

Indian Standard

SPECIFICATION FOR MOULDS AND
ACCESSORIES FOR DETERMINATION OF
DENSITY INDEX (RELATIVE DENSITY) OF
COHESIONLESS SOILS

UDC 624.131.21 : 624.131.431.5



© Copyright 1985

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR MOULDS AND ACCESSORIES FOR DETERMINATION OF DENSITY INDEX (RELATIVE DENSITY) OF COHESIONLESS SOILS

Soil Engineering and Rock Mechanics Sectional Committee, BDC 23

<i>Chairman</i>	<i>Representing</i>
DR JAGDISH NARAIN	Association of Indian Universities, New Delhi
<i>Members</i>	
SHRI P. D. AGARWAL	Public Works Department, Govt of Uttar Pradesh, Lucknow
SHRI B. L. DHAWAN (<i>Alternate</i>)	
PROF ALAM SINGH	University of Jodhpur, Jodhpur
SHRI B. ANJIAH	Engineering Research Laboratories, Government of Andhra Pradesh, Hyderabad
SHRI E. M. BENJAMIN	Concrete Association of India, Bombay
SHRI N. C. DUGGAL (<i>Alternate</i>)	
CHIEF ENGINEER (IPRI)	Irrigation Department, Government of Punjab, Chandigarh
DIRECTOR (DAM) (<i>Alternate</i>)	
SHRI A. G. DASTIDAR	In personal capacity (5 Hungerford Court, 12/1, Hungerford Street, Calcutta)
DR G. S. DHILLON	Indian Geotechnical Society, New Delhi
DIRECTOR	Central Soil & Materials Research Station, New Delhi
DEPUTY DIRECTOR (<i>Alternate</i>)	
DIRECTOR, IRI	Irrigation Department, Government of Uttar Pradesh, Roorkee
SHRI A. H. DIVANJI	Asia Foundations and Construction (P) Ltd, Bombay
SHRI A. N. JANGLE (<i>Alternate</i>)	
DR GOPAL RANJAN	University of Roorkee, Roorkee; and Institute of Engineers (India), Calcutta
SHRI S. GUPTA	Cemindia Company Limited, Bombay
SHRI N. V. DE SOUSA (<i>Alternate</i>)	
SHRI M. IYENGAR	Engineers India Limited, New Delhi
SHRI ASHOK K. JAIN	G. S. Jain and Associates, Roorkee
SHRI VIJAY K. JAIN (<i>Alternate</i>)	

(Continued on page 2)

© Copyright 1985

INDIAN STANDARDS INSTITUTION

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.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
JOINT DIRECTOR RESEARCH (GE)-I, RDSO	Ministry of Railways
JOINT DIRECTOR RESEARCH (GE)-II RDSO (<i>Alternate</i>)	
LT COL V. K. KANITKAR	Ministry of Defence (Engineer-in-Chief 's Branch)
SHRI O. P. MALHOTRA	Public Works Department, Chandigarh Administration, Chandigarh
SHRI D. R. NARAHARI	Central Building Research Institute (CSIR), Roorkee
SHRI V. S. AGARWAL (<i>Alternate</i>)	
SHRI T. K. NATARAJAN	Central Road Research Institute (CSIR), New Delhi
SHRI RANJIT SINGH	Ministry of Defence (R & D)
SHRI P. D. DESHPANDE (<i>Alternate</i>)	
DR G. V. RAO	Indian Institute of Technology, New Delhi
DR K. K. GUPTA (<i>Alternate</i>)	
RESEARCH OFFICER (B & RRL)	Public Works Department, Government of Punjab, Chandigarh
SECRETARY	Central Board of Irrigation and Power, New Delhi
DEPUTY SECRETARY (<i>Alternate</i>)	
SHRI N. SIVAGURU	Roads Wing (Ministry of Shipping and Transport)
SHRI P. R. KALRA (<i>Alternate</i>)	
SHRI K. S. SRINIVASAN	National Buildings Organization, New Delhi
SHRI SUNIL BERRY (<i>Alternate</i>)	
DR N. SOM	Jadavpur University, Calcutta
SHRI N. SUBRAMANYAM	Karnataka Engineering Research Station, Krishnarajasagar
SUPERINTENDING ENGINEER (P & DC)	Public Works Department, Government of Tamil Nadu
EXECUTIVE ENGINEER (SMRD) (<i>Alternate</i>)	
SHRI H. C. VERMA	All India Instrument Manufacturers and Dealers Association, Bombay
SHRI H. K. GUHA (<i>Alternate</i>)	
SHRI G. RAMAN, Director (Civ Engg)	Director General, ISI (<i>Ex-officio Member</i>)

Secretary

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

(Continued on page 11)

Indian Standard

SPECIFICATION FOR MOULDS AND ACCESSORIES FOR DETERMINATION OF DENSITY INDEX (RELATIVE DENSITY) OF COHESIONLESS SOILS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 23 April 1984, after the draft finalized by the Soil Engineering and Rock Mechanics Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The Indian Standards Institution has already published a series of standards on methods of testing soils. It has been recognized that reliable and inter-comparable test results can be obtained only with standard testing equipment capable of giving the desired level of accuracy. The Sectional Committee has, therefore, decided to bring out a series of specifications covering the requirements of equipment used for testing soils to encourage its development and manufacture in the country.

0.3 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* using vibratory table.

0.4 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 : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the details of two types of moulds, guide sleeves surcharge base plate with handle and surcharge weights used for

*Methods of test for soils: Part 14 Determination of density index (relative density) of cohesionless soils (*first revision*).

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

the laboratory determination of density index (relative density) of cohesionless free draining soils using vibratory table.

2. DIMENSIONS

2.1 Dimensions with tolerances of different 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 tolerances as given in IS : 2102 (Part 1)-1980* (medium class).

3. MATERIALS

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

TABLE 1 MATERIALS OF CONSTRUCTION OF DIFFERENT COMPONENTS

SL No.	EQUIPMENT	MATERIAL	SPECIAL REQUIREMENTS, IF ANY	RELEVANT INDIAN STANDARD
(1)	(2)	(3)	(4)	(5)
i)	Mould	Copper alloy	—	IS : 318-1981*
		<i>or</i>		
		Brass	—	IS : 292-1961†
		<i>or</i>		
		Aluminium	—	IS : 617-1975‡
		<i>or</i>		
		Mild Steel	Cadmium plated	IS : 513-1973§
ii)	Guide sleeve	Mild Steel	Cadmium plated	IS : 513-1973§
iii)	Surcharge base plate with handle	Mild Steel	Cadmium plated	IS : 513-1973§
iv)	Surcharge weight:			
	Body	Mild Steel	Cadmium plated	IS : 513-1973§
	Filling	Lead		IS : 782-1978

*Specification for leaded in bronze ingots and castings (*second revision*).

†Specification for brass ingots and castings (*revised*).

‡Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*).

§Specification for cold rolled carbon steel sheets (*second revision*).

||Specification for caulking lead (*third revision*).

*General tolerances for dimensions and form and position: Part 1 General tolerances for linear and angular dimensions (*second revision*).

4. CONSTRUCTION

4.1 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.

4.2 Guide Sleeve — The inside of the sleeve shall be finished smooth and one is 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.

4.3 Surcharge Base Plates with Handles — The surcharge base plate is provided with each mould as detailed in Fig. 3. The details of handle for both sizes are given in Fig. 4.

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

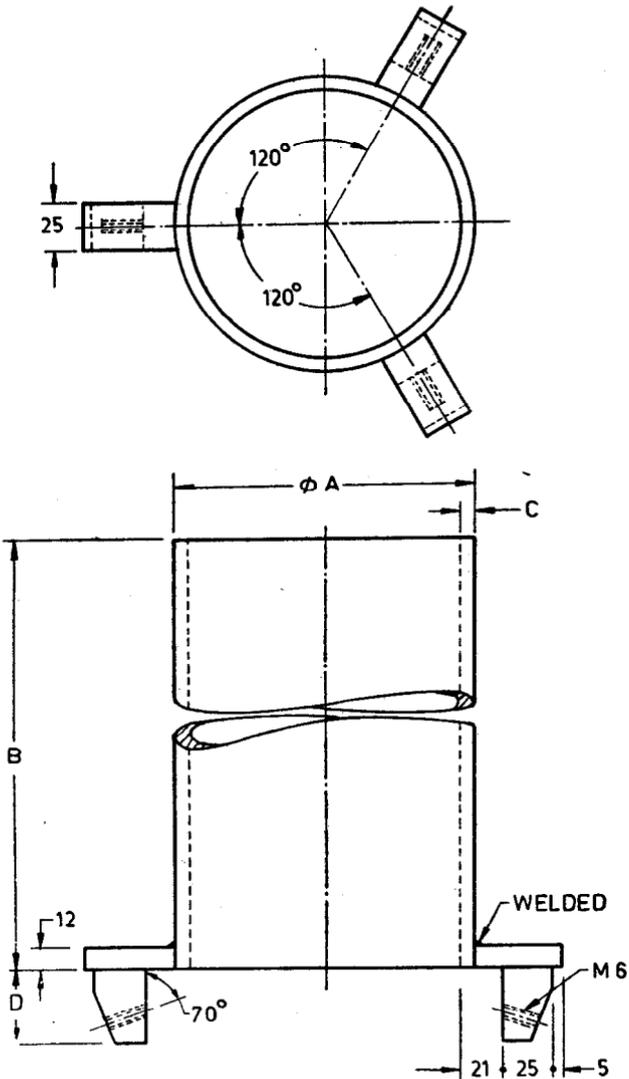
5. MARKING

5.1 The following information shall be clearly and indelibly marked on each part of equipment:

- a) Name of the manufacturer or his registered trade-mark;
- b) Type of material used; and
- c) Date of manufacture.

5.1.1 The equipment may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

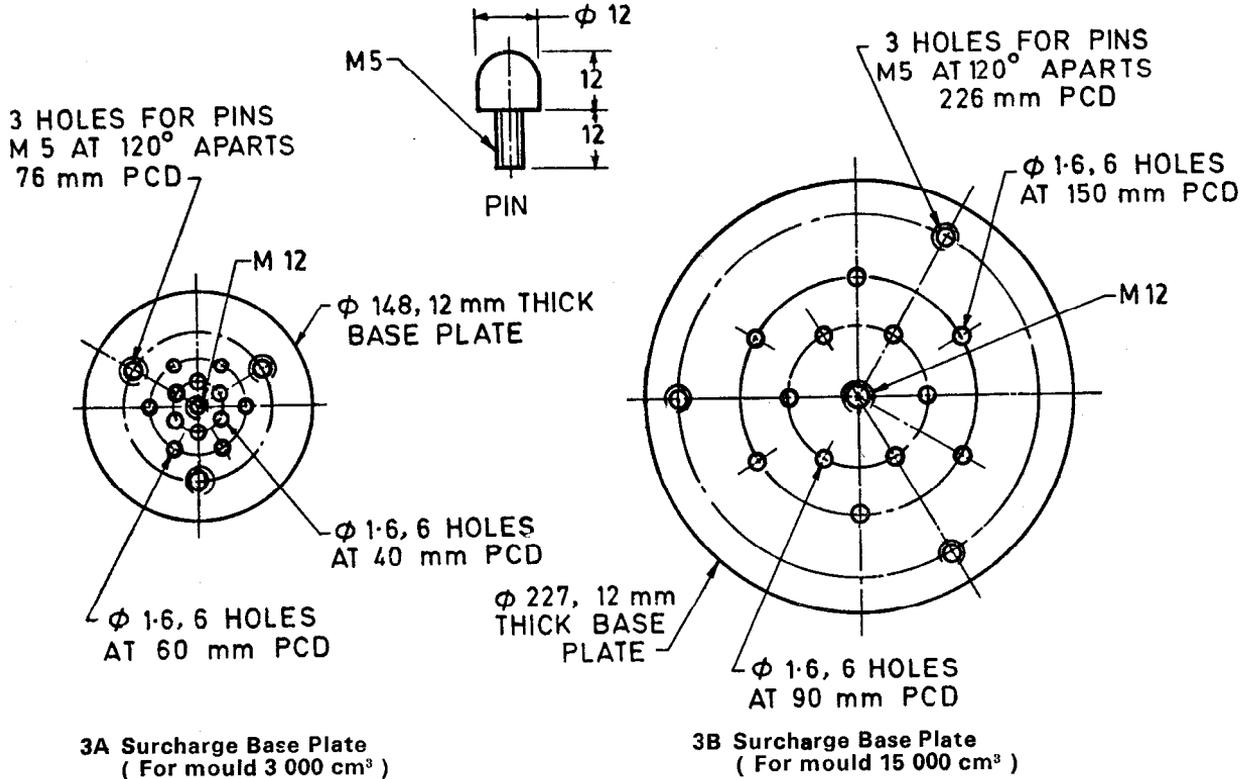


Size of Mould	ϕA	B	C	D
3,000 cm ³	150 ± 0.05	300	6	35
15 000 cm ³	280 ± 0.05	200	10	38

All dimensions in millimetres.

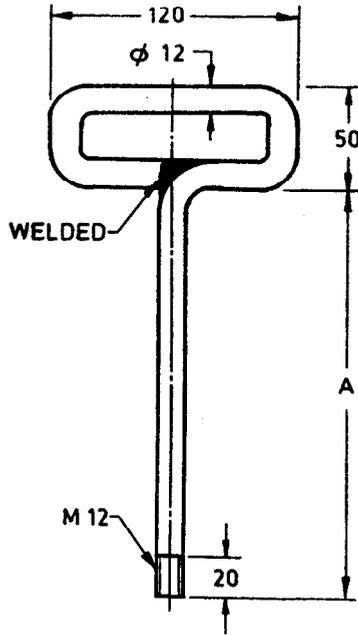
FIG. 2 GUIDE SLEEVE

8



All dimensions in millimetres.

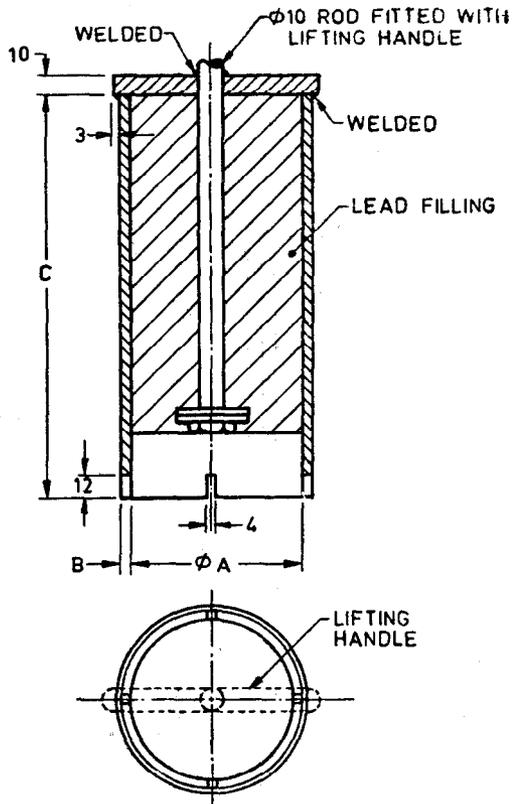
FIG. 3 SURCHARGE BASE PLATE



$A = 275$ mm for mould of capacity 3 000 cm^3
 $A = 200$ mm for mould of capacity 15 000 cm^3

All dimensions in millimetres.

FIG. 4 LIFTING HANDLE



Size of Mould	A	B	C	Total Wt. Reqd, kg
3 000 cm ³	100 ± 0.05	6	225	24.7 ± 0.2
15 000 cm ³	250 ± 0.05	10	150	86.0 ± 0.5

All dimensions in millimetres.

FIG. 5 SURCHARGE WEIGHT

(Continued from page 2)

Soil Testing Instruments and Equipment Subcommittee, BDC 23 : 6

Convener

SHRI H. C. VERMA

*Representing*Associated Instruments Manufacturers (I) Pvt Ltd,
New Delhi*Members*

SHRI M. D. NAIR (*Alternate* to
Shri H. C. Verma)
SHRI AMOD KRISHNA Saraswati Engineering Agency, Roorkee
SHRI RAKESH GOEL (*Alternate*)
DEPUTY DIRECTOR RESEARCH Ministry of Railways
(GE-III) RDSO
JOINT DIRECTOR RESEARCH
(GE-II) RDSO (*Alternate*)
DIRECTOR Central Soil & Material Research Station,
New Delhi

DEPUTY DIRECTOR (*Alternate*)
SHRI H. K. GUHA Geologists' Syndicate Pvt Ltd, Calcutta
SHRI A. BHATTACHARYA (*Alternate*)
SHRI S. C. HANDA University of Roorkee, Roorkee
SHRI VIJAY K. JAIN G. S. Jain Associates, Roorkee
SHRI SATYENDRA MITTAL (*Alternate*)
SHRI B. R. MALHOTRA Central Road Research Institute (CSIR),
New Delhi

SHRI S. K. MITRA K. N. Dadina Foundation Engineers, Calcutta
BRIG M. K. PAUL Ministry of Defence
SHRI M. P. SHUKLA (*Alternate*)
DR T. RAMAMURTHY Indian Institute of Technology, New Delhi
SHRI RESHAM SINGH Hydraulic & Engineering Instruments Co,
New Delhi

SHRI JATINDER SINGH (*Alternate*)
SHRI S. VENKATASAN Central Building Research Institute (CSIR),
Roorkee

SHRI M. R. SONEJA (*Alternate*)

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²