

भारतीय मानक
Indian Standard

IS 11315 (Part 7) : 2023

रॉक मास में दरारों का मात्रात्मक विवरण के
तरीके

भाग 7 भराई
(पहला पुनरीक्षण)

**Methods for Quantitative Description
of Discontinuities in Rock Masses**

Part 7 Filling
(*First Revision*)

ICS 93.060

© BIS 2023



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002

www.bis.gov.in www.standardsbis.in

July 2023

Price Group 6

FOREWORD

This Indian Standard (Part 7) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rock Mechanics Sectional Committee had been approved by the Civil Engineering Division Council.

A series of Indian standard test methods for assessing the strength characteristics of rocks and rock masses are being developed/revised in view of recent advances in the field of rock mechanics. The majority of rock masses, in particular, those within a few hundred metres from the surface, behave as discontinuous, with the discontinuities largely determining the mechanical behaviour. It is, therefore, essential that structure of a rock mass and the nature of its discontinuities are carefully described and quantified to have a complete and unified descriptions of rock masses and discontinuities. Careful field descriptions will enhance the value of *in-situ* tests that are performed since the interpretation and extrapolation of results will be made more reliable.

Discontinuity is the general term for any mechanical discontinuity in a rock mass, along which the rock mass has zero or low tensile strength. It is the collective term for most types of joints, weak bedding planes, weak schistosity planes, weakness zones, shear zones and faults. The ten parameters selected for rock mass survey to describe discontinuities are orientation, spacing, persistence, roughness, wall strength, aperture, filling, seepage, number of sets and block size. These parameters are also evaluated from the study of drill cores to obtain information on the discontinuities.

It is essential that both the structures of a rock mass and the nature of its discontinuities are carefully described for determining the mechanical behaviour. This Indian Standard, covering various parameters to describe discontinuities in rock masses.

This standard (Part 7) covers the methods for quantitative description of discontinuities in rock masses for filling. This standard (Part 7) was first formulated in 1987. This revision incorporates the latest advancement and modifications based on the experience gained in the use of this standard. The other parts formulated in the series are:

- Part 1 Orientation
- Part 2 Spacing
- Part 3 Persistence
- Part 4 Roughness
- Part 5 Wall strength
- Part 6 Aperture
- Part 8 Seepage
- Part 9 Number of sets
- Part 10 Block size
- Part 11 Core recovery and rock quality designation
- Part 12 Drill core study

Filling describe the material that separates the adjacent rock walls of a discontinuity, which is usually weaker than the parent rock. Typical filling materials are sand, silt, clay, breccia, gouge, mylonite. Also include thin mineral coatings and healed discontinuities, for example, quartz veins.

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

METHODS FOR QUANTITATIVE DESCRIPTION OF DISCONTINUITIES IN ROCK MASSES

PART 7 FILLING

(*First Revision*)**1 SCOPE**

This standard (Part 7) covers the method for the quantitative description of filling in the discontinuities in the rock mass.

2 REFERENCES

The standards listed in Annex A contain provisions which though reference in the text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions of terms given in IS 11358 shall apply.

4 GENERAL

4.1 Filling is the term for material separating the adjacent rock walls of discontinuities, for example, calcite, chlorite, clay, silt, fault gouge, breccia, etc. The perpendicular distance between the adjacent rock walls is termed the width of the filled discontinuity, as opposed to the aperture of a gapped or open feature.

4.2 Due to the enormous variety of occurrences, filled discontinuities display a wide range of physical behaviour, in particular as regards their shear strength, deformability and permeability. Short-term and long-term behaviour may be quite different such that it is easy to be misled by favourable short-term conditions.

4.3 The wide range of physical behaviour depends on many factors of which the following are probably the most important:

- a) mineralogy of filling material;
- b) grading or particle size;
- c) over-consolidation ratio;
- d) water content and permeability;
- e) previous shear displacement;
- f) wall roughness;
- g) width; and
- h) fracturing or crushing of wall rock.

4.4 Every attempt should be made to record the above factors, using quantitative descriptions, where possible, together with sketches and/or colour

photographs of the most important occurrences. Certain index tests are suggested for a closer investigation of major discontinuities considered to be threat to stability. In special cases, the result of these field descriptions may warrant the recommendation for large scale *in-situ* testing, at least in the case of dam foundations or major slopes.

5 PROCEDURE

5.1 The minimum and maximum widths of simple filled discontinuities (for example, clay filled joints) should be measured to the nearest 10 percent and an estimate made of the most common (modal) width. Marked differences between the minimum and maximum widths may indicate that shear displacement has occurred if the walls are essentially unaltered or unweathered.

5.1.1 In cases where fillings are thin it may be helpful to try to measure the mean amplitude of wall roughness using the straight edge, and compare this with the mean width of the filling as illustrated in Fig. 1. This will be especially valuable when assessing shear strength and deformation characteristics in detailed studies.

5.1.2 The principal dimensions of complex filled discontinuities (for example, shear zones, crushed zones, faults, fault zones, dykes and lithological contacts) should be estimated, or measured to the nearest 10 percent, when possible. In the case of important occurrences, it is helpful to make field sketches such that the condition of the wall rock (that is, degree of associated fracturing and/or alternation) is also communicated (*see* examples in Fig. 2).

5.2 Filled discontinuities that have originated as a result of preferential weathering along discontinuities may have fillings composed of decomposed rock, or disintegrated rock. The relevant type should be recorded:

- a) *Decomposed* — The rock is weathered to the condition of a soil in which the original material fabric is still intact, but some or all of the mineral grains are decomposed; and
- b) *Disintegrated* — The rock is weathered to the condition of a soil, in which the original material fabric is still intact. The rock is friable, but the mineral grains are not decomposed.

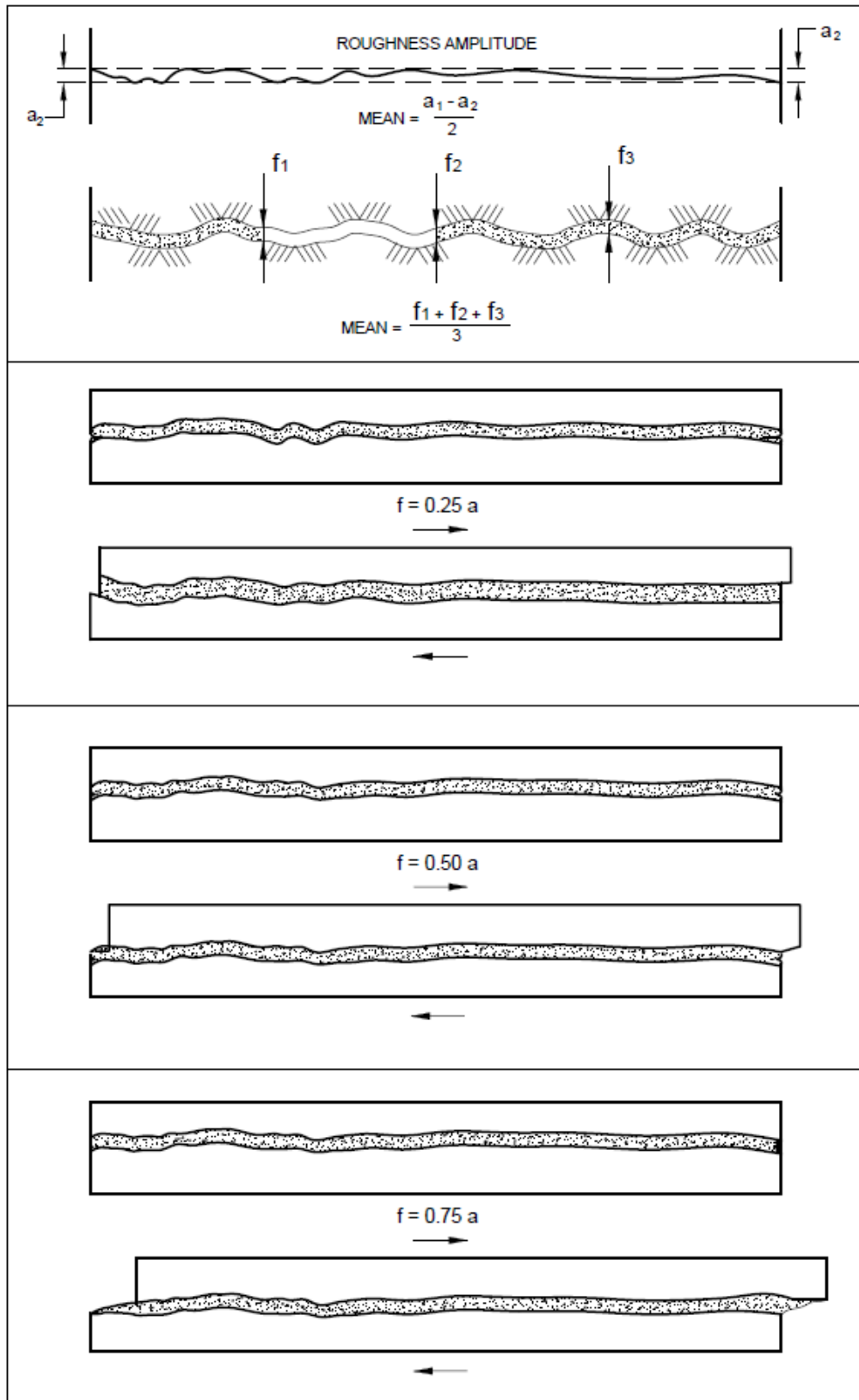


FIG. 1 IN THE CASE OF SIMPLE FILLED DISCONTINUITIES, THE AMPLITUDE OF THE WALL AND THICKNESS OF THE FILLING CAN HELP TO INDICATE THE AMOUNT OF SHEAR DISPLACEMENT REQUIRED FOR ROCK CONTACT (STIFFENING) TO OCCUR (ZERO VOLUME CHANGE ASSUMED DURING SHEAR)

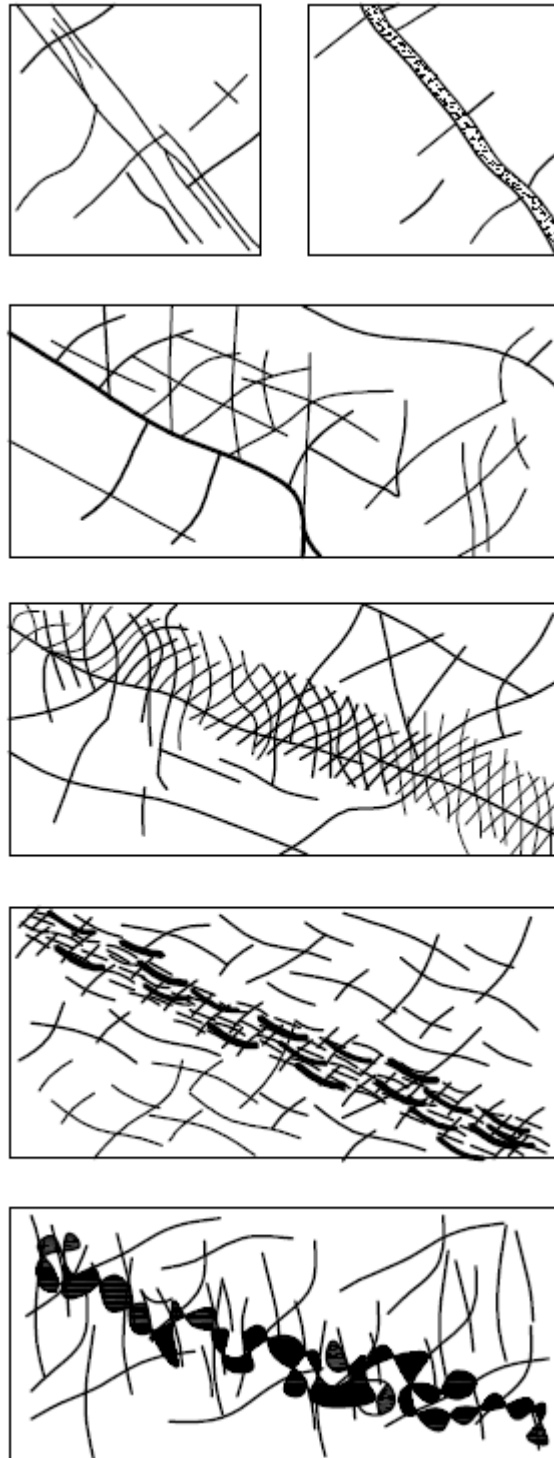


FIG. 2 EXAMPLE OF FIELD SKETCHES OF COMPLEX FILLED DISCONTINUITIES

5.3 For all types of filled discontinuities the finest fraction of the filling or gouge is of most interest since this usually controls the long-term shear strength. The mineralogical composition of the finer filling material should, therefore, be determined, especially in cases where active clays or swelling clays are suspected. Samples should be taken when in doubt concerning the mineralogy.

NOTE — Hydrothermal alteration of gouge material and/or the deposition of hydrothermal products will complicate the mineralogical identification of fillings since products not associated with the petrography of the crushed rock or the wall rock may be present.

5.3.1 In cases where swelling clay such as montmorillonite is identified or suspected, and where this condition might be critical for stability, samples should be taken for free swelling and swelling pressure tests. (It is of advantage of record the *in-situ* water content of these samples, where possible. Such samples should, therefore, be sealed).

5.4 The method of describing the grading or particle size will depend on the type of occurrence. A rough quantitative description of the grading of discontinuity fillings can be given by estimating the percentages of

clay, silt, sand and rock particles (± 10 percent). Several kilos of filling material may need to be extracted and fingered before making these estimates.

5.4.1 Particle size can be classified as under according to IS 1498:

- a) Boulders;
- b) Cobbles;
- c) Coarse gravel;
- d) Medium, gravel;
- e) Fine gravel;
- f) Coarse sand;
- g) Medium sand;
- h) Fine sand; and
- j) Silt, clay.

5.4.2 If a detailed soil mechanics investigation is warranted, the first fraction can be analyzed in the laboratory to determine clay fraction liquid limit and plasticity index, according to relevant method given in relevant part of IS 2720.

5.5 Filling material, in particular the finer fraction which is usually weakest, can be assessed by means of the manual index tests given in Table 1.

Table 1 Manual Index

(Clause 5.5)

Sl No.	Grade	Description	Field Identification	Approximate Range of Uniaxial Compressive Strength Mpa
(1)	(2)	(3)	(4)	(5)
i)	S1	Very soft clay	Easily penetrated several inches by fist	< 0.025
ii)	S2	Soft clay	Easily penetrated several inches by thumb	0.025 to 0.05
iii)	S3	Firm clay	Can be penetrated several inches by thumb with moderate effort	0.05 to 0.10
iv)	S4	Stiff clay	Readily indented by thumb but penetrated only with great effort	0.10 to 0.25
v)	S5	Very stiff clay	Readily indented by thumbnail	0.25 to 0.50
vi)	S6	Hard clay	Indented with difficulty by thumbnail	> 0.50

NOTE — Grades S1 to S6 apply to cohesive soils, for example clays, silty clays, and combinations of silts and clays with sand, generally allow draining. Discontinuity wall strength will generally be characterized by grades R0-R6 (rock) (*see* Part 6) while S1 to S6 (clay) will generally apply to filled discontinuities.

5.5.1 The undrained shear strengths of the soils represented in grades S1 to S6 are equal to one half of the given uniaxial compressive strengths (care should be taken in applying these estimates to fissured clays).

NOTE — The manual index tests for determining grades S1 to S6 can be replaced by more accurate assessments using a standard soil mechanics penetrometer. This contains a stylus which is pressed into the sample at a constant rate. The maximum resistance can be read off a scale which is calibrated to show the maximum compressive strength of the sample. [This value is equal to twice the undrained shear strength $= \frac{1}{2}(\sigma_1 - \sigma_3)$].

5.5.2 If a detailed soil mechanics investigation is warranted (as in drained shear strength determination) due to critical natures of an individual filled discontinuity, then undisturbed samples of the filling material may be required. Various tube samples are available for this sampling operation.

5.6 Care should be taken to determine whether a given filled discontinuity has suffered previous shear displacement or not (Slickensides, shears, displaced cross joints, etc). This should be recorded in conjunction with an estimate of the approximate over-consolidation ratio (OCR) of any clay filling.

NOTE — If previous displacement has occurred through the potential weakest layers of a filled discontinuity, that is, through the clay filling or clay gouge, as evidenced by slicken sides and shears, then the over-consolidation ratio (OCR) of the clay will not be important since the discontinuity will be close to residual strength. However, if previous displacement through these weak layers is not suspected, then the over-consolidation ratio will be important since the peak drained shear strength of the intact clay may be much higher than the residual strength. Short-term stability will be deceptively high, especially in the case of unloading, due to the reduced or negative pore pressures. However, in time swelling and softening may occur due to increased pore pressure and water content and possibly also due to strain softening caused by engineering loading, for example, by excavation of an overlying rock slope. This potential for reduction in strength with time should not be underestimated during field assessment.

5.7 The water content and permeability of the filled discontinuity as a whole and of the clay filling, in particular, should be described as below. The decision to make actual measurements of these properties will depend on the importance of the occurrence to the project:

W_1 The filling materials are heavily consolidated and dry, significant flow

appears unlikely due to very low permeability.

W_2 The filling materials are damp, but no free water is present.

W_3 The filling materials are wet, occasional drops of water.

W_4 The filling materials show of outwash, continuous flow of water (estimate litres/minute).

W_5 The filling materials are washed out locally, considerable water flow along-out wash channels (estimate litres/minute and describe pressure, that is, low, medium high).

W_6 The filling materials are washed out completely, very high water pressures experienced, especially on first exposure (estimate litres/minute and describe pressure).

NOTE — Faults frequently contain highly permeable brecciated gouge adjacent to highly impermeable clay gouge. The water conducting capacity will therefore be strongly anisotropic, and may even be confined to flow parallel to the plane of the fault. It may be premature to describe a fault zone as dry or impermeable, if the tunnel or exploratory adit has not completely penetrated the feature.

6 PRESENTATION OF RESULTS

The detail of presentation will be dependent on the importance of the individual filled discontinuity (or set) to the project as a whole. In general, the description should be arranged as below, so as to include a description of those factors of particular relevance to project in hand:

- a) *Geometry* — Width wall roughness field sketch;
- b) *Filling type* — Mineralogy particle size weathering grade soil index parameters swelling potential;
- c) *Filling strength* — Manual index (S1 to S6) shear strength over-consolidation ratio displaced/undisplaced; and
- d) *Seepage* — Water content rating as ($W_1 - W_2$) permeability quantitative data.

ANNEX A

(Clause 2)

LIST OF REFERRED STANDARDS

<i>IS No.</i>	<i>Title</i>
IS 1498 : 1970	Classification and identification of soils for general engineering purposes (<i>first revision</i>)
IS 2720	Methods of test for soils:
(Parts 1) : 1983	Preparation of dry soil samples for various tests (<i>second revision</i>)
(Parts 2) : 1973	Determination of water content (<i>second revision</i>)
(Parts 3)	Determination of specific gravity,
(Sec 1) : 1980	Fine grained soils (<i>first revision</i>)
(Sec 2) : 1980	Fine, medium and coarse grained soils (<i>first revision</i>)
(Parts 4) : 1985	Grain size analysis (<i>second revision</i>)
(Parts 5) : 1985	Determination of liquid and plastic limit (<i>second revision</i>)
(Parts 6) : 1972	Determination of shrinkage factors (<i>first revision</i>)
(Parts 7) : 1980	Determination of water content-dry density relation using light compaction (<i>second revision</i>)
(Parts 8) : 1983	Determination of water content-dry density relation using heavy compaction (<i>second revision</i>)
(Parts 9) : 1992	Determination of dry density-moisture content relation by constant mass of soil method (<i>first revision</i>)
(Parts 10) : 1991	Determination of unconfined compressive strength (<i>second revision</i>)
(Parts 11) : 1993	Determination of the shear strength parameters of a specimen tested in unconsolidated undrained triaxial compression without the measurement of pore water pressure (<i>first revision</i>)
(Parts 12) : 1981	Determination of shear strength parameters of soil from consolidated undrained triaxial compression test with measurement of pore water pressure (<i>first revision</i>)
(Parts 13) : 1986	Direct shear test (<i>second revision</i>)
(Parts 14) : 1983	Determination of density index (Relative Density) of cohesionless soils (<i>first revision</i>)
(Parts 15) : 1965	Determination of consolidation properties (<i>first revision</i>)
(Parts 16) : 1987	Laboratory determination of CBR (<i>second revision</i>)
(Parts 17) : 1986	Laboratory determination of permeability (<i>first revision</i>)
(Parts 18) : 1992	Determination of field moisture equivalent (<i>first revision</i>)
(Parts 19) : 1992	Determination of centrifuge moisture equivalent (<i>first revision</i>)
(Parts 20) : 1992	Determination of linear shrinkage (<i>first revision</i>)
(Parts 21) : 1977	Determination of total soluble solids (<i>first revision</i>)
(Parts 22) : 1972	Determination of organic matter (<i>first revision</i>)
(Parts 23) : 1976	Determination of calcium carbonate (<i>first revision</i>)
(Parts 24) : 1976	Determination of cation exchange capacity (<i>first revision</i>)
(Parts 25) : 1982	Determination silica sesquioxide ratio (<i>first revision</i>)
(Parts 26) : 1987	Determination of pH value (<i>second revision</i>)
(Parts 27) : 1977	Determination of total soluble sulphates (<i>first revision</i>)
(Parts 28) : 1974	Determination of dry density of soils, in-place, by the sand replacement method (<i>first revision</i>)
(Parts 29) : 1975	Determination of dry density of soils in-place by the core — Cutter method (<i>first revision</i>)
(Parts 30) : 1980	Laboratory vane shear test (<i>first revision</i>)
(Parts 31) : 1990	Field determination of california bearing ratio (<i>first revision</i>)
(Parts 33) : 1971	Determination of the density in-place by the ring and water replacement method
(Parts 34) : 1972	Determination of density of soil in-place by rubber-balloon method
(Parts 35) : 1974	Measurement of negative pore water pressure
(Parts 36) : 1987	Laboratory determination of permeability of granular soils (constant head) (<i>first revision</i>)
(Parts 37) : 1976	Determination of sand equivalent values of soils and fine aggregates
(Parts 38) : 1976	Compaction control test (Hilf method)
(Parts 39)	Direct shear test for soils containing gravel
(Sec 1) : 1977	Laboratory test
(Sec 2) : 1979	<i>In-situ</i> shear test
(Parts 40) : 1977	Determination of free swell index of soils
(Parts 41) : 1977	Measurement of swelling pressure of soils
IS 11358 : 1987	Glossary of terms and symbols relating to rock mechanics

ANNEX B*(Foreword)***COMMITTEE COMPOSITION**

Rock Mechanics Sectional Committee, CED 48

<i>Organization</i>	<i>Representative(s)</i>
Indian Institute of Technology Roorkee, Roorkee	DR N. K SAMADHIYA (<i>Chairperson</i>)
AIMIL Ltd, New Delhi	SHRI AKHIL RAJ
Amberg Technologies, Gurugram	SHRI KRIPAL CHOUDHARY SHRI RAKESH PANDITA (<i>Alternate</i>)
Border Roads Organisation, New Delhi	LT COL ANIL RAJ
Central Board of Irrigation & Power, New Delhi	SHRI G. P. PATEL SHRI UDAY CHANDER (<i>Alternate</i>)
Central Soil & Materials Research Station, New Delhi	SHRI HARI DEV SHRI MAHABIR DIXIT (<i>Alternate</i>)
Central Water and Power Research Station, Pune	SHRI RIZWAN ALI DR S. A. BURELE (<i>Alternate</i>)
Central Water Commission, New Delhi	SHRI DARPAN TALWAR M. S. HARSHITHA (<i>Alternate</i>)
CSIR–Central Building Research Institute, Roorkee	DR SHANTANU SARKAR SHRI KOUSHIK PANDIT (<i>Alternate</i>)
CSIR–Central Institute of Mining & Fuel Research, Dhanbad	DR J. K. MOHNOT DR R. D. DWIVEDI (<i>Alternate</i>)
CSIR–Central Road Research Institute, New Delhi	DR PANKAJ GUPTA SHRI R. K. PANIGRAHI (<i>Alternate</i>)
Engineers India Ltd, New Delhi	DR ALTAF USMANI SHRI SAIKAT PAL (<i>Alternate</i>)
Geological Survey of India, New Delhi	SHRI SANTOSH KUMAR TRIPATHI SHRI D. P. DANGWAL (<i>Alternate</i>)
Indian Institute of Technology Delhi, New Delhi	PROF R. AYOTHIRAMAN PROF PRASHANTH VANGLA (<i>Alternate</i>)
Indian Institute of Technology Roorkee, Roorkee	DR MAHENDRA SINGH DR PRITI MAHESHWARI (<i>Alternate</i>)
Indian Institute of Technology-ISM, Dhanbad	PROF A. K. MISHRA DR R. K. SINHA (<i>Alternate</i>)
Indian Society for Rock Mechanics and Tunnelling Technology, New Delhi	DR C. S. KHOKHAR
Irrigation Research Institute, Roorkee	SHRI DINESH CHANDRA SHRI SHANKAR KUMAR SAHA (<i>Alternate</i>)
National Disaster Management Authority, New Delhi	J. S. (MITIGATION) DR RAVINDER SINGH (<i>Alternate</i>)

IS 11315 (Part 7) : 2023

<i>Organization</i>	<i>Representative(s)</i>
National Highways & Infrastructure Development Corporation Limited, Delhi	SHRI SANJEEV MALIK SHRI ASHOK KUMAR JHA (<i>Alternate</i>)
National Highways Authority of India, New Delhi	REPRESENTATIVE
National Hydroelectric Power Corporation Ltd, Faridabad	SHRI RAJESH KUMAR SHRI AJAY KUMAR VERMA (<i>Alternate I</i>) SHRI PRADEEP KUMAR GARNAYAK(<i>Alternate II</i>)
National Institute of Rock Mechanics, Bengaluru	DR A. RAJAN BABU SHRI G. GOPINATH (<i>Alternate</i>)
NTPC Ltd, New Delhi	SHRI N. K. JAIN SHRI PRAKASH RAWAT (<i>Alternate</i>)
Rail Vikas Nigam Ltd, New Delhi	SHRI SUMIT JAIN SHRI VIJAY DANGWAL (<i>Alternate</i>)
Reliance Industries Limited, Mumbai	SHRI ABHISHEK SAMPATRAO BHOSALE
RITES Ltd, Gurugram	SHRIMATI JYOTSNA DIXIT SHRI SANDEEP SINGH NIRMAL (<i>Alternate</i>)
THDC India Limited, Rishikesh	SHRI T. S. ROUTELA SHRI SAMRAT MUKHERJEE (<i>Alternate</i>)
In Personal Capacity (<i>Flat No. 4123, Tower 4, ACE Golfshire, Sector-150, Noida</i>)	SHRI R. K. GOEL
In Personal Capacity (<i>Naimex House, A-8, Mohan Co-operative Industrial Estate, Mathura Road, New Delhi</i>)	SHRI SHARIQUE KHAN
In Personal Capacity (<i>Jal Vidyut Apts, Sector 21- C, Faridabad</i>)	SHRI IMRAN SAYEED
In Personal Capacity (<i>A-125. Prodhyagiki Apartment, Sector-3, Dwarka, New Delhi</i>)	DR RAJBAL SINGH
In Personal Capacity (<i>C-1004, Park View City - 2, Sector - 49, Gurugram</i>)	DR MANOJ VERMAN
BIS Directorate General	SHRI ARUNKUMAR S., SCIENTIST 'E'/DIRECTOR AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary
DR MANOJ KUMAR RAJAK
SCIENTIST 'D'/JOINT DIRECTOR
(CIVIL ENGINEERING), BIS

This Page has been Intentionally left blank

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 2016* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Head (Publication & Sales), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website- www.bis.gov.in or www.standardsbis.com.

This Indian Standard has been developed from Doc No.: CED 48 (19670).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.gov.in

Regional Offices:

	Telephones
Central : 601/A, Konnectus Tower -1, 6 th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	{ 2323 7617
Eastern : 8 th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	{ 2367 0012 2320 9474
Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	{ 265 9930
Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	{ 2254 1442 2254 1216
Western : Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	{ 2821 8093

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.