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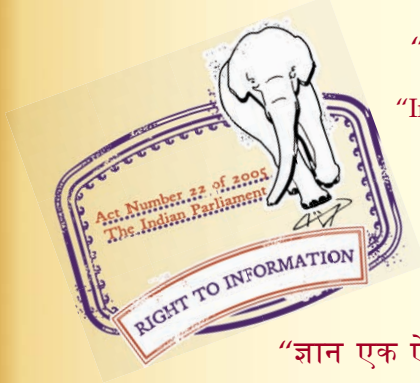
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IS 6286 (1971): Seamless and welded steel pipes for sub-zero temperature service [MTD 19: Steel Tubes, Pipes and Fittings]



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“Knowledge is such a treasure which cannot be stolen”



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IS : 6286 - 1971  
(Reaffirmed 2003)

*Indian Standard*  
SPECIFICATION FOR  
SEAMLESS AND WELDED STEEL PIPE FOR  
SUB-ZERO TEMPERATURE SERVICE

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

AMENDMENT NO. 1 AUGUST 1983

TO

IS:6286-1971 SPECIFICATION FOR SEAMLESS AND WELDED  
STEEL PIPE FOR SUB-ZERO TEMPERATURE SERVICE

Alterations

(Page 4, clause 5.1) - Substitute the following  
for the existing clause:

'5.1 Ladle Analysis - When requested by the purchaser,  
the manufacturer shall furnish a report giving the  
ladle analysis of each heat of steel.

5.1.1 The ladle analysis of steel shall be as  
given in Table 1. The analysis of steel shall be  
carried out either by the method specified in  
IS:228\* and its relevant parts or any other  
established instrumental/chemical method. In case  
of dispute the procedure given in IS:228\* and its  
relevant parts shall be referee method. However,  
where the method is not given in IS:228\* and its  
relevant parts, the referee method shall be agreed  
to between the purchaser and the manufacturer.'

' (Page 4, foot-note with '\*' mark) - Substitute  
the following for the existing foot-note:

'\*Methods for chemical analysis of steels.'

(SMDC 22)

# *Indian Standard*

## SPECIFICATION FOR SEAMLESS AND WELDED STEEL PIPE FOR SUB-ZERO TEMPERATURE SERVICE

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# *Indian Standard*

## SPECIFICATION FOR SEAMLESS AND WELDED STEEL PIPE FOR SUB-ZERO TEMPERATURE SERVICE

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 1 October 1971, after the draft finalized by the Steel Tubes, Pipes and Fittings Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** This standard keeps in view the manufacturing and trade practices followed in the country in this field. In the preparation of this standard due consideration has been given to the need for international co-ordination among standards being followed in other countries and assistance has been derived from the following publications:

ASTM A333-1969 'Specification for seamless and welded steel pipe for low temperature service'. American Society for Testing and Materials.

API Std. 5LX-1969 'Specification for high test line pipe'. American Petroleum Institute, USA.

BS 3603 : 1963 'Specification for steel pipes and tubes for pressure purposes carbon and alloy steel: Low temperature duties'. British Standards Institution, London.

**0.3** 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.

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### 1. SCOPE

**1.1** This standard covers the requirements for 4 grades of seamless and electric welded steel pipe for conveying fluids at sub-zero temperature.

### 2. SUPPLY OF MATERIAL

**2.1** General requirements relating to the supply of steel pipe for sub-zero temperature shall conform to IS : 1387-1967†.

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

†General requirements for the supply of metallurgical materials (*first revision*).



### 3. MANUFACTURE

**3.1** Steel for pipes shall be made by open hearth, electric, basic oxygen or a combination of these processes. In case any other process is employed by the manufacturer, prior approval of the purchaser should be obtained. If basic oxygen process is employed for the manufacture, the nitrogen content of the steel shall not exceed 0.007 percent.

**3.1.1** The steel shall be of fully killed type.

**3.2** Pipes of grades 1, 2 and 3 shall be made either by seamless or electric welded process. The welded pipes shall be made by electric flash welding, electric resistance welding or induction welding without the addition of filler metal in the welding process. Pipes of grade 4 shall be made by seamless process only.

### 4. HEAT TREATMENT

**4.1** All pipes shall be cooled either in air or in the cooling chamber of a controlled atmosphere furnace from above 845°C and may be re-heated to a temperature above 595°C. However, in case of pipe made from carbon steel, the weld seam of welded pipe shall be normalized after welding.

### 5. CHEMICAL REQUIREMENTS

**5.1 Ladle Analysis** — When requested by the purchaser, the manufacturer shall furnish a report giving the ladle analysis of each heat of steel. The steel when analyzed in accordance with IS : 228-1959\* shall conform to the chemical composition given in Table 1.

**TABLE 1 CHEMICAL REQUIREMENTS**

	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Carbon, percent, <i>Max</i>	0.30	0.30	0.19	0.12
Manganese, percent	0.40 to 1.06	0.29 to 1.06	0.90 <i>Max</i>	0.50 to 1.05
Phosphorus, percent, <i>Max</i>	0.05	0.05	0.04	0.04
Sulphur, percent, <i>Max</i>	0.05	0.05	0.05	0.04
Silicon, percent	—	0.10 <i>Min</i>	0.13 to 0.32	0.08 to 0.37
Nickel, percent	—	—	2.03 to 2.57	0.47 to 0.98
Chromium, percent	—	—	—	0.44 to 1.01
Copper, percent	—	—	—	0.40 to 0.75
Aluminium, percent	—	—	—	0.04 to 0.30

NOTE — For each reduction of 0.01 percent carbon below 0.30, an increase of 0.04 percent manganese above 1.06 shall be permitted to a maximum of 1.30 percent.

\*Methods of chemical analysis of pig iron, cast iron and plain carbon and low-alloy steels (*revised*).

**5.1.1 Product Analysis** — The maximum permissible variation of various elements in the case of product analysis from the limits stated in 5.1 shall be as follows:

	<i>Percent</i>
Carbon	$\pm 0.02$
Manganese	$\pm 0.03$
Phosphorus	$+ 0.005$
Sulphur	$+ 0.005$

## 6. DIMENSIONS

**6.1 Dimensions of pipes** shall conform to the requirements specified in Table 2.

**TABLE 2 DIMENSIONS OF STEEL PIPES**

NOMINAL BORE	OUTSIDE DIAMETER	THICKNESS
		mm
6	10.2	1.8, 2.0 and 2.65
8	13.5	1.8, 2.35 and 2.9
10	17.2	1.8, 2.35 and 2.9
15	21.3	2.0, 2.65 and 3.25
20	26.9	2.35, 2.65 and 3.25
25	33.7	2.65, 3.25, 4.05 and 4.85
32	42.4	2.65, 3.25, 4.05 and 5.4
40	48.3	2.9, 3.25, 4.05, 4.85 and 5.9
50	60.3	2.9, 3.65, 4.5, 4.85, 5.6 and 6.35
65	76.1	3.25, 3.65, 4.5, 5.4 and 6.35
80	88.9	3.25, 4.05, 4.85, 5.4 and 6.35
90	101.6	3.65, 4.05, 4.85 and 6.35
100	114.3	3.65, 4.5, 5.4, 5.9, 6.35 and 8.0
125	139.7	3.65, 4.5, 4.85, 5.4, 6.35, 8.0 and 9.5
150	165.1 and 168.3	3.65, 4.5, 4.85, 5.4, 6.35, 7.1, 8.0 and 9.5
175	193.7	3.65, 4.5, 4.85, 5.4, 6.35, 7.1, 8.0 and 9.5
200	219.1	4.85, 5.4, 6.35, 7.1, 8.0, 9.5, 11.0 and 12.5
225	244.5	5.9, 7.1, 8.0 and 9.5
250	273.0	5.9, 6.35, 7.1, 8.0, 9.5, 11.0 and 12.5
300	323.9	6.35, 7.1, 8.0, 9.5, 11.0 and 12.5
350	355.6	8.0, 9.5 and 11.0
400	406.4	8.0, 9.5, 11.0 and 12.5
450	457.2	8.8, 9.5, 11.0 and 12.5

## IS : 6286 - 1971

**6.1.1 Length** — If definite length is not required, pipes may be ordered in lengths between 7 to 13 m with minimum average of 10.5 m.

**6.2 Tolerances** — The following tolerances shall apply:

- a) Outside diameter  $\pm 1$  percent
- b) Wall thickness  $\begin{array}{l} + 15.0 \\ - 12.5 \end{array}$  percent

**6.2.1** Pipe 273.0 mm and smaller shall not be more than 0.40 mm smaller than the specified outside diameter for a distance of 101.6 mm from the end of the pipe and shall permit the passage over the ends, for a distance of 101.6 mm, of a ring gauge which has a bore 1.6 mm larger than the specified outside diameter of the pipe. Pipe 323.8 to 457.2 mm inclusive, shall not be more than 0.80 mm smaller than the specified outside diameter for a distance 101.6 mm from the end of the pipe and shall permit passage over the ends, for a distance of 101.6 mm, of a ring gauge which has a bore 2.4 mm larger than the specified outside diameter of the pipe. At the option of the manufacturer the minimum outside diameter of pipe may be measured with a diameter tape.

## 7. WORKMANSHIP AND FINISH

**7.1** Unless specified otherwise, plain-end pipes of 60.3 mm outside diameter and larger shall be furnished with the ends bevelled to an angle of  $30^\circ \pm 5^\circ$ , measured from a line drawn perpendicular to the axis of the pipe and with a root face of  $1.6 \pm 0.8$  mm. The end finish for pipes smaller than 60.3 mm outside diameter shall be as specified by the purchaser. The pipe ends shall have all burrs removed from both the inside and outside edges.

**7.2** Unless specified otherwise, pipes shall be given a mill-coating to protect it from rusting in transit.

**7.2.1** If so required by the purchaser, pipes shall be furnished bare or specially coated. In the case of special coatings, the purchaser should specify whether the coating is to be applied to the full length or whether a certain specified length from the end is to be left uncoated. Unless specified otherwise, such bare ends are commonly given a coating with oil for protection in transit.

**7.3** The finished pipe shall be reasonably straight and free from injurious defects. At the discretion of the inspection authority representing the purchaser, finished pipe shall be subject to rejection if surface defects are **not** scattered but appear over a large area.

**7.4 Depth of Injurious Defects** — All defects shall be explored for depth when the depth is in excess of 12·5 percent of the nominal wall thickness or encroaches on the minimum wall thickness, such defects shall be considered injurious.

**7.5 Machining or Grinding Defects** — Surface defects not classified as injurious defects shall be treated as in 7.5.1 to 7.5.4.

**7.5.1** Pipe showing scabs, seams, laps, tears or slivers not deeper than 5 percent of the nominal wall thickness need not have these defects removed. If deeper than 5 percent such defects shall be removed by machining or grinding.

**7.5.2** Pipe showing inside or outside fish scale 0·40 mm or less in depth need not have these defects removed. Such defects over 0·40 mm but not more than 0·80 mm in depth shall be removed by machining or grinding. Pipe on which these defects are more than 0·80 mm in depth shall be rejected unless the manufacturer can demonstrate to the purchaser that the defects are not injurious.

**7.5.3** Mechanical marks or abrasions or pits shall be acceptable without grinding or machining provided the depth does not exceed the limitations given in 7.4.

**7.5.4** When defects have been removed by grinding or machining the outside diameter at the point of grinding or machining may be reduced by the amount so removed. Should it be impracticable to secure a direct measurement, the wall thickness at the point of grinding or at a defect not required to be removed, shall be determined by deducting the amount removed in grinding or the depth of the defect from the minimum measured wall thickness at the ends of the pipe and the remainder shall be not less than 87·5 percent of the nominal wall thickness.

**7.6** Imperfections of the following types shall be considered as poor workmanship. Pipe containing such imperfection shall be rejected. The manufacturer shall take all reasonable precautions to minimise recurring damage to the pipe.

**7.6.1 Dents** — The pipe shall contain no dents greater than 6·35 mm measured as the gap between the lowest point of the dent and a prolongation of the original contour of the pipe. The length of the gap in any direction shall not exceed one-half the pipe diameter. All cold formed dents deeper than 3·18 mm with a sharp bottom gouge shall be considered injurious. The gouge may be removed by grinding.

**7.6.2 Offset of Plate Edges** — For electric welded pipe, the radial offset (misalignment) of plate edges plus flash trim shall not be more than 1·52 mm.

**7.7 Repair by Welding** — Repair of injurious defects shall be permitted only subject to the approval of the purchaser and with further undertaking

that the composition of the welding rod shall be suitable for the composition of the metal being welded. Welding of injurious defects, in no case shall be permitted when the depth of defects exceeds 33.5 percent of the nominal wall thickness or the length of repair exceeds 25 percent of the nominal diameter of the pipe.

**7.7.1** Each length of repaired pipe shall be subjected to hydrostatic test in accordance with 9.

## **8. PHYSICAL TESTS**

**8.0** In case the purchaser does not require tests specifically related to his order the manufacturer shall undertake the mechanical tests specified in this standard from a sufficient number of pipes to ensure that the pipes comply with the requirements of this standard. When the purchaser requires tests specifically related to his order, the number of pipes on which mechanical tests shall be performed shall be as follows, subject to a minimum of two pipes:

Up to and including 114.3 mm outside diameter	1 pipe in each 400 pipes as made
Over 114.3 mm outside diameter up to and including 323.9 mm outside diameter	1 pipe in each 200 pipes as made
Over 323.9 mm outside diameter	1 pipe in each 100 pipes as made

The samples shall be taken at random from batches as presented for inspection, each batch containing not more than 400 pipes for sizes up to and including 114.3 mm outside diameter or not more than 200 pipes for sizes over 114.3 mm outside diameter. If the number of samples specified in this clause when applied to a particular order necessitates a number of pipes which includes a fraction, the fraction shall be treated as unity.

**8.1 Tensile Test** — When tested in accordance with IS:1894-1962\*, tensile properties of the pipe shall conform to the requirements specified in Table 3.

**8.1.1 Longitudinal Tensile Test Specimens** — At the option of the manufacturer the longitudinal tensile test specimens as shown in Fig. 1 shall be taken either from the pipe or from the strip.

The test specimens shall be taken from: (a) any location in case of seamless pipe, (b) approximately 90° from the weld in case of welded pipe, and (c) the strip parallel to the direction of rolling and approximately midway between the edge and the centre.

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\*Method for tensile testing of steel tubes.

The test specimen shall represent full wall thickness from which it is cut.

**TABLE 3 TENSILE REQUIREMENTS**

( Clause 8.1 )

	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Tensile strength, kgf/mm <sup>2</sup> , Min	38.5	42.0	45.5	42.0
Yield point, kgf/mm <sup>2</sup> , Min	21.0	24.5	24.5	24.5

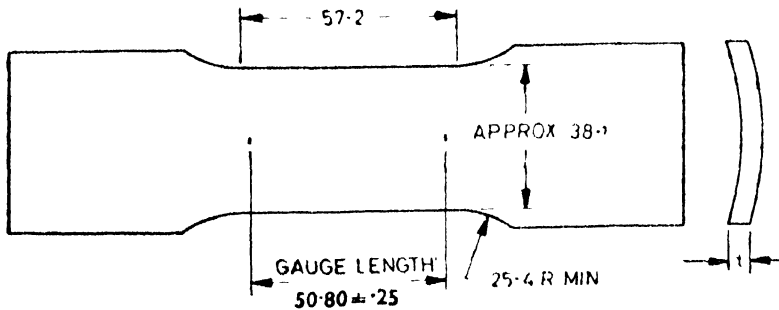
NOTE — Elongation in 50.8 mm, Min, percent shall be computed by using the following equations:

Grade	Direction of Test	Equation
1	Longitudinal	$E = 2.205t + 17.50$
	Transverse	$E = 1.575t + 12.50$
2	Longitudinal	$E = 1.890t + 15.00$
	Transverse	$E = 1.260t + 6.50$
3	Longitudinal	$E = 1.890t + 15.00$
	Transverse	$E = 1.339t + 11.00$
4	Longitudinal	$E = 1.890t + 15.00$
	Transverse	$E = 1.260t + 6.50$

where

$E$  = percent elongation in 50.8 mm, and

$t$  = actual thickness of specimen in millimetres.



All dimensions in millimetres.

**FIG. 1 LONGITUDINAL STRIP SPECIMEN**

**8.1.2 Transverse Tensile Test Specimen** — Transverse tensile test specimens shall be taken from any location from seamless pipe and from opposite to the weld from welded pipe. All test specimens shall be as shown in Fig. 2 and shall represent the full wall thickness from which the specimen is cut. Hot flattening of the specimens shall not be done unless agreed upon between the purchaser and the manufacturer.

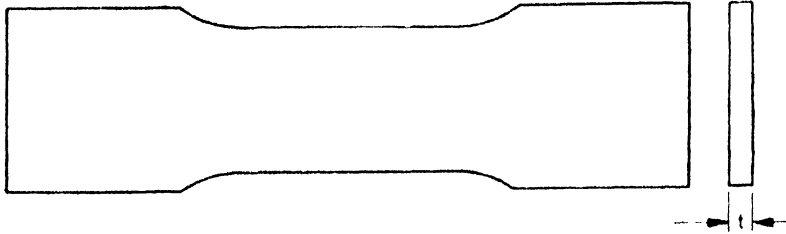


FIG. 2 TRANSVERSE SECTION

**8.1.3 Weld Tensile Test Specimen** — Weld tensile test specimens shall be taken at 90° to the weld at the centre as shown in Fig. 3 and shall represent the full wall thickness from which the specimen is cut.

**8.1.4** The gauge length of the tensile specimen shall be  $50.80 \pm 0.25$  mm.

**8.1.5 Retests** — If the tensile test specimen representing a lot of pipe fails to conform to the specified requirements, the manufacturer may elect to make retests on two additional lengths from the same lot. If both of the retest specimens conform to the requirements, all the lengths in the lot shall be accepted except the length from which the initial specimen was taken. If one or both of the retest specimens fail to conform to the specified requirements, the manufacturer may elect to test individually the remaining lengths in the lot. Specimens for retests shall be taken in the same manner as specified in 8.1.3.

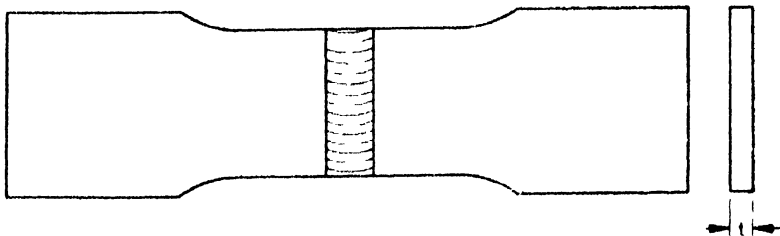


FIG. 3 WELD SPECIMEN

**8.2 Flattening Test** — For non-expanded electric welded pipe produced in single lengths or in multiple lengths the crop ends cut from each end of each length shall be flattened between parallel plates until opposite walls of the pipe meet. The test from each end shall be made alternately with the welds at 0° and 90° (point of maximum bending). No opening in the weld shall take place until the distance between the plates is less than two-thirds of the original outside diameter and no cracks or breaks, elsewhere than in weld shall occur until the distance between the plates is less than one-third of the original outside diameter of the pipe. Also evidence of laminations or burnt metal shall not develop during the entire flattening operation.

**8.2.1** If any cropped end fails to conform to these requirements additional tests shall be made on specimens cut from the same end of the same length of pipe until the requirements are met, except that the finished pipe shall not be larger than 80 percent of its length after the initial cropping. Precautions shall be taken so that the cropped ends can be identified with respect to the length of pipe from which they were cut.

**8.2.2** The flattening test shall be carried out in accordance with IS : 2328-1963\*.

### 8.3 Impact Test

**8.3.1** One notched bar impact test, consisting of breaking three specimens shall be made from each heat represented in a heat treatment load on specimens taken from the finished pipe. This test shall represent only pipe from the same heat and the same heat-treatment load, the wall thickness of which do not exceed by more than 6.35 mm the wall thickness of the pipe from which the test specimen are taken. On welded pipe additional impact tests of the same number shall be made to test the weld. All materials furnished to this specification shall be tested for impact resistance at the minimum temperature for the respective grade as follows:

<i>Grade</i>	<i>Minimum Impact Test Temperature</i>
1	-46°C
2	-46°C
3	-73°C
4	-101°C

**8.3.1.1** Special impact tests on individual lots of material may be made at lower temperatures if agreed upon by the purchaser and the manufacturer.

**8.3.2** The notched bar impact properties of each set of three impact specimens including specimens for the welded joint in welded pipe with wall

\*Method for flattening test on steel tubes.



thickness of 3.05 mm and larger, when tested in accordance with IS : 1757-1961\* at temperatures given in 8.3.1, shall not be less than the values specified in Table 4.

**TABLE 4 IMPACT PROPERTIES**

SIZE OF SPECIMEN	MINIMUM AVERAGE NOTCHED BAR IMPACT VALUE OF EACH SET OF THREE SPECIMENS	MINIMUM NOTCHED BAR IMPACT VALUE OF ONE SPECIMEN ONLY OF A SET
mm × mm	kgf·m	kgf·m
10 × 10	2.07	1.38
10 × 7.5	1.73	1.17
10 × 5	1.38	0.97
10 × 2.5	0.69	0.48

**8.3.3** Impact tests specified for temperature lower than 21°C should be made with the precautions given in 8.3.3.1.

**8.3.3.1** The impact test specimens as well as the handling tongues shall be cooled for sufficient time in a suitable container so that both reach the desired temperature. The temperature shall be measured with thermocouples, thermometers or any other suitable devices and shall be controlled within 1.7°C. The specimen shall be quickly transferred from the cooling device to the anvil of the Charpy impact testing machine and broken with a time lapse of not more than 5 seconds.

## **9. HYDROSTATIC TEST**

**9.1** Each length of pipe shall be subjected to hydrostatic test without leakage. Test pressures for pipe in sizes 457.2 mm and smaller shall be held for not less than 5 seconds. The pipe shall be struck while under pressure with 1-kg hammer or its equivalent near the weld at both the ends of the pipe.

**9.1.1** The test pressure shall be calculated by the following equation:

$$P \text{ (kgf/cm}^2\text{)} = \frac{200 St}{D}$$

where

$P$  = hydrostatic test pressure in kgf/cm<sup>2</sup>,

$S$  = fibre stress† in kgf/mm<sup>2</sup>,

$t$  = specified wall thickness in mm, and

$D$  = specified outside diameter in mm.

\*Method for beam impact test (V-notch) on steel.

†Fibre stress values for standard test pressure are 75 percent of the specified minimum yield strength and for alternate test pressure fibre stress values are 80 percent of the specified minimum yield strength.

**9.1.2** By mutual agreement between the purchaser and the manufacturer, a full length pipe from a lot of thousand pipes may be subjected to hydrostatic destructive tests in which the length of the specimen exceeds ten times the outside diameter.

## **10. NON-DESTRUCTIVE TESTS**

**10.1** The purchaser may call for radiographic examination or other non-destructive tests of pipes on a mutually agreed basis and this shall be specified in the enquiry and order.

## **11. MARKING**

**11.1** The pipes shall be marked with the following particulars:

- a) Manufacturer's name or trade-mark.
- b) Size,
- c) Weight per metre,
- d) Grade,
- e) Process of manufacture,
- f) Type of steel,
- g) Heat treatment, and
- h) Test pressure.

**11.1.1** The product may also be marked with Standard mark.

**11.1.2** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## BUREAU OF INDIAN STANDARDS

### Headquarters

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

**Telephones** 23230131, 23233375, 23239402      **Fax** 91+011 23239 399, 23239382

**E-Mail** info@bis.org.in      **website** <http://www.bis.org.in>

### Central Laboratory:

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

### Telephone

277 0032

### Regional Offices:

Central Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002      2323 7617

\*Eastern: 1/14 CIT Scheme VIII M, V I P Road, Kankurgachi, KOLKATA 700054      2337 8662

Northern: SCO 335-336, Sector 34-A, CHANDIGARH 160022      260 3843

Southern: C I T Campus, IV Cross Road, CHE NNAI 600113      2254 1984

Western: Manakalaya E9, MIDC, Behind Marol Telephone Exchange,  
Andheri (East), MUMBAI 400093      2832 9295

### Branch Offices:

'Pushpak' Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001      560 1348

Peenya Industrial Area, 1<sup>st</sup> Stage, Bangalore Tumkur Road, BANGALORE      839 4955

Commercial cum-Office Complex, Opp. Dushera Maidan, E-5 Arera Colony,  
Bittan Market, BHOPAL 462016      242 3452

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

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

SCO 21, Sector 12, Faridabad 121007      229 2175

Savitri Complex, 116 G T Road, GHAZIABAD 201001      286 1498

53/5 Ward No. 29, R G Barua Road, 5th By lane, Apurba Sinha Path,  
GUWAHATI 781003      245 6508

5-3-56C L N Gupta Marg, Nampally Station Road, HYDRABAD 500001      2320 1084

E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001      237 3879

117/418 B, Sarvodaya Nagar, KANPUR 208005      223 3012

Sethi Bhawan, 2<sup>nd</sup> Floor, Behind Leela Cinema, Naval Kishore Road,  
LUCKNOW 226001      261 8923

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010      252 5171

Mahabir Bhavan, 1<sup>st</sup> Floor, Ropar Road, NALAGARH 174101      22 1451

Plot No A-20-21, Institutional Area, Sector 62, Goutam Budh Nagar, NOIDA-201307      240 2206

Patliputra Industrial Estate, PATNA 800013      226 2808

First Floor, Plot Nos 657-660, Market Yard, Gultkdi, PUNE 411037      426 8659

\*Sahajanand House\* 3<sup>rd</sup> Floor, Bhaktinagar Circle, 80 Feet Road,  
RAJKOT 360002      237 8251

T C No 14/1421, University PO Palayam, THIRUVANANTHAPURAM 695034      233 9174

1<sup>st</sup> Floor, Udyog Bhavan, VUDA, Siripuram Junction, VISHAKHAPATNAM-03      271 2833

\*Sales Office is at 5 Chowringhee Approach, PO Princep Street, KOLKATA 700072      2355 3243

\*Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007      2309 6528