

IS : 7322 - 1985

Indian Standard

SPECIFICATION FOR
SPECIALS FOR STEEL CYLINDER
REINFORCED CONCRETE PIPES

(First Revision)

UDC 621.613.2 [666.982.2]



© Copyright 1985

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

Indian Standard

SPECIFICATION FOR SPECIALS FOR STEEL CYLINDER REINFORCED CONCRETE PIPES (*First Revision*)

Cement and Concrete Sectional Committee, BDC 2

<i>Chairman</i>	<i>Representing</i>
DR H. C. VISVESVARAYA	Cement Research Institute of India, New Delhi
<i>Members</i>	
ADDITIONAL DIRECTOR STANDARDS (B & S)	Research, Designs & Standards Organization (Ministry of Railways), Lucknow
DEPUTY DIRECTOR STANDARDS (B & S) (<i>Alternate</i>)	
SHRI K. P. BANERJEE	Larsen and Toubro Limited, Bombay
SHRI HARISH N. MALANI (<i>Alternate</i>)	
SHRI S. K. BANERJEE	National Test House, Calcutta
CHIEF ENGINEER (BD)	Bhakra Beas Management Board, Nangal Township
SHRI J. C. BASUR (<i>Alternate</i>)	
CHIEF ENGINEER (DESIGNS)	Central Public Works Department, New Delhi
EXECUTIVE ENGINEER (D) III (<i>Alternate</i>)	
CHIEF ENGINEER (RESEARCH- cum-DIRECTOR)	Irrigation and Power Research Institute, Government of Punjab, Amritsar
RESEARCH OFFICER (CONCRETE TECHNOLOGY) (<i>Alternate</i>)	
DIRECTOR	A. P. Engineering Research Laboratories, Hyderabad
JOINT DIRECTOR (<i>Alternate</i>)	
DIRECTOR	Central Soil and Materials Research Station, New Delhi
CHIEF RESEARCH OFFICER (<i>Alternate</i>)	
DIRECTOR (C & MDD-I)	Central Water Commission, New Delhi
DEPUTY DIRECTOR (C & MDD-I) (<i>Alternate</i>)	
SHRI V. K. GHANEKAR	Structural Engineering Research Centre (CSIR), Roorkee.
SHRI A. V. GOKAK	Cement Controller (Ministry of Industry), New Delhi
SHRI S. S. MIGLANI (<i>Alternate</i>)	
SHRI A. K. GUPTA	Hyderabad Asbestos Cement Products Limited, Ballabgarh

(*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>
SHRI P. J. JAGUS DR A. K. CHATTERJEE (<i>Alternate</i>)	Associated Cement Companies Ltd, Bombay
SHRI N. G. JOSHI	Indian Hume Pipes Co Limited, Bombay
SHRI R. L. KAPOOR SHRI N. SIVAGURU (<i>Alternate</i>)	Ministry of Shipping and Transport (Roads Wing)
SHRI S. K. LAHA SHRI B. T. UNWALLA (<i>Alternate</i>)	Institution of Engineers (India), Calcutta
DR A. K. MULLICK	Cement Research Institute of India, New Delhi
SHRI K. K. NAMBIAR	In personal capacity ('Ramanalaya' 11, First Crescent Park Road, Gandhinagar, Adyar, Madras)
SHRI S. N. PAL SHRI BIMAN DASGUPTA (<i>Alternate</i>)	M. N. Dastur and Company Private Limited, Calcutta
SHRI H. S. PASRICHA	Hindustan Prefab Limited, New Delhi
SHRI Y. R. PHULL SHRI M. R. CHATTERJEE (<i>Alternate</i>)	Indian Roads Congress, New Delhi; and Central Road Research Institute (CSIR), New Delhi
DR MOHAN RAI	Central Road Research Institute (CSIR), New Delhi
DR S. S. REHSI (<i>Alternate</i>)	Central Building Research Institute (CSIR), Roorkee
DR M. RAMAIAH DR A. G. MADHAVA RAO (<i>Alternate</i>)	Structural Engineering Research Centre (CSIR), Madras
SHRI A. V. RAMANA DR K. C. NARANG (<i>Alternate</i>)	Dalmia Cement (Bharat) Limited, New Delhi
SHRI P. S. RAMACHANDRAN SHRI G. RAMDAS	India Cements Limited, Madras Directorate General of Supplies and Disposals, New Delhi
DR A. V. R. RAO SHRI J. SEN GUPTA (<i>Alternate</i>)	National Buildings Organization, New Delhi
SHRI R. V. CHALAPATHI RAO SHRI S. ROY (<i>Alternate</i>)	Geological Survey of India, Calcutta
SHRI T. N. SUBBA RAO SHRI S. A. REDDI (<i>Alternate</i>)	Gammon India Limited, Bombay
SHRI ARJUN RIJHSINGHANI SHRI C. S. SHARMA (<i>Alternate</i>)	Cement Corporation of India, New Delhi
SHRI H. S. SATYANARAYANA SHRI V. R. KOTNIS (<i>Alternate</i>)	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SECRETARY SHRI K. R. SAXENA (<i>Alternate</i>)	Central Board of Irrigation and Power, New Delhi
SUPERINTENDING ENGINEER (DESIGNS) EXECUTIVE ENGINEER (SMD DIVISION) (<i>Alternate</i>)	Public Works Department, Government of Tamil Nadu, Madras
SHRI L. SWAROOP SHRI H. BHATTACHARYYA (<i>Alternate</i>)	Orissa Cement Limited, New Delhi
SHRI G. RAMAN, Director (Civ Engg)	Director General, ISI (<i>Ex-officio Member</i>)

Secretary

SHRI N. C. BANDYOPADHYAY
Deputy Director (Civ Engg), ISI

(Continued on page 13)

Indian Standard

**SPECIFICATION FOR
SPECIALS FOR STEEL CYLINDER
REINFORCED CONCRETE PIPES**

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 15 April 1985, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 With steel cylinder reinforced concrete pipe lines used for water mains, sewer lines and irrigation works, certain fittings and specials are required for curves, bends, branches, manholes, air valves, blow-offs and connection to main line valves and other pipes. A detailed specification for specials has been considered necessary as an adjunct to IS : 1916-1963* for guidance of the manufacturer and the user.

0.3 This standard was first published in 1974. The present revision has been taken up with a view to incorporating the modifications found necessary in the light of experience gained during the use of this standard. This revision incorporates a number of changes, the most important of them being the thickness of plate used for steel core reinforcement, aligning the details of flange with IS : 1538 (Parts 1 to 23)-1976†, inclusion of dye penetration test in place of penetration oil test, and deleting the use of mortar in the manufacture of specials.

0.4 This standard contains a clause **3.4.3** which calls for agreement between the purchaser and the supplier.

0.5 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.

*Specification for steel cylinder reinforced concrete pipes.

†Specification for cast iron fittings for pressure pipes for water, gas and sewage (*second revision*).

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

1. SCOPE

1.1 This standard lays down requirements and methods of tests for steel cylinder reinforced concrete specials for steel cylinder reinforced concrete pipes conforming to IS : 1916-1963* having nominal internal diameter from 200 to 1 800 mm. This specification covers specials having:

- a) spigot and socket ends,
- b) plain ends or slip-in type ends suitable for field welding, and
- c) flanged ends for connection with valves and accessories.

2. CLASSIFICATION

2.1 For the purpose of this standard steel cylinder reinforced concrete specials shall have the same classification as for steel cylinder reinforced concrete pipes given in **2.1** of IS : 1916-1963*.

3. MATERIALS

3.1 Cement — Cement used for the manufacture of specials shall conform to IS : 269-1976† or IS : 455-1976‡ or IS : 1489-1976§ or IS : 8041-1978|| or IS : 8043-1978¶ or IS : 8112-1976**.

3.2 Aggregates — Aggregates used for the manufacture of specials shall conform to IS : 383-1970††. The maximum size of aggregate shall not exceed one-third the wall thickness of the special or 10 mm, whichever is smaller.

3.3 The steel plate for the specials shall be mild steel conforming to IS : 226-1975‡‡ or steel conforming to IS : 2062-1980§§.

3.3.1 Reinforcement — Reinforcement used for the specials shall be any of the following:

- a) mild steel and medium tensile steel bars conforming to IS : 432 (Part 1)-1982|||,

*Specification for steel cylinder reinforced concrete pipes.

†Specification for ordinary and low heat Portland cement (*third revision*).

‡Specification for Portland slag cement (*third revision*).

§Specification for Portland pozzolana cement (*second revision*).

||Specification for rapid hardening Portland cement (*first revision*).

¶Specification for hydrophobic Portland cement (*first revision*).

**Specification for high strength ordinary Portland cement.

††Specification for coarse and fine aggregate from natural sources for concrete (*second revision*).

‡‡Specification for structural steel (standard quality) (*fifth revision*).

§§Specification for structural steel (fusion welding quality) (*second revision*).

|||Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement: Part 1 Mild steel and medium tensile steel bars (*third revision*).

- b) high strength deformed steel bars conforming to IS : 1786-1985*,
- c) hard-drawn steel wire fabric conforming to IS : 1566-1982†, and
- d) rolled steel made from structural steel conforming to IS : 226-1975‡.

3.3.1.1 All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which may destroy or reduce bond.

3.4 Concrete — Concrete used for the manufacture of specials shall conform to IS : 456-1978§.

3.4.1 The concrete mix shall have a minimum cement content of 450 kg/m³ and a minimum compressive strength of 21 N/mm² at 28 days.

3.4.2 Compressive strength tests shall be conducted on 15 cm concrete cubes in accordance with the relevant requirements of IS : 456-1978§ and IS : 516-1959||.

3.4.3 If so required by the purchaser, the manufacturer shall give a certificate indicating the quantity of cement in the concrete mix.

4. DESIGN

4.1 General — The specials for steel cylinder reinforced concrete pipes shall be designed such that the maximum tensile stress in the reinforcement under the specified hydrostatic test pressure (*see 2.1*) does not exceed 200 N/mm², assuming that no tension is taken up by concrete.

4.2 The thickness of the plate used for steel core reinforcement shall not be less than the thickness specified in Table 1.

4.3 The design provision for cage reinforcement, nominal longitudinal reinforcement and cover shall generally conform to the requirements specified in **4.2**, **4.4** and **4.5** of IS : 1916-1963¶.

*Specification for high strength deformed steel bars and wires for concrete reinforcement (*third revision*).

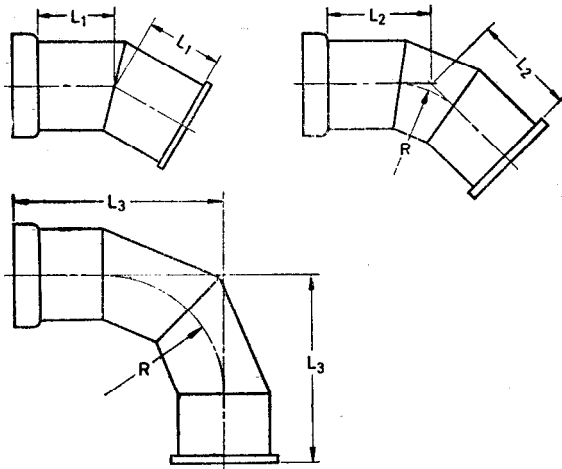
†Specification for hard-drawn steel wire fabric for concrete reinforcement (*first revision*).

‡Specification for structural steel (standard quality) (*fifth revision*).

§Code of practice for plain and reinforced concrete (*third revision*).

||Methods of test for strength of concrete.

¶Specification for steel cylinder reinforced concrete pipes.

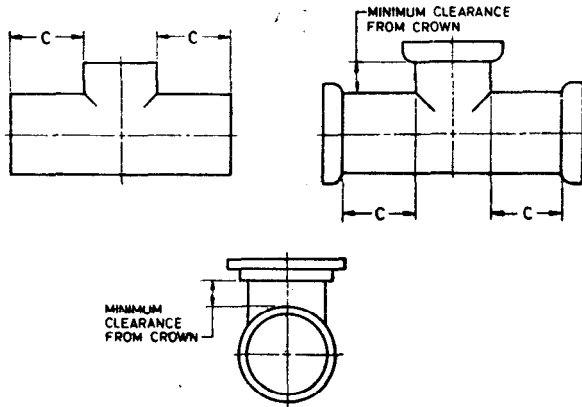


All dimensions in millimetres.

Nominal Internal Diameter	61° to 90° R	Bends L ₃	46° to 60° R	Bends L ₂	31° to 45° R	Bends L ₂	30° Bends L ₁
200	340	530	340	460	340	380	310
250	380	610	380	460	380	380	380
300	460	690	460	460	460	380	380
350	460	840	460	610	610	530	460
400	460	840	460	610	690	610	460
450	510	840	510	610	760	610	460
500	560	910	560	690	840	690	460
600	660	990	660	690	990	690	530
700	760	1 140	760	840	1 140	840	610
800	810	1 200	810	840	1 250	840	610
900	910	1 300	910	910	1 370	910	610
1 000	970	1 500	970	1 040	1 480	1 040	760
1 100	1 070	1 600	1 070	1 140	1 600	1 070	760
1 200	1 220	1 680	1 220	1 220	1 830	1 140	840
1 300	1 270	1 730	1 270	1 220	1 940	1 220	840
1 400	1 370	1 830	1 370	1 220	2 060	1 220	840
1 500	1 580	2 030	1 580	1 370	2 290	1 370	910
1 600	1 680	2 130	1 680	1 370	2 520	1 370	910
1 700	1 730	2 170	1 730	1 450	2 630	1 450	910
1 800	1 830	2 210	1 830	1 450	2 740	1 450	910

NOTE — For details of end dimensions refer to Table 3 and 4 of IS : 1916-1963 Specification for steel cylinder reinforced concrete pipes.

FIG. 1 STEEL CYLINDER REINFORCED CONCRETE BENDS



Minimum total length — 1 000 mm.

Nominal Internal Diameter, mm	C mm	Clearance from Crown, mm, Min
Up to 300	300	80
301 to 700	350	100
701 to 900	450	150
901 to 1 800	600	150

NOTE — For details of end dimensions refer to Tables 3 and 4 of IS : 1916-1963 Specification for steel cylinder reinforced concrete pipes.

FIG. 2 STEEL CYLINDER REINFORCED CONCRETE TEES

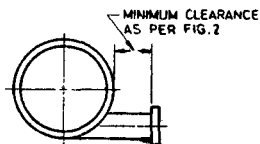
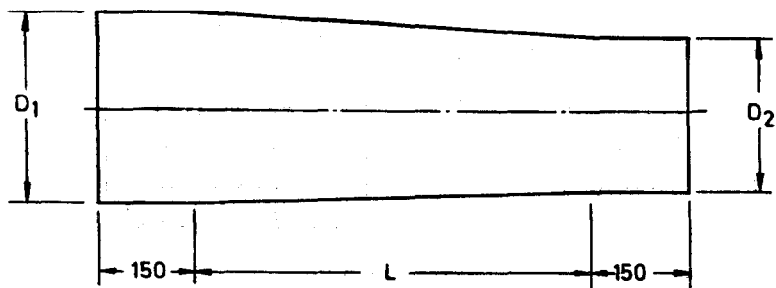


FIG. 3 STEEL CYLINDER REINFORCED CONCRETE SCOUR TEES



All dimensions in millimetres.

NOTE 1 — L shall be minimum 600 mm or four times the difference of diameter whichever is more.

NOTE 2 — For details of end dimensions refer to Tables 3 and 4 of IS : 1916-1963 Specification for steel cylinder reinforced concrete pipes.

FIG. 4 STEEL CYLINDER REINFORCED CONCRETE REDUCER

TABLE 1 MINIMUM THICKNESS OF PLATE FOR STEEL SHELL

(Clause 4.2)

NOMINAL INTERNAL DIAMETER OF FINISHED SPECIAL	MINIMUM THICKNESS OF STEEL PLATE
mm	mm
200 to 500	2.5
600 to 900	5.0
1 000 to 1 100	6.0
1 200 to 1 500	8.00
1 600 to 1 800	10.00

5. DIMENSIONS

5.1 The essential dimensions for bends, tees, scour tees and reducers shall be as indicated in Fig. 1, 2, 3 and 4 respectively.

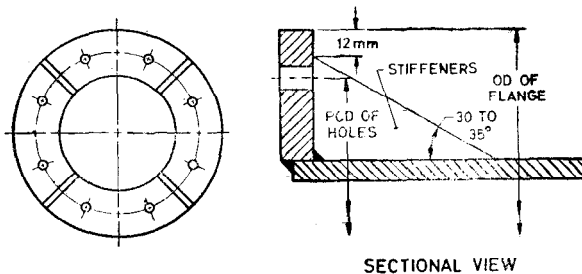
5.1.1 For flanged ends nominal thickness of flange shall be as specified in Table 2. Nominal thickness is the thickness of flat or plate from which flange is to be made. Actual thickness will be less by maximum 5 mm after machining the face. Stiffeners as shown in Fig. 5 may be provided. Number of stiffeners should be half the number of holes. Other details of flange, namely, outer diameter of flange, PCD of holes, number of holes and diameter shall be as given in IS : 1538 (Parts 1 to 23)-1976*.

*Specification for cast iron fittings for pressure pipes for water, gas and sewage (second revision).

TABLE 2 NOMINAL THICKNESS OF FLANGE

(Clause 5.1.1)

NOMINAL INTERNAL DIAMETER mm	NOMINAL THICKNESS mm
200 to 300	15
350 to 450	18
500 to 600	20
700 to 1 100	25
1 200 to 1 800	32



All dimensions in millimetres.

FIG. 5 STANDARD FLANGE DETAILS

5.1.2 The thickness of special and positioning of steel cylinder shall be in accordance with **5.2** of IS : 1916-1963*.

6. TOLERANCES

6.1 The following tolerances shall be permitted:

<i>Dimensions</i>	<i>Tolerances</i>
Arm length	± 40 mm
Arm length (specified)	± 10 mm
Internal diameter	
300 mm and under	± 3 mm
Over 300 mm	± 6 mm or $\pm 1\frac{1}{2}$ per- cent whichever is less
Angular deviation	$\pm 1^\circ$

*Specification for steel cylinder reinforced concrete pipes.

7. MANUFACTURE

7.1 Steel Core — The steel core for special shall be formed by shaping and welding together steel plates of specified thickness. Either lap welding or butt welding may be adopted for all longitudinal and circumferential welds. All welds shall be made down-hand by the manual or automatic shielded arc welding process. Welding shall be done so that there shall be thorough fusion and complete penetration. Prior to welding, the plates shall be fitted closely and during welding they shall be held firmly. For guidance on metal arc welding, reference may be made to IS : 816-1969*.

7.2 Reinforcement Cage — The reinforcement cage for special shall extend throughout the special and shall consist of spirals or rings and straights. The spirals or rings shall be circular in shape and shall be either wound round the steel special itself or wound round collapsible frames or drums and then slipped on to the steel special.

7.3 Mixing — The concrete for internal and external covers shall normally be mixed in mechanical mixers. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency, but in no case shall mixing be done for less than two minutes.

7.4 Concreting — Before concreting the steel plate shall be thoroughly cleaned of loose scale, rust and foreign matter, and given a coating of neat cement slurry. Concreting shall be done generally in two stages to give the required thickness.

7.4.1 Concreting outside the steel special shall not commence before the expiry of three days after the completion of the concreting inside, unless otherwise it is established that the concrete inside has attained a cube strength of not less than 11 N/mm^2 earlier than this period. During this entire period the concrete inside the steel cylinder shall be under curing. The concrete outside the steel special shall be either vibrated or applied under pressure.

7.5 Curing — After completion of concreting, the concrete shall be kept wet by any suitable means, such as immersion in water, covering by wet gunny bags, or by mechanical sprinklers, for a period of not less than 14 days when ordinary Portland cement conforming to IS : 269-1976† or Portland slag cement conforming to IS : 455-1976‡ or Portland

*Code of practice for use of metal arc welding for general construction in mild steel (*first revision*).

†Specification for ordinary and low heat Portland cement (*third revision*).

‡Specification for Portland slag cement (*third revision*).

pozzolana cement conforming to IS : 1489-1976* or hydrophobic Portland cement conforming to IS : 8043-1978† and less not than 7 days when rapid hardening Portland cement conforming to IS : 8041-1978‡ or high strength ordinary Portland cement conforming to IS : 8112-1976§ is used.

7.5.1 Steam curing may be permitted provided the requirements of steam curing are fulfilled.

8. TESTS

8.1 Each fitting shall be tested for conformity to the requirements of this standard.

8.2 The unlined special shall be tested by dye penetration test or other approved means.

8.3 Dye-Penetration Test — This test shall be done in accordance with IS : 3658-1981||.

9. WORKMANSHIP AND FINISH

9.1 The specials for steel cylinder reinforced concrete pipes shall be free from cracks. The ends shall be square with their longitudinal axis at that point, so that when actually placed in site trench, no opening between ends in contact shall exceed 3 mm in specials up to 600 mm diameter and 6 mm in specials larger than 600 mm diameter.

9.1.1 The outside and inside surface shall be smooth, dense and hard, and shall not be coated with cement wash or other preparation unless otherwise agreed to between the purchaser and the manufacturer.

9.1.2 Specials shall be free from local dents or bulges greater than 3.0 mm in depth and extending over a length in any direction greater than twice the thickness of the barrel.

10. MARKING

10.1 The following information shall be clearly marked on each special:

- a) Size of special,
- b) Class of special,

*Specification for Portland pozzolana cement (*second revision*).

†Specification for hydrophobic Portland cement (*first revision*).

‡Specification for rapid-hardening Portland cement (*first revision*).

§Specification for high strength ordinary Portland cement.

||Code of practice for liquid penetrant flaw detection (*first revision*).

- c) Radius of bend in case of bends,
- d) Date of manufacture, and
- e) Name of manufacturer or his registered trade-mark or both.

10.1.1 Each special 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.

(Continued from page 2)

Concrete Pipes Subcommittee, BDC 2 : 6

<i>Convener</i>	<i>Representing</i>
SHRI N. G. JOSHI	Indian Hume Pipe Co Ltd, Bombay
<i>Members</i>	
SHRI B. SANKARASUBRAMONIA AYYAR	Kerala Premo Pipe Factory Ltd, Quilon
SHRI S. N. BASU	Directorate General of Supplies and Disposals, New Delhi
SHRI T. N. UBOVEJA (<i>Alternate</i>)	
CHIEF ENGINEER (SEWERAGE PROJECT)	Municipal Corporation of Greater Bombay, Bombay
DEPUTY CHIEF ENGINEER (SEWERAGE PROJECT) P & D (<i>Alternate</i>)	
SHRI A. W. DESHPANDE	National Environmental Engineering Research Institute (CSIR), Nagpur
SHRI V. A. MHAISALKAR (<i>Alternate</i>)	
SHRI G. R. HARIDAS	Gammon India Ltd, Bombay
SHRI P. C. JAIN	Engineer-in-Chief's Branch, Army Headquarters, New Delhi
SHRI SUCHA SINGH (<i>Alternate</i>)	
JOINT DIRECTOR (STANDARDS) B & S/CB	Research, Designs and Standards Organization (Ministry of Railways), Lucknow
DEPUTY DIRECTOR (STANDARDS) B & S/CB (<i>Alternate</i>)	
SHRI P. D. KELKAR	Indian Hume Pipe Co Ltd, Bombay
SHRI H. S. PASRICHA	Hindustan Prefab Ltd, New Delhi
DR N. RAGHAVENDRA	Cement Research Institute of India, New Delhi
SHRI S. S. RAMRAKHYANI	Municipal Corporation of Delhi, Delhi
SHRI S. PRAKASH (<i>Alternate</i>)	
REPRESENTATIVE	Tamil Nadu Water Supply & Drainage Board, Madras
SARDAR BHAGWANT SINGH	Concrete Pipe Manufacturers Association of India, New Delhi
SHRI H. S. MANIK (<i>Alternate</i>)	
SUPERINTENDING SURVEYOR OF WORKS (NZ)	Central Public Works Department, New Delhi
SURVEYOR OF WORKS (NZ) (<i>Alternate</i>)	
SHRI V. M. TALATI	Spunpipe & Construction Co (Baroda) Pvt Ltd, Vadodara
SHRI A. V. TALATI (<i>Alternate</i>)	
DR B. VENKATESWARLU	Structural Engineering Research Centre (CSIR), Madras
SHRI Z. GEORGE (<i>Alternate</i>)	

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



INDIAN STANDARDS INSTITUTION

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31, 3 31 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :

Telephone

*Western : Manakalaya, E9 MIDC, Marol, Andheri (East),
BOMBAY 400093 6 32 92 95

†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road,
Maniktola, CALCUTTA 700054 36 24 99

Southern : C. I. T. Campus, MADRAS 600113 41 24 42

Northern : B69 Phase VII, Industrial Focal Point,
S. A. S. NAGAR 160051 (Punjab) 8 73 28

Branch Offices :

'Pushpak', Nurmohamed Shaikh Marg, Khanpur,
AHMADABAD 380001 { 2 63 48
{ 2 63 49

'F' Block, Unity Bldg, Narasimharaja Square,
BANGALORE 560002 22 48 05

Gangotri Complex, Bhadbhada Road, T. T. Nagar,
BHOPAL 462003 6 27 16

22E Kalpana Area, BHUBANESHWAR 751014 5 36 27

5-8-56C L. N. Gupta Marg, HYDERABAD 500001 22 10 83

R14 Yudhister Marg, C Scheme, JAIPUR 302005 6 98 32

117/418 B Sarvodaya Nagar, KANPUR 208005 4 72 92

Patliputra Industrial Estate, PATNA 800013 6 23 05

Hantex Bldg (2nd Floor), Rly Station Road,
TRIVANDRUM 695001 32 27

Inspection Office (With Sale Point) :

Institution of Engineers (India) Building, 1332 Shivaji Nagar,
PUNE 410005 5 24 35

*Sales Office in Bombay is at Novelty Chambers, Grant Road, 89 65 28
Bombay 400007

†Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep
Street, Calcutta 700072 27 68 00