

इंटरनेट

मानक

### Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 2720-30 (1980): Methods of test for soils, Part 30: Laboratory vane shear test [CED 43: Soil and Foundation Engineering]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



IS : 2720 (Part XXX) - 1980  
(Reaffirmed 2007)

*Indian Standard*  
METHODS OF TEST FOR SOILS  
PART XXX LABORATORY VANE SHEAR TEST

*(First Revision)*

Third Reprint JULY 2004

UDC 624.131.377

© *Copyright* 1980

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

*Indian Standard*

METHODS OF TEST FOR SOILS

PART XXX LABORATORY VANE SHEAR TEST

( *First Revision* )

---

Soil Engineering and Rock Mechanics Sectional Committee, BDC 23

<i>Chairman</i>	<i>Representing</i>
DR JAGDISH NARAIN	University of Roorkee, Roorkee
<i>Members</i>	
ADDITIONAL DIRECTOR, IRI	Irrigation Department, Government of Bihar, Patna
ADDITIONAL DIRECTOR RESEARCH ( F. E. ), RDSO	Ministry of Railways
DEPUTY DIRECTOR RESEARCH ( SOIL MECH ), RDSO ( <i>Alternate</i> )	
PROF ALAM SINGH	University of Jodhpur, Jodhpur
COL AVTAR SINGH	Engineer-in-Chief's Branch, Army Headquarters
LT-COL V. K. KANITKAR ( <i>Alternate</i> )	
DR A. BANERJEE	Cemindia Co Ltd, Bombay
SHRI S. GUPTA ( <i>Alternate</i> )	
DR R. K. BHANDARI	Central Building Research Institute, Roorkee
CHIEF ENGINEER ( B&R )	Irrigation Department, Government of Punjab, Chandigarh
DR G. S. Dhillon ( <i>Alternate</i> )	
SHRI M. G. DANDAVATE	The Concrete Association of India, Bombay
SHRI N. C. DUGGUL ( <i>Alternate</i> )	
SHRI A. G. DASTIDAR	In personal capacity ( 5 Hungerford Court, 12/1 Hungerford Street, Calcutta 700017 )
DR G. S. DHILLON	Indian Geotechnical Society, New Delhi
DIRECTOR, IRI	Irrigation Department, Government of Uttar Pradesh, Roorkee

( *Continued on page 2* )

© Copyright 1980

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act ( XIV of 1957 )* and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

**IS : 2720 ( Part XXX ) - 1980**

( Continued from page 1 )

<i>Members</i>	<i>Representing</i>
SHRI A H DIVANJI	Asia Foundations & Construction ( P ) Ltd, Bombay
SHRI A. N. JANGLE ( <i>Alternate</i> )	
PROF GOPAL RANJAN	University of Roorkee, Roorkee
PROF GOPAL RANJAN	Institution of Engineers ( India ), Calcutta
DR SHASHI K. GULHATI	Indian Institute of Technology, New Delhi
DR G. B. RAO ( <i>Alternate</i> )	
SHRI O. P. MALHOTRA	Public Works Department, Chandigarh Administration, Chandigarh
SHRI T. K. NATRAJAN	Central Road Research Institute, New Delhi
PRESIDENT ( IMDA )	All India Instrument Manufacturers & Dealers Association, Bombay
DEPUTY SECRETARY ( AIIMDA ) ( <i>Alternate</i> )	
SHRI R. V. RANTHIDEVAN	Central Water Commission, New Delhi
DEPUTY DIRECTOR ( CSMRS ) ( <i>Alternate</i> )	
RESEARCH OFFICER ( B&RRL )	Public Works Department, Government of Punjab, Chandigarh
SHRI K. R. SAXINA	Public Works Department, Government of Andhra Pradesh, Hyderabad
SECRETARY	Central Board of Irrigation & Power, New Delhi
DEPUTY SECRETARY ( <i>Alternate</i> )	
SHRI N. SIVAGURU	Roads Wing, Ministry of Shipping & Transport
SHRI D. V. SIKKA ( <i>Alternate</i> )	
SHRI K. S. SRINIVASAN	National Buildings Organization, New Delhi
SHRI SUNIL BERRY ( <i>Alternate</i> )	
SUPERINTENDING ENGINEER ( P&D )	Public Works Department, Government of Tamil Nadu, Madras
EXECUTIVE ENGINEER ( SMRD ) ( <i>Alternate</i> )	
SHRI H. C. VERMA	All India Instrument Manufacturers & Dealers Association, Bombay
SHRI H. K. GUHA ( <i>Alternate</i> )	
SHRI S. D. VIDYARTHI	Public Works Department, Government of Uttar Pradesh, Lucknow
DR B. L. DHAWAN ( <i>Alternate</i> )	
SHRI G. RAMAN, Director ( Civ Engg )	Director General, ISI ( <i>Ex-officio Member</i> )

*Secretary*

SHRI K. M. MATHUR  
Deputy Director ( Civ Engg ), ISI

( Continued on page 8 )

AMENDMENT NO. 1    MAY 1984  
TO  
IS:2720(Part 30)-1980 METHODS OF TEST FOR SOILS  
PART 30 LABORATORY VANE SHEAR TEST

*(First Revision)*

Alteration

*(Page 5, clause 3.1, line 1) - Substitute '30 mm'  
for '37.5 mm'.*

(BDC 23)

*Indian Standard*

METHODS OF TEST FOR SOILS

PART XXX LABORATORY VANE SHEAR TEST

( *First Revision* )

0. FOREWORD

0.1 This Indian Standard ( Part XXX ) ( First Revision ) was adopted by the Indian Standards Institution on 31 October 1980, after the draft finalized by the Soil and Rock Mechanics Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The laboratory vane shear test for the measurement of shear strength of cohesive soils is useful for soils of low shear strength of less than about 0.5 kgf/cm<sup>2</sup>. This test gives the undrained strength of the soil and the undisturbed and remoulded strengths obtained are used for evaluating the sensitivity of the soil. This standard was first published in the year 1968. This revision has been prepared to incorporate revised shape of vane found useful for this test.

0.3 In reporting the result of a test of analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

---

1. SCOPE

1.1 This standard ( Part XXX ) covers the procedure of conducting laboratory vane shear test on cohesive soils of low shear strength for determining their undrained shear strength.

2. APPARATUS

2.1 **Vane** — The vane shall consist of four blades each fixed at 90° to the adjacent blades as illustrated in Fig. 1. The vane should not deform under the maximum torque for which it is designed. The penetrating

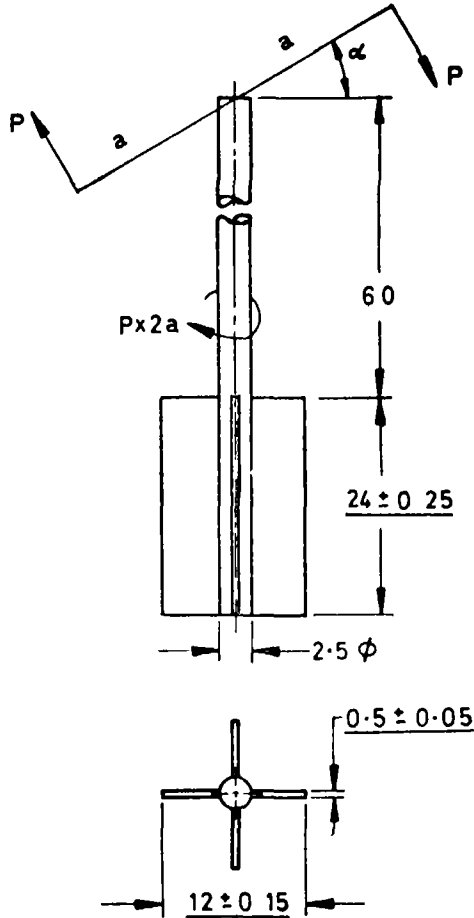
---

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



**IS : 2720 ( Part XXX ) - 1980**

edge of the vane blades shall be sharpened having an included angle of  $90^\circ$ . The vane blades shall be welded together suitably to a central rod, the maximum diameter of which should preferably not exceed 2.5 mm in the portion of the rod which goes into the specimen during the test. The vane should be properly treated to prevent rusting and corrosion.



All dimensions in millimetres.

Essential dimensions underlined.

**FIG. 1 PRINCIPLE OF VANE SHEAR TEST**

**2.2** The apparatus may be either of the hand-operated type or motorized. Provisions should be made in the apparatus for the following:

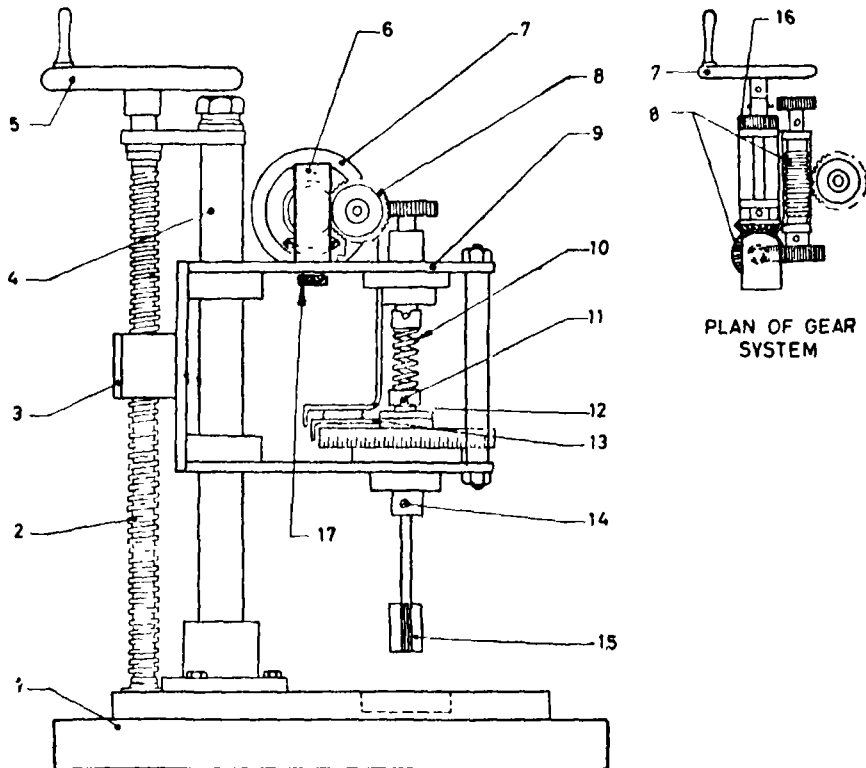
- a) Fixing of vane and shaft to the apparatus in such a way that the vane can be lowered gradually and vertically into the soil specimen.
- b) Fixing the tube containing the soil specimen to the base of the equipment for which it should have suitable hole.
- c) Arrangement for lowering the vane into the soil specimen ( contained in the tube fixed to the base ) gradually and vertically and for holding the vane properly and securely in the lowered position.
- d) Arrangement for rotating the vane steadily at a rate of approximately 1/60 rev/min ( 0.1°/s ) and for measuring the rotation of the vane.
- e) A torque applicator to rotate the vane in the soil and a device for measuring the torque applied to an accuracy of 0.05 cm.kgf.
- f) A set of springs capable of measuring shear strength of 0.5 kgf/cm<sup>2</sup>.

**2.2.1** A typical form of the hand operated apparatus is shown in Fig 2.

### **3. PROCEDURE**

**3.1** The specimen in the tube should be at least 37.5 mm in diameter and 75 mm long. Mount the specimen container with the specimen on the base of the vane shear apparatus and fix it securely to the base. If the specimen container is closed at one end it should be provided at the bottom with a hole of about 1 mm diameter. Lower the shear vanes into the specimen to their full length gradually with minimum disturbance of the soil specimen so that the top of the vane is at least 10 mm below the top of the specimen. Note the readings of the strain and torque indicators. Rotate the vane at a uniform rate approximately 0.1 °/s by suitably operating the torque applicator handle until the specimen fails. Note the final reading of the torque indicator. Torque readings and the corresponding strain readings may also be noted at desired intervals of time as the test proceeds.

**3.2** Just after the determination of the maximum torque rotate the vane rapidly through a minimum of ten revolutions. The remoulded strength should then be determined within 1 minute after completion of the revolution.



This is only a typical example and any design of apparatus satisfying the requirements specified in 2 may be used.

- |                                  |                              |
|----------------------------------|------------------------------|
| 1 Base                           | 10 Torque spring             |
| 2 Lead screw                     | 11 Locating pins             |
| 3 Nut                            | 12 Strain indicating pointer |
| 4 Support pillar                 | 13 Maximum pointer           |
| 5 Lead screw handle              | 14 Vane fixing screw         |
| 6 Gear bracket                   | 15 Shear vanes               |
| 7 Torque applicator handle       | 16 Normal speed gear         |
| 8 Slow motion bevel & work gears | 17 Gear bracket clamp screws |
| 9 Bracket                        |                              |

FIG. 2 LABORATORY VANE SHEAR APPARATUS

#### 4. COMPUTATIONS

4.1 For vane testing instruments that do not read the torque directly, a calibration curve to convert the readings to cm.kgf of torque shall be provided. These calibration curves shall be checked periodically.

4.2 Calculate the shear strength of the soil using the following formula :

$$S = \frac{3}{19} T$$

where

$S$  = shear strength in kgf/cm<sup>2</sup>, and

$T$  = torque in cm.kgf.

NOTE 1 — This formula is based on the following assumptions:

- a) Shearing strengths in the horizontal and vertical directions are the same;
- b) At the peak value, shear strength is equally mobilized at the end surface as well as at the centre, and
- c) The shear surface is cylindrical and has a diameter equal to the diameter of the vane.

NOTE 2 — It is important that the dimensions of the vane are checked periodically to ensure that the vane is not distorted or worn.

**IS : 2720 ( Part XXX ) - 1980**

( Continued from page 2 )

**Soil Testing Procedures and Equipment Subcommittee, BDC 23:3**

<i>Convener</i>	<i>Representing</i>
PROF ALAM SINGH	University of Jodhpur, Jodhpur
<i>Members</i>	
SHRI AMAR SINGH DEPUTY DIRECTOR RESEARCH (FE-II), RDSO	Central Building Research Institute, Roorkee Ministry of Railways
DEPUTY DIRECTOR RESEARCH ( SM-III ), RDSO ( <i>Alternate</i> )	
DIRECTOR ( CSMRS )	Central Water Commission, New Delhi
DEPUTY DIRECTOR ( CSMRS ) ( <i>Alternate</i> )	
PROF GOPAL RANJAN DR S. C. HANDA ( <i>Alternate</i> )	University of Roorkee, Roorkee
DR SHASHI K. GULHATI	Indian Institute of Technology, New Delhi
SHRI H. K. GUHA	Geologists Syndicate Pvt Ltd, Calcutta
SHRI H. N. BHATTACHARAYA ( <i>Alternate</i> )	
SHRI O. P. MALHOTRA	Public Works Department, Chandigarh Administration
SHRI M. D. NAIR	Associated Instruments Manufacturers ( I ) Pvt Ltd, New Delhi
PROF T. S. NAGARAJ ( <i>Alternate</i> )	
SHRI N. M. PATEL	Delhi College of Engineering, Delhi
SHRI P. JAGANATHA RAO	Central Road Research Institute, New Delhi
COL AVTAR SINGH	Engineer-in-Chief's Branch, Army Headquarters
LT-COL V. K. KANITKAR ( <i>Alternate</i> )	
SHRI S. D. VIDYARTHI	Public Works Department, Government of Uttar Pradesh, Lucknow
DR B. L. DHAWAN ( <i>Alternate</i> )	

## BUREAU OF INDIAN STANDARDS

### **Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

**Telephones** 23230131, 23233375, 23239402 **Fax** 91+011 23234062, 23239399, 23239382

**E-mail:** [bis@vsnl.com](mailto:bis@vsnl.com)

**website** <http://www.bis.org.in>

### **Central Laboratory:**

Plot No 20/9 Site IV, Sahibabad Industrial Area, SAHIBABD 201010

### **Telephone**

2770032

### **Regional Offices:**

Central Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002 23237617

\*Eastern, 1/14 CIT Scheme VII M, V I P Road Kankurgachi, KOLKATA 700054 23378662

Northern SCO 335-336, Sector 34-A, Chandigarh 160022 603843

Southern C I T Campus, IV Cross Road, CHENNAI 600113 254 19 84

Western Manakalaya, E9, MIDC, Behind Marol Telephone Exchange,  
Andheri (East), MUMBAI 400093 2832 92 95

### **Branch offices:**

'Pushpak' Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001 560 13 48

Peenya Industrial Area, 1<sup>st</sup> Stage, Bangalore-Tumkur Road, BANGALORE 839 49 55

Commercial-cum-office Complex, opp Dushera Maidan, Arera Colony,  
Bittan Market, BHOPAL 462016 242 34 52

62/63, Ganga Nagar, Unit VI, BHUBANESHWAR 751001 240 3139

5<sup>th</sup> Floor, Kovai Towers, 44 Bala Sundaram Road, COIMBATORE 641018 221 0141

SCO 21, Sector 12, Faridabad 121007 2292175

Savitri Complex, 116 G T Road Ghaziabad 201001 2861498

53/5 Ward No 29, R G Barua Road 5 by-lane, Apurba Sinha Path  
GUWAHATI 781003 2541137

5-8-56C L N Gupta Marg, Nampally Station Road, HYBERABAD 500001 23201084

E-52, Chitranjan Marg, C-Scheme, JAIPUR 302001 2373879

117/418 B Sarvodaya Nagar, KANPUR 208005 2218774

Sethi Bhavan, 2<sup>nd</sup> Floor, Behind Leela Cinema, Naval Kishore Road,  
LUCKNOW 226001 2215698

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010 2525171

Mahavir Bhavan, First Floor, Ropar Road, NALAGARH 174101 221451

Patliputra Industrial Estate, PATNA 800013 2262808

First Floor, Plot Nos 657-660, Market Yard, Gultkdi, PUNE 411037 4268659

"Sahajanand House" 3<sup>rd</sup> Floor, Bhaktinagar Circle, 80 Feet Road,  
RAJKOT 360002 2378251

T C No 14/1421, University P O Palayam, THIRUVANANTHAPURAM 695034 2322104

1st Floor, Udyog Bhavan, VUDA, Siripuram Junction, VISHAKHAPATNAM-03 2712833

Sales Office is at 5 Chowringhee Approach, P O Princep Street, Kolkata 700072 22371085

Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007 23096528