# इंटरनेट मानक

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Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
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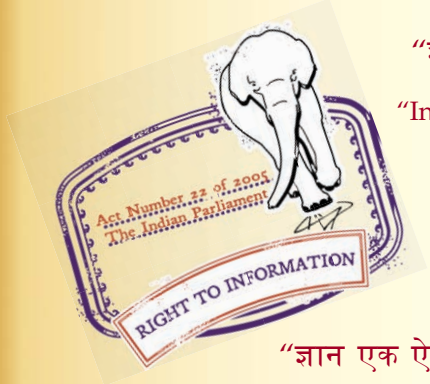
"Step Out From the Old to the New"

IS 15225 (2002): Chlorinated Polyvinyl Chloride Compounds Used for Pipes and Fittings [PCD 12: Plastics]

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"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

# पाइपों और फिटिंगों के इस्तेमाल के लिए क्लोरीनीकृत पोलिविनाइल क्लोराईड यौगिक — विशिष्टि

*Indian Standard*

# CHLORINATED POLYVINYL CHLORIDE COMPOUNDS USED FOR PIPES AND FITTINGS — SPECIFICATION

ICS 83.080.20;83.140.30



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

*October* 2002

Price Group 5

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Chlorinated polyvinyl chloride (CPVC) compounds consisting of CPVC resin, suitably compounded with additives. General properties, common to all members of CPVC, include excellent elevated temperature, water and chemical resistance, strength, abrasion resistance and unlimited colour possibilities. The CPVC compounds are processed by techniques such as extrusion, injection moulding, compression moulding, calendering, etc.

This standard deals only with CPVC compounds and its major applications are pipe, profiles, sheet, fittings and associated ancillary products.

The composition of the committee responsible for the formulation of this standard is given in Annex E.

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

# CHLORINATED POLYVINYL CHLORIDE COMPOUNDS USED FOR PIPES AND FITTINGS — SPECIFICATION

## 1 SCOPE

This standard prescribes the requirements and methods of sampling and test for chlorinated polyvinyl chloride (CPVC) compounds used for pipes and fittings.

## 2 REFERENCES

The Indian Standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

## 3 TERMINOLOGY

**3.1** For the purpose of this standard definition given in IS 2828 and the following shall apply.

**3.2 Chlorinated Polyvinyl Chloride Compound (CPVC)**—Compounds based upon chlorinated polyvinyl chloride in which the chlorinated polyvinyl chloride is the greatest amount by weight, suitably compounded with other ingredients like stabilizers, lubricants, pigments, etc, for processing, property control and colour.

## 4 DESIGNATION

**4.1** The designation system given in **4.2** into which the materials are classified according to method of processing, their designatory properties such as Vicat softening temperature, Charpy notched impact strength, tensile strength and tensile modulus and certain other supplementary information shall be used. The designation system is only intended to indicate a broad classification and in most circumstances specific values of the designatory properties and other characteristics as given in **8** shall be required.

**4.2** The designation shall consist of following information given in the order represented and shall be codified in different blocks as indicated below:

| | |
|---|---|
| Block 1 | For Indian Standard |
| Block 2 | Identification of the plastic by its symbol (CPVC) |
| Block 3 | Identification for the form of the compound |
| Block 4 | Method of processing or intended application |
| Block 5 | Designatory properties |
| Block 6 | Additional Information |

The blocks shall be separated from each other by hyphen (-).

If a block is not used, this shall be indicated by doubling the separation sign, that is, by two hyphens (- -).

**4.2.1** *Data Block 1*

In this block the number and year of this Indian Standard shall be indicated.

**4.2.2** *Data Block 2*

In this block, after the hyphen, chlorinated polyvinyl chloride plastics is identified by the symbol 'CPVC'.

**4.2.3** *Data Block 3*

In this block, the commercial form of the compound using the codes given in Table 1 shall be specified.

**Table 1 Code Used for Block 3**

| Sl No. (1) | Code (2) | Commercial Form (3) |
|---|---|---|
| i) | D | Dry blend or powder |
| ii) | G | Granules, cubes or pellets |

4.2.4 *Data Block 4*

In this block information relative to the method of processing or intended application, using the codes given in Table 2, shall be specified.

**Table 2 Code Used for Block 4**

| Sl No. | Code | Method of Processing or Intended Application |
|---|---|---|
| (1) | (2) | (3) |
| i) | P | Pipe extrusion |
| ii) | S | Sheet extrusion |
| iii) | E | Profile extrusion |
| iv) | I | Injection moulding |
| v) | Q | Compression moulding |
| vi) | C | Calendering |
| vii) | X | No indication |

4.2.5 *Data Block 5*

In this block, the designatory properties are coded and are separated from each other by a hyphen. First the range of the Vicat softening temperature is coded by three digits (*see* **8.2.1**), followed by the ranges of the Charpy notched impact strength (*see* **8.2.2**), the tensile strength (*see* **8.2.3**) and the tensile modulus (*see* **8.2.4**) each coded by one digit as specified in Table 3.

If a property value falls on or near a cell limit, the manufacturer shall state which cell will designate the material. If subsequent individual test values lie on or either side of the cell limit because of manufacturing tolerances, the designation is not affected.

4.2.6 *Data Block 6*

Additional information may be included in this block.

NOTE—The kind of information and respective code relative to this data block are not presently covered in this standard. Specific suggestions are invited from the members so that the same can be considered for the incorporation in the standard.

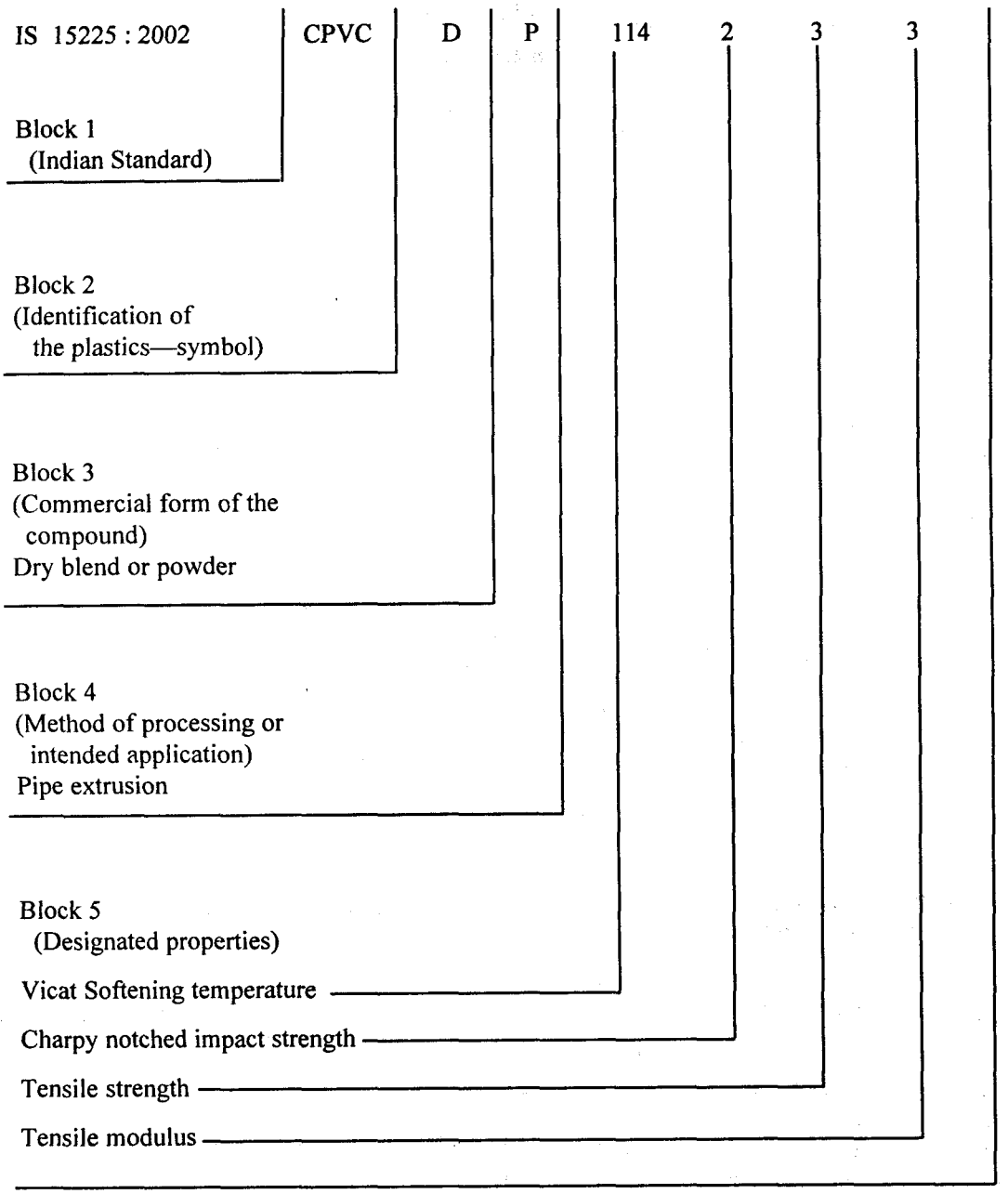
**Table 3 Cell Codes and Range for Block 5**

(*Clause* 4.2.5)

| Vicat Softening Temperature | Cell Code | Impact Strength kJ/m² | Tensile Strength MPa | Tensile Modulus MPa |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| Use three digits to give the | 0 | Unspecified | Unspecified | Unspecified |
| minimum Vicat Softening | 1 | ≤ 4.0 | ≤ 35 | ≤ 2 000 |
| temperature of the | 2 | > 4.0 to 8.0 | > 35 to 45 | > 2 000 to 2 500 |
| material | 3 | > 8.0 to 15 | > 45 to 55 | > 2 500 to 3 000 |
| (for example VST of 114°C = '114') | 4 | > 15 | > 55 | > 55 |
| (tolerance of ± 2°C) | | | | |

## 5 CODING EXAMPLE

A chlorinated polyvinyl chloride compound (CPVC), having the physical form of powder (D), for the extrusion of pipes (P), with a Vicat Softening temperature (VST/B/50) of 114°C (114), Charpy notched impact strength of 5.0 kJ/m² (2), tensile strength of 54.0 MPa (3) and tensile modulus of 2 600 MPa (3), would be designated as:




Designation : IS 15225 : 2002 –CPVC–D–P–114–2–3–3

## 6 PREPARATION OF TEST SPECIMEN

The test specimens for the various tests prescribed in this standard shall be prepared in accordance with Annex B.

## 7 CONDITIONING

Test specimens shall be conditioned in standard atmospheric condition of 27 ± 2°C and 65 ± 5 percent relative humidity in accordance with IS 13360 (Part 1) before performing the required tests.

Test shall be conducted in the standard atmospheric condition of 27 ± 2°C and 65 ± 5 percent relative humidity.

## 8 REQUIREMENTS

### 8.1 Compound

#### 8.1.1 *Resin K-Value*

The K-value of the unchlorinated polyvinyl chloride resin used to produce the chlorinated polyvinyl chloride resin that is used in pipe compounds shall not be less than 66, when measured in accordance with IS 4669. The k-value of the unchlorinated polyvinyl chloride resin used to produce the chlorinated polyvinyl chloride resin that is used in fitting compounds shall not be less than 56, when measured in accordance with IS 4669.

#### 8.1.2 *Resin Chlorine Content*

The chlorine content of the chlorinated polyvinyl chloride resin shall be greater than 66.5 percent when measured in accordance with IS 4669.

#### 8.1.3 *Form*

The compound under this specification shall be in the form of random cut chips, regular cubes, regular cylindrical pellets, powder, or any other convenient form.

#### 8.1.4 *Compound Chlorine Content*

The chlorinated polyvinyl chloride compounds containing additives such as modifiers, lubricants, fillers, etc, from which the pipes and fittings are to be manufactured shall have a chlorine content not less than 57.5 percent when tested in accordance with IS 4669.

#### 8.1.5 *Appearance*

The compound shall be free from foreign matter and uniform in colour. It may be of any colour. The colour of the sheet moulded in accordance with Annex B shall be taken as the colour of the compound.

### 8.2 Property Requirements

#### 8.2.1 *Vicat Softening Temperature*

The Vicat Softening temperature shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS 13360 (Part 6/Sec 1)/ISO 304 (Method B). The tolerance shall be ±2 percent of the agreed Vicat Softening temperature.

#### 8.2.2 *Charpy Impact Strength*

The Charpy impact strength shall be agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS 13360 (Part 5/Sec 5)/ ISO 179. The values of Charpy impact strength shall be within ±20 percent of the agreed value.

#### 8.2.3 *Tensile Strength*

The tensile strength shall be agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS 13360 (Part 5/Sec 1)/ ISO 527-1. The values of tensile strength shall be within ±20 percent of the agreed value.

#### 8.2.4 *Tensile Modulus*

The tensile modulus shall be agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS13360 (Part 5/Sec 1)/ ISO 527-1. The values of tensile modulus shall be within ±20 percent of the agreed value.

### 8.3 Ash Content

When tested in accordance with the method described in Annex C, the ash content in the compound shall not exceed 6 percent.

## 9 PACKING AND MARKING

### 9.1 Packing

The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

### 9.2 Marking

The container shall be marked with the following information:

a) Mass of the material;
b) Name of the manufacturer and his trade-mark, if any;
c) Class and type of material;
d) Batch or lot number; and
e) Date of manufacture.

**9.2.1** *BIS Certification Marking*

**9.2.1.1** The containers may also be marked with the Standard Mark.

**9.2.1.2** 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 license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

NOTE—Any additional seal or mark of the laboratory conducting an evaluation spaced at intervals specified by the laboratory. Such approvals would be for materials intended for potable water contact and transport.

## 10 SAMPLING

The representative samples of the material shall be drawn and the criteria for conformity determined as prescribed in Annex D.

## ANNEX A

( *Clause* 2 )

## LIST OF REFERRED INDIAN STANDARDS

| *IS No.* | *Title* |
|---|---|
| 2828:2001 | Plastics—Vocabulary (*first revision*) |
| 4669:1968 | Methods of test for polyvinyl chloride resins (*first revision*) |
| 4905:1968 | Methods for random sampling |
| 13360 (Part 1):1992 | Plastics—Methods of testing: Part 1 Introduction |
| (Part 5/Sec 1): 1996/ ISO 527-1: 1993 | Part 5 Mechanical properties, Section 1 Determination of tensile properties—General principles |
| (Part 5/Sec 5) : 1996/ISO 179: 1993 | Part 5 Mechanical properties, Section 5 Determination of Charpy impact strength |
| (Part 6/Sec 1) : 1999/ISO 304: 1994 | Part 6 Thermal properties, Section 1 Determination of Vicat Softening temperature of thermoplastics materials (*first revision*) |

# ANNEX B

(*Clauses* 6 *and* 8.5)

## PREPARATION OF MOULDED TEST SHEET FROM CHLORINATED POLYVINYL CHLORIDE COMPOUNDS

### B-1 PROCEDURE

**B-1.1** Unless the compound is in the form of sheet, it shall be formed by milling at a suitable temperature which shall be the Vicat Softening temperature [*see* IS:13360 (Part 6/ Sec 1)/ISO 306] plus 90°C before the moulding operation is carried out. The milling time shall be 5 to 10 min to form the material into a continuous homogeneous sheet with optimum dispersion of all material components.

**B-1.2** A test sheet of any convenient area shall be moulded to a thickness of 1.25 ± 0.15 mm.

**B-1.3** The moulding conditions shall be those recommended by the manufacturer of the material. If these recommendations are not available, the test sheet shall be moulded at a temperature approximately 100°C above the Vicat Softening temperature [*see* IS 13360 (Part 6/Sec1)].

**B-1.4** In preparing a test sheet or series of test sheets from a given batch of material, the moulding temperatures shall not vary by more than ±2°C. The moulding cycle shall consist of preheating in the press at full moulding temperatures under pressure of 0.5 to 1.0 MPa for a period of 5 min followed by the application of a pressure between 5.0 MPa and 10 MPa for 2 to 5 min. Cool the mould to approximately 40°C, while maintaining constant applied pressure.

# ANNEX C

(*Clause* 8.3)

## TEST METHOD FOR THE DETERMINATION OF ASH CONTENT OF CHLORINATED POLYVINYL CHLORIDE COMPOUNDS

### C-1 OUTLINE OF THE TEST METHOD

The material is ashed in a muffle furnace.

### C-2 APPARATUS

**C-2.1 Porcelain Crucible**

**C-2.2 Weighing Balance**

**C-2.3 Muffle Furnace**

**C-2.4 Dessicator**

### C-3 PROCEDURE

**C-3.1** Weigh accurately about 1 to 2 g of the test sample in a porcelain crucible of about 30 ml capacity. Place sample into the muffle furnace at 800°C for 2 h. After the allotted time remove the crucible from the furnace and determine the mass of the crucible and sample.

### C-4 CALCULATION

$$\text{Ash content, percent by mass} = \frac{(C-A)}{(B-A)} \times 100$$

where

$A$ = mass in g of the empty crucible,

$B$ = mass in g of the crucible and sample before residing in furnace, and

$C$ = mass in g of the crucible and sample after removal from the furnace.

# ANNEX D

(*Clause* 10)

## SAMPLING OF CHLORINATED POLYVINYL CHLORIDE COMPOUNDS

### D-1 GENERAL

**D-1.1** In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

**D-1.2** Samples shall not be taken in an exposed place.

**D-1.3** The sampling instrument shall be made of stainless steel or any other suitable material on which the material shall have no action. The instrument shall be clean and dry.

**D-1.4** Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

**D-1.5** The samples shall be placed in suitable, clean, dry, air-tight metal or glass containers on which the material has no action. The sample containers shall be of a size that the sample nearly fills the container.

**D-1.6** Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling, such as the date of sampling, the month and year of manufacture of the material, etc.

**D-1.7** Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

### D-2 SCALE OF SAMPLING

#### D-2.1 Lot

In a single consignment, all the containers of the same class, same type, same form and belonging to the same batch of manufacture, shall be grouped together to constitute a lot. If a consignment is known to consist of containers belonging to different batches of manufacture or different forms, the containers belonging to the same batch of manufacture and the same form shall be grouped together and each such group shall constitute a lot.

**D-2.2** A number of containers, consisting 10 percent of the containers in a lot but not less than 3 containers in any case, shall be selected at random from a lot for the purpose of drawing samples for test (*see* IS 4905).

### D-3 TEST SAMPLES AND REFEREE SAMPLE

#### D-3.1 Preparation

To prepare a set of test samples draw with an appropriate sampling instrument, from freshly opened containers which have been selected for sampling and equal number of scoopful of material from any point at least 75 mm below the surface and 75 mm above the bottom of large containers, and from any point at least 25 mm below the surface and 25 mm above the bottom of small containers. The sample prepared by mixing the portions from each container shall be not less than eight times the quantity which is estimated to be required for carrying out all the tests. Divide this composite sample into the required number of reduced samples. Each set of these reduced samples shall constitute a lot.

**D-3.2** Three sets of test samples, each not less than twice the quantity required for the purpose of testing, representative of each selected container (*see* **D-3.1**) shall be transferred immediately to thoroughly dried container, which shall be sealed air-tight with an appropriate stopper. These containers shall be marked with all the particulars of sampling given under **D-1.6**.

#### D-3.3 Referee Sample

The third set of the test samples, bearing the seals of the purchaser and the supplier shall constitute the referee sample, to be used in case of dispute between the purchaser and the supplier. It shall be kept at a place as agreed to between the purchaser and the supplier.

### D-4 TEST FOR ACCEPTANCE

#### D-4.1 Examination and Tests

The purchaser may examine and test separately samples from each lot (*see* **D-2.1**) for compliance with the requirements of the standard, or he may prepare for the purpose of such examination, a composite sample representing the whole of the consignment, by mixing the test samples.

# ANNEX E

( *Foreword* )

## COMMITTEE COMPOSITION

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| Shriram Fertilizers & Chemicals, Kota | SHRI M. S. TRIPATHI<br>SHRI R. C. GUPTA (*Alternate*) |
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| XPRO India Ltd, Faridabad | SHRI C. BHASKAR<br>SHRI MANMOHAN KRISHAN (*Alternate*) |
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*Member Secretary*
SHRI T. KALAIVANAN
Joint Director (PCD), BIS

## Thermoplastics Subcommittee, PCD 12 : 3

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| All India Plastics Manufacturers' Association, Mumbai | SHRI A. K. MUKHERJEE<br>SHRI UMAKANT A. SHAH (*Alternate*) |
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| Supreme Petrochem Ltd, Mumbai | SHRI R. RANGARAJAN |
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| XPRO India Ltd, Faridabad | SHRI C. BHASKAR<br>SHRI RAVI KUMAR (*Alternate*) |

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**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 latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc: No. PCD 12 ( 1930 ).

**Amendments Issued Since Publication**

| Amend No. | Date of Issue | Text Affected |
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BUREAU OF INDIAN STANDARDS

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Telegrams: Manaksanstha
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