ― Specification: Part 1 For moulded products (*second revision*) |

**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* - *201301*) |  | Shri C. Pushpakaran **(*Chairperson*)** |
| AFCONS Infrastructure Limited, Mumbai |  | Dr Sunil Basarkar  Dr Lakshmana Rao Mantri (*Alternate* I)  Shri Budhmal Jain (*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*) |
| 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*) |
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| CSIR - Central Building Research Institute, Roorkee |  | Shri Manojit Samanta  Dr S. Ganesh Kumar (*Alternate*) |
| CSIR - Central Road Research Institute, New Delhi |  | Dr Kanwar Singh  Dr P. S. Prasad (*Alternate*) |
| CSIR - Structural Engineering Research Centre, Chennai |  | Dr P. Kamatchi  Shrimati R. Sreekala (*Alternate*) |
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| Delhi Development Authority, New Delhi |  | Shri Arun Kumar  Shri Harindar Pal (*Alternate*) |
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| Indian Institute of Technology Madras, Chennai |  | Prof Subhadeep Banerjee  Prof Ramesh K. Kandasami (*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*) |
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| MECON Limited, Ranchi |  | Shri Shankar Ray  Shri Ayush Srivastava (*Alternate*) |
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| National High Speed Rail Corporation Ltd, Mumbai |  | Representative |
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| 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)  Shrimati M. Manjula (*Alternate* II) |
| The Pressure Piling Co (I) Pvt Limited, Mumbai |  | Shri V. C. Deshpande  Shri Pushkar V. Deshpande (*Alternate*) |
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| 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 Damachya  Scientist ‘B’/Assistant Director  (Civil Engineering), BIS | | |