

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 2771-1 (1990): Corrugated Fibreboard Boxes, Part 1:
General Requirements [CHD 15: Paper and its products]



“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 : 2771 (Part 1) - 1990
(Reaffirmed 2002)

भारतीय मानक

पनालीदार रेशागत्ते के बाक्स—विशिष्टि

भाग 1 सामान्य आवश्यकताएं

(दूसरा पुनरीक्षण)

Indian Standard

CORRUGATED FIBREBOARD BOXES—
SPECIFICATION

PART 1 GENERAL REQUIREMENTS

(Second Revision)

Third Reprint JUNE 2003

UDC 621.798.143 : 676.273.3

© BIS 1991

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

January 1991

Price Group 2

**AMENDMENT NO. 1 JUNE 1997
TO
IS 2771 (Part 1) : 1990 CORRUGATED
FIBREBOARD BOXES — SPECIFICATION**

PART 1 GENERAL REQUIREMENTS

(Second Revision)

(Page 2, clause 5.2, last sentence) — Delete.

(Page 4, clause 7.3) — Substitute the following for the existing clause:

'7.3 The flaps of the box shall be capable of being folded through 180° inside and then 180° outside along the line of creasing without cracking of the board or facing.'

(CHD 016)

AMENDMENT NO. 2 · APRIL 1998
TO
IS 2771 (Part 1) : 1990 CORRUGATED FIBREBOARD
BOXES—SPECIFICATION
PART 1 GENERAL REQUIREMENTS
(Second Revision)

(Second cover page, Foreword) — Insert the following as the third paragraph in the FOREWORD:

'A scheme ~~for labelling~~ environment friendly products to be known as ECO Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF). The ECO Mark shall be administered by the Bureau of Indian Standards (BIS) under the *BIS Act, 1986* as per the Resolution No. 71 dated 20 February 1991, published in the Gazette of the Government of India. For a product to be eligible for ECO Mark it shall also carry Standard Mark of BIS for quality, in addition to the compliance with the optional environment friendly (EF) requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO logo. Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness, will be included in the relevant published Indian Standard through an amendment. These requirements will be optional; manufacturing units will be free to opt for the ISI Mark alone also.

This amendment is based on the Gazette Notification No. 364 dated 7 September 1995 for packaging material/package (Part I Paper Board and Plastics Excluding Laminates) as environment friendly products, published in the Gazette of India. This amendment is, therefore, being issued to this standard to include EF requirements for corrugated fibreboard boxes.'

(Page 4, clause 7.4) — Insert the following new clauses after 7.4:

7.5 Additional Requirements for ECO Mark

7.5.1 General Requirements

7.5.1.1 The product shall conform to the requirements for quality and performance prescribed under clauses 4.1 to 7.4.

Price Group 1

1

Amend No. 2 to IS 2771 (Part 1) : 1990

7.5.1.2 The manufacturer shall produce to BIS, the environmental consent clearance from the concerned State Pollution Control Board as per the provisions of *Water (Prevention and Control of Pollution) Act, 1974* and *Air (Prevention and Control of Pollution) Act, 1981* along with the authorization, if required under the *Environment (Protection) Act, 1986* and the Rules made thereunder, while applying for ECO Mark. Additionally the manufacturers shall also comply with the provisions under *Prevention of Food Adulteration Act, 1954* and the Rules made thereunder wherever necessary.

7.5.2 Specific Requirements

7.5.2.1 The material shall be of the following two types depending on the raw material used in the manufacture:

- a) *Type A* — Manufactured from pulp containing not less than 60 percent by mass of pulp made from materials other than bamboo, hardwood, softwood and reed.
- b) *Type B* — Manufactured from pulp made from 100 percent waste paper or agricultural/industrial waste.

7.5.2.2 The material if used for the packaging of food materials, shall be manufactured from virgin pulp and shall be free from dioxins. Printed surfaces of the paper shall not come into contact with the food and the maximum amounts of contaminants in paper intended to come into contact with food shall not exceed the limits prescribed in Table 4 when tested according to the methods given in Annex A.

Table 4 Limits of Contaminants in Paper

Contaminant	Paper Intended to Come into Contact with Dry Food	Paper Intended to Come into Contact with Wet Food and Food with Fatty Surface	Paper for Filtration
	(mg/kg of paper)	(mg/kg of paper)	(mg/kg of paper)
Cadmium (Cd)	—	0.5	0.5
Chromium (Cr ⁶⁺)	—	0.1	0.1
Lead (Pb)	—	3.0	3.0
Mercury (Hg)	—	0.3	0.3
Pentachlorophenol (PCP)	0.05	0.05	0.05
Polychlorinated biphenyls (PCBs)	2.0	2.0	0.5

(Page 4, clause 9.2) — Insert the following new clauses after 9.2:

9.3 Additional Requirements for ECO Mark

9.3.1 For ECO Mark, corrugated fibreboard boxes shall be packed in such packages which shall be recyclable/reusable or biodegradable.

9.3.2 The corrugated fibreboard boxes may display in brief the criteria based on which the product has been labelled as environment friendly.

9.3.3 The corrugated fibreboard boxes shall be sold along with instruction for proper use and mode of safe disposal so as to maximise its performance and minimise wastage.

9.3.4 It shall be suitably marked that ECO Mark label is applicable only to the corrugated fibreboard boxes if content is not separately covered under the ECO Mark scheme.

NOTE — It may be stated that the ECO Mark is applicable to the product or packaging material or both.

(Page 4, clause 9.2) — Insert the following after 9.2:

ANNEX A

(Clause 7.5.2.2)

**DETERMINATION OF CHROMIUM, LEAD, MERCURY, CADMIUM,
PENTACHLOROPHENOL AND POLYCHLORINATED BIPHENYLS**

A-1 DETERMINATION OF CHROMIUM (as Cr⁶⁺)

A-1.1 Principle

The hexavalent chromium is determined colorimetrically by reaction with diphenylcarbazide in acid solution at a wavelength of 550 nm.

A-1.2 Apparatus

A-1.2.1 Spectrophotometer

Any spectrophotometer suitable for measurement at a wavelength of about 550 nm or photoelectric absorptiometer fitted with filters giving maximum transmission near 550 nm.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-1.2.2 Shaker

Any shaker suitable for rotating/moving at 30 ± 2 rev/min.

A-1.3 Reagents

A-1.3.1 Extraction Fluid — Mix 5.7 ml of acetic acid in distilled water.

A-1.3.2 Nitric Acid — Concentrated.

A-1.3.3 Sulphuric Acid — Approximately 0.2 N.

A-1.3.4 Diphenylcarbazide Solution

Dissolve 0.25 g of diphenylcarbazide in 50 ml acetone. Store in a brown bottle. Discard when solution becomes discoloured.

A-1.3.5 Stock Chromium Solution

Dissolve 0.141 g $K_2Cr_2O_7$ in distilled water and dilute to 100 ml. One millilitre of this solution contains 500 μg of chromium (as Cr^{6+}).

A-1.3.6 Intermediate Chromium Solution

Take 10 ml of stock chromium solution and dilute to 1 000 ml with distilled water. One millilitre of this solution contains 5.00 μg of chromium (as Cr^{6+}).

A-1.3.7 Standard Chromium Solution

Take 10 ml of intermediate chromium solution and dilute to 1 000 ml with distilled water. One millilitre of this solution contains 0.05 μg of chromium (as Cr^{6+}).

A-1.3.8 Indicator Paper — Covering the pH range 0.5 to 1.5.

A-1.4 Procedure

A-1.4.1 Preparation of Calibration Curve

Into each of a series of ten 250-ml volumetric flasks, place the quantities of standard chromium solution as indicated below:

Amend No. 2 to IS 2771 (Part 1) : 1990

<i>Standard Chromium Solution</i>	<i>Corresponding to Cr⁶⁺</i>
ml	µg
1.0	0.05
2.0	0.10
3.0	0.15
4.0	0.20
5.0	0.25
6.0	0.30
7.0	0.35
8.0	0.40
9.0	0.45
10.0	0.50

A-1.4.1.1 Add sulphuric acid to adjust the solution pH to 1.0 ± 0.3 in each flask and dilute to 100 ml. Add 2.0 ml diphenylcarbazide solution, mix thoroughly and wait for 10 minutes.

A-1.4.1.2 Carry out the measurement on the spectrophotometer or on a photoelectric colorimeter using appropriate filter with a 1-cm cell at a wavelength of 550 nm. As references use extraction fluid. Correct the absorbance readings of standard solution by subtracting absorbance of a reagent blank carried through the above method.

A-1.4.1.3 Construct a calibration curve by plotting corrected absorbance values against chromium content in microgram per 102 ml.

A-1.4.2 *Determination*

A-1.4.2.1 *Sample preparation*

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-1.4.2.2 *Preparation of test solution*

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Add sufficient

Amend No. 2 to IS 2771 (Part 1) : 1990

amount of aluminium sulphate and filter if any precipitate appears. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

A-1.4.2.3 According to the expected chromium content, take an aliquot portion of the test solution containing 10 to 100 µg of chromium to a 100-ml volumetric flask. Adjust the pH of the solution to 1.0 ± 0.3 by adding 0.2 N sulphuric acid. Dilute to 100 ml. Add 2 ml diphenylcarbazide solution, mix thoroughly, and wait for 10 minutes.

A-1.4.2.4 Photometric measurement

Carry out the photometric measurements of the test solution according to the methods given in A-1.4.1.1.

A-1.4.3 Calculation

By means of the calibration curve (see A-1.4.1.3) determine the quantity of chromium present:

$$\text{Chromium (as Cr}^{6+}\text{), ppm} = \frac{m \times D}{M}$$

where

- m = mass of chromium determined in the aliquot of the sample solution, µg;
- M = mass of paper sample taken for testing, g; and
- D = ratio of the volume of test solution to the volume of aliquot portion taken for the colour development.

A-2 DETERMINATION OF MERCURY (as Hg)

A-2.1 Principle

The flameless atomic absorption procedure is a physical method based on the absorption of radiation at 253.7 nm by mercury vapour. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapour passes through a cell positioned in the light path of mercury hollow cathode lamp of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration and record.

A-2.2 Apparatus

A-2.2.1 Atomic Absorption Spectrometer (AAS) and Associated Equipment

Instrument settings recommended by the manufacturer shall be followed. Instruments designed specifically for the measurement of mercury using the cold vapour technique may be substituted for the AAS.

A-2.2.2 Mercury Vapour Generation Assembly

Consists of an absorption cell, peristaltic pump, flow meter, aeration tubing and a drying tube containing magnesium perchlorate.

A-2.2.3 Mercury Hollow Cathode Lamp

A-2.2.4 Recorder/Printer/Display Meter

Any multi-range variable recorder that is compatible with the UV detection system is suitable.

A-2.3 Reagents

A-2.3.1 Sulphuric Acid — Concentrated.

A-2.3.2 Nitric Acid — Concentrated.

A-2.3.3 Stannous Chloride Solution

Dissolve 25 g of stannous chloride (SnCl_2) in water containing 50 ml of concentrated hydrochloric acid and dilute to 250 ml. If a suspension forms, stir reagent continuously during use.

A-2.3.4 Sodium Chloride — Hydroxylamine Sulphate Solution

Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulphate ($(\text{NH}_2\text{OH})_2\text{H}_2\text{SO}_4$) in distilled water and dilute to 100 ml.

A-2.3.5 Potassium Permanganate Solution

Dissolve 5 g of potassium permanganate in distilled water and dilute to 100 ml.

A-2.3.6 Potassium Persulphate Solution

Dissolve 5 g of potassium persulphate in distilled water and dilute to 100 ml.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-2.3.7 Stock Mercury Solution

Dissolve 1.354 g of mercuric chloride in about 700 ml of distilled water. Add 10 ml of concentrated nitric acid and make up to 1 000 ml. One millilitre of the solution contains 1 mg of mercury as Hg.

A-2.3.8 Standard Mercury Solution

Prepare a series of standard mercury solutions containing 0 to 5 $\mu\text{g/l}$ by appropriate dilution of stock mercury solution (A-2.3.7) with water containing 10 ml of concentrated nitric acid per litre. Prepare standards daily.

NOTE — Use mercury free distilled water for the preparation of reagents and standards.

A-2.4 Procedure

A-2.4.1 Instrument Operation

Follow the procedure of the manufacturer's operating manual. Connect the mercury vapour generating assembly as shown in Fig. 1.

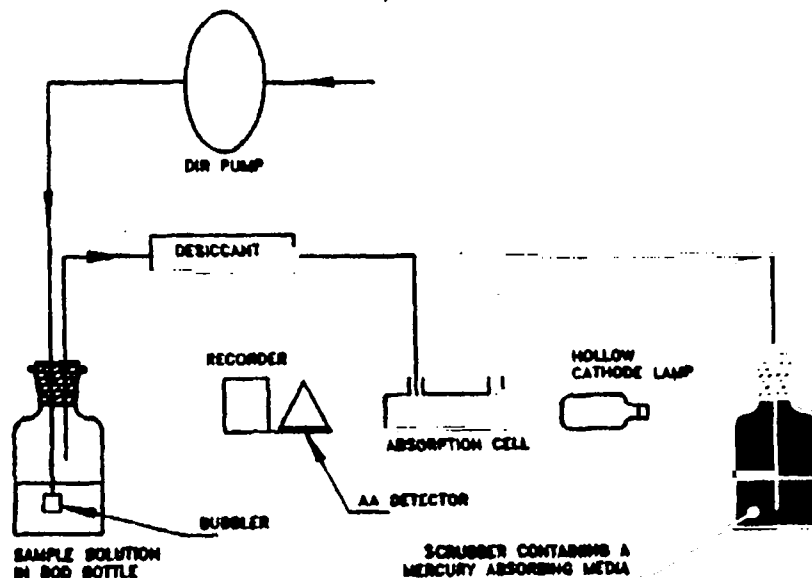


FIG. 1 SCHEMATIC ARRANGEMENT OF EQUIPMENT FOR MEASUREMENT OF MERCURY BY COLD VAPOUR ATOMIC ABSORPTION TECHNIQUE

A-2.4.2 Standardization

Transfer 100 ml of each of the 1.0, 2.0 and 5.0 µg/l standard mercury solution and a blank of 100 ml water to 300 ml BOD bottles. Add 5 ml of concentrated sulphuric acid and 2.5 ml of concentrated nitric acid to each bottle. Add 15 ml of potassium permanganate solution to each bottle and let stand for at least 15 minutes. Add 8 ml of potassium persulphate ($K_2S_2O_8$) solution to each bottle and heat for 2 hours in a water bath at 95°C. Cool and add 6 ml of sodium chloride-hydroxylamine sulphate solution to reduce the excess permanganate. After decolourization add 5 ml of stannous chloride solution and attach the bottle immediately to the aeration apparatus forming a closed system. As mercury is volatilised and carried into the absorption cell, absorbance will increase to a maximum within a few seconds. As soon as recorder returns approximately to the base line, remove stopper holding the aeration frit from the reaction bottle and replace with a bottle containing distilled water. Flush the system for a few seconds and run the next standard in the same manner. Construct a standard calibration curve by plotting absorbance (peak height) versus mercury concentration in µg.

A-2.4.3 Determination

A-2.4.3.1 Sample preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-2.4.3.2 Preparation of test solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Transfer the solution quantitatively to a volumetric flask of suitable capacity, dilute to the mark and mix.

A-2.4.3.3 According to the expected mercury content, take an aliquot portion of the test solution containing not more than 5 µg/l of mercury to a 300 ml BOD bottle and treat as in A-2.4.2.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-2.5 Calculation

Determine peak height of sample from recorder chart, read mercury value from standard curve and determine the mercury content of the sample using the following formula :

$$\text{Mercury (as Hg), ppm} = \frac{C \times V}{M \times 1000}$$

where

C = concentration of mercury from the calibration curve;

V = volume of test solution prepared, ml; and

M = mass of paper sample taken for testing, g.

A-3 DETERMINATION OF LEAD (as Pb)

A-3.1 Principle

The lead content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-3.2 Apparatus

A-3.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-3.2.2 Lead Hollow — Cathode Lamp or Multielement Hollow — Cathode Lamp — for use at 283.3 nm.

A-3.2.3 Hot Plate

A-3.3 Reagents

A-3.3.1 Nitric Acid — concentrated.

A-3.3.2 Nitric Acid — 1 : 1.

A-3.3.3 Dilute Nitric Acid — 1 : 499.

A-3.3.4 Stock Lead Solution

Dissolve 1.599 9 g of $\text{Pb}(\text{NO}_3)_2$ in a mixture of 10 ml of concentrated HNO_3 and 100 ml of water and dilute to 1 litre. One millilitre of this solution contains 1.0 mg of lead (as Pb).

Amend No. 2 to IS 2771 (Part 1) : 1990

A-3.3.5 Intermediate Lead Solution

A-3.3.6 Standard Lead Solution

Dilute 100 ml of intermediate lead solution to 1 litre with dilute nitric acid (1 : 499). One millilitre of this solution contains 0.1 mg of lead (as Pb).

A-3.4 Procedure

A-3.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-3.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/ moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-3.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with water and then filter if necessary. Quantitatively transfer filtrate to a 100ml volumetric flask, dilute to the mark and mix thoroughly.

A-3.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

A-3.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of lead by diluting suitable volume of the standard lead solution with nitric acid (1:499) and repeat as above (A-3.4.3). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

A-3.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of lead concentration of each standard. Read the concentration of the sample from the graph

Amend No. 2 to IS 2771 (Part 1) : 1990

and determine the lead content of the sample from the calibration graph using the following formula:

$$\text{Lead (as Pb), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of lead from the calibration curve;

F = dilution factor; and

M = mass of paper sample taken for testing, g.

A-4 DETERMINATION OF CADMIUM (as Cd)

A-4.1 Principle

The cadmium content of the sample is determined by electrothermal atomic absorption spectrometric method.

A-4.2 Apparatus

A-4.2.1 Atomic Absorption Spectrometer — with graphite oven technique in place of conventional burner assembly.

A-4.2.2 Cadmium Hollow — Cathode Lamp or Multielement Hollow Cathode Lamp — for use at 228.8 nm.

A-4.2.3 Hot Plate

A-4.3 Reagents

A-4.3.1 Nitric Acid — Concentrated.

A-4.3.2 Nitric Acid — 1 : 1.

A-4.3.3 Dilute Nitric Acid — 1 : 499.

A-4.3.4 Stock Cadmium Solution

Dissolve 1.0 g of pure cadmium metal in minimum quantity of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 1 mg of cadmium (as Cd).

A-4.3.5 Intermediate Cadmium Solution

Add 1 ml of concentrated nitric acid to 50 ml of stock solution and dilute to 1 litre with distilled water. One millilitre of this solution contains 50 µg of cadmium (as Cd)

A-4.3.6 Standard Cadmium Solution

To 10 ml of cadmium intermediate solution add 1 ml of concentrated nitric acid and dilute to 1 litre with distilled water. One millilitre of this solution contains 0.5 µg of cadmium (as Cd).

A-4.4 Procedure

A-4.4.1 Sample Preparation

Tear the air dry sample into pieces of suitable size. Do not use cut or punched edges or other parts where metallic contamination may have occurred.

A-4.4.2 Preparation of Test Solution

Weigh to the nearest 0.01 g about 20 g of paper, leach the paper with about 200 ml of extraction fluid for 18 ± 2 h using shaker rotating/ moving at 30 ± 2 rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size.

A-4.4.3 Transfer the extract to a 250-ml conical flask. Add 5 ml concentrate nitric acid and a few boiling chips or glass beads. Slowly evaporate on a hot plate to about 10 to 20 ml. Continue heating and adding concentrated nitric acid until digestion is complete. Wash down with distilled water and then filter if necessary. Quantitatively transfer filtrate to a 100-ml volumetric flask, dilute to the mark and mix thoroughly.

A-4.4.4 Inject a measured portion of the digested solution into the graphite oven. Dry, char and atomize according to the preset programme. Measure the absorbance.

A-4.4.5 Prepare a reagent blank and sufficient standards containing 5.0, 7.5 and 10.0 mg/l of cadmium by diluting suitable volume of the standard cadmium solution with nitric acid (1 : 499). Inject a suitable portion of each standard solution in order of increasing concentration. Analyse each standard solution and measure the absorbances.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-4.4.6 Calculation

Construct a standard calibration graph by plotting the absorbance versus mg of cadmium concentration of each standard. Read the concentration of the sample from the graph and determine the cadmium content of the sample from the calibration graph using the following formula:

$$\text{Cadmium (as Cd), ppm} = \frac{C \times F \times 100}{M}$$

where

C = concentration of cadmium from the calibration curve;

F = dilution factor; and

M = mass of paper sample taken for testing, g

A-5 DETERMINATION OF PENTACHLOROPHENOL (PCP)

A-5.1 Principle

PCP is extracted with acetone by Soxhlet extraction. Acetone extract is evaporated to dryness and subjected to acetylation. The acetylated PCP is determined quantitatively by Gas Chromatograph-Electron Capture Detector (GC-ECD).

A-5.2 Apparatus

A-5.2.1 Round Bottom Flask — 250 ml.

A-5.2.2 Soxhlet Extractor

A-5.2.3 Water Bath

A-5.2.4 Separating Funnels — 60 ml and 100 ml.

A-5.2.5 Injection Syringes — 1 µl, 5 µl and 10 µl

A-5.2.6 Gas Chromatograph with ECD — Capillary columns.

A-5.2.7 Glass Columns — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 µm × 200 µm.

A-5.3 Reagents

A-5.3.1 Acetone

A-5.3.2 n-Hexane

A-5.3.3 Acetic Anhydride

A-5.3.4 Sodium Sulphate Anhydrous

A-5.3.5 PCP Stock Solution

Dissolve 10 mg of pentachlorophenol in 100 ml of acetone. One millilitre of this solution contains 0.1 mg of pentachlorophenol.

A-5.3.6 PCP Standard Solution

Dilute 10 ml of stock solution with acetone to 100 ml. One millilitre of this solution contains 0.01 mg of pentachlorophenol.

A-5.3.7 Internal Standard Stock Solution

Dissolve 1 g of 2,4 dibromophenol in 1 l of acetone. One millilitre of this solution contains 1 mg of dibromophenol.

A-5.3.8 Internal Standard Solution

Dilute 1 ml of the stock solution (A-5.3.7) with acetone to 100 ml. One millilitre of this solution contains 10 µg of dibromophenol.

A-5.4 Procedure

A-5.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) : 1966.

A-5.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and put into a thimble. Extract with about 150 ml of acetone by Soxhlet extraction for 6 h. Filter the acetone extract, dry over anhydrous sodium sulphate, and evaporate under vacuum to a small volume approximately to 5 ml and cool.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-5.4.3 Clean Up

Transfer the extract (A-5.4.2) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask. Dry over anhydrous sodium sulphate and evaporate nearly to dryness.

A-5.4.4 Treat the residue (A-5.4.3) with 1 ml of acetic anhydride, and heat on a water bath for about 30 min. Remove the flask from the water bath and cool the acetylated product. Transfer the content in a separating funnel and add 10 ml of hexane and 5 ml distilled water. Shake well for 2 minutes and let the layers be separated. Collect the hexane layer, dry over anhydrous sodium sulphate and evaporate nearly to dryness. Cool for at least 10 minutes, add 1 ml of internal standard solution and adjust the volume to 5.0 ml with *n*-hexane.

A-5.4.5 Inject 2 µl of the solution into the Gas Chromatograph. Record the peak size in area and peak height units. If peak response exceeds linear range of the system, dilute the concentration of the extract and reanalyze.

A-5.4.6 Calibration

Prepare three calibration standards from the PCP standard solutions. Add 1 ml of internal standard solution and follow the steps as above (A-5.4.3 to A-5.4.5). Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-5.5 Calculation

Determine the PCP content of the sample from the calibration graph using the following formula:

$$\text{PCP content, mg/kg on dry matter} = \frac{A \times B \times V_i \times 100}{M \times C \times V_t \times (100 - X)}$$

where

- M = mass of the paper sample taken for testing, g;
- A = PCP content in µg from the graph;
- X = moisture content, percent by mass;
- V_i = volume of eluent injected, ml;
- V_t = volume of total eluent, ml;

Amend No. 2 to IS 2771 (Part 1) : 1990

- B* = total volume of hexane extract before derivatization, ml; and
C = volume of hexane extract carried through derivatization, ml.

A-6 DETERMINATION OF POLYCHLORINATED BIPHENYLS (PCBs)

A-6.1 Principle

PCB is extracted with boiling ethanolic potassium hydroxide solution. An aliquot of the extract is mixed with distilled water and subjected to extraction with hexane. The PCB content is determined quantitatively by GC-ECD by comparing the pattern of the peaks with the pattern of a suitable technical PCB.

A-6.2 Apparatus

A-6.2.1 Erlenmeyer Flask — 200 ml.

A-6.2.2 Water Bath

A-6.2.3 Separating Funnels — 60 ml and 100 ml.

A-6.2.4 Injection Syringes — 1 μ l, 5 μ l and 10 μ l.

A-6.2.5 Gas Chromatograph with ECD — Capillary columns

A-6.2.6 Glass Columns — Length 20 cm, internal diameter 12 mm filled with 5 cm of silica gel having particle size 63 μ m \times 200 μ m.

A-6.3 Reagents

A-6.3.1 Ethanolic Potassium Hydroxide Solution

Prepare 1 N ethanolic potassium hydroxide solution by dissolving the required amount of potassium hydroxide in absolute ethanol that has been purified as follows:

Dissolve 1.5 g of silver nitrate in 3 ml of water and add it to one litre of alcohol. Dissolve 3 g of potassium hydroxide in the smallest amount of hot distilled water, cool, and add it to the silver nitrate solution. Shake thoroughly, allow the solution to stand for at least 24 h, filter and distill.

NOTE — Absolute alcohol denatured with 10 percent by volume of methanol may also be used.

A-6.3.2 n-Hexane

A-6.3.3 Sodium Sulphate Anhydrous

Amend No. 2 to IS 2771 (Part 1) : 1990

A-6.3.4 PCB Stock Solution

Dissolve 10 mg of any PCB technical in 100 ml of hexane. One millilitre of this solution contains 0.1 mg of PCB.

A-6.3.5 PCB Standard Solution

Dilute 10 ml of stock solution with hexane to 100 ml. One millilitre of this solution contains 0.01 mg of PCB.

A-6.3.6 Internal Standard Stock Solution

Dissolve 1 g of 2,4 dibromophenol in 1 l of *n*-hexane. One millilitre of this solution contains 1 mg of dibromophenol.

A-6.3.7 Internal Standard Solution

Dilute 1 ml of the stock solution (A-6.3.6) with hexane to 100 ml. One millilitre of this solution contains 10 µg of dibromophenol.

A-6.4 Procedure

A-6.4.1 Determine the moisture content of the sample as given in 9 of IS 1060 (Part 1) : 1966.

A-6.4.2 Weigh accurately about 1 g of the paper sample pieces up to two decimal places and take into a 200-ml Erlenmeyer flask. Add 50 ml of ethanolic potassium hydroxide solution and heat under reflux condenser for 4 h, filter and dilute to the mark with alcohol in a 250-ml volumetric flask. Take an aliquot portion of the test solution in a separating funnel, add sufficient distilled water and 15 ml hexane. Shake well for 5 minutes and wait for 15 minutes. Collect the hexane phase.

A-6.4.3 Filter the hexane extract. Dry the filtrate over anhydrous sodium sulphate, and evaporate under vacuum to approximately 5 ml. Take the residue for clean up.

A-6.4.4 Clean Up

Transfer the hexane extract (A-6.4.3) to the silica gel packed column and elute with about 25 ml of *n*-hexane at the rate of 2 ml/min. Collect the eluent in a flask and evaporate to a small volume. Add 1 ml of internal standard solution and made up to 10 ml with hexane.

Amend No. 2 to IS 2771 (Part 1) : 1990

A-6.4.5 Inject 2 ul of the solution to the Gas chromatograph. From the peaks obtained PCB and Internal Standard are identified by their retention times as well as relative retention time.

A-6.4.6 Calibration

Prepare three calibration standards from the PCB standard solutions and follow the steps as above (A-6.4.3 to A-6.4.5). Tabulate peak height or area responses against calculated equivalent mass of underivatized pentachlorophenol injected. Prepare a calibration curve.

A-6.5 Calculation

Determine the PCB content of the sample from the calibration graph using the following formula :

$$\text{PCB content, mg/kg on dry matter} = \frac{A \times v_i \times 100}{M \times V_t \times (100 - X)}$$

where

- A = PCB content in μg from the graph;
- M = mass of the paper sample taken for testing, g;
- X = moisture content, percent by mass;
- V_i = volume of eluent injected, ml; and
- V_t = volume of total eluent, ml.

(CHD 16)

FOREWORD

This Indian Standard (Second Revision) (Part 1) was adopted by the Bureau of Indian Standards on 31 May 1990 after the draft finalized by the Paper and Pulp Based Packaging Sectional Committee had been approved by the Chemical Division Council.

This standard was first published in 1965 and was covering both solid fibreboard as well as corrugated fibreboard boxes. However, it was revised in 1977 and split into two parts, Part 1 covering CFB boxes only, and Part 2 covering solid fibreboard boxes. With the experience gained by the use of corrugated fibreboard boxes over the years, it was felt that one single specification could not cover all the requirements of these boxes for variety of items. Depending upon the nature of the product to be packed into these boxes, the requirements like compression strength, puncture resistance, bursting strength and water-proofing were varying and in some cases some of these requirements were not applicable. Hence while revising this standard, only general requirements like bursting strength, internal dimensions and manufacturing which are applicable to all the boxes, by and large, have been specified. The other requirements like compression strength, puncture resistance and water-proofing have been left for the user of these boxes to specify, if required, depending upon the product to be packed into them. Some further modification in the flute heights and pitch have been made besides adding the flap bend test and the joint strength test.

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.

AMENDMENT NO. 3 SEPTEMBER 2009
TO
IS 2771 (PART 1) : 1990 CORRUGATED FIBREBOARD BOXES —
SPECIFICATION

(Second Revision)

[Page 4, clause **A-1.3.1** (see also Amendment No. 2)] — Substitute the following for the existing:

A-1.3.1 *Extraction Fluid* — Mix 5.7 ml of acetic acid in 200 ml distilled water.’

[Page 5, clause **A-1.4.2.2**, line 3 (see also Amendment No. 2)] — Substitute ‘Add sufficient amount of aluminium sulphate to bring the pH below 5.0 and filter if any precipitate appears’ for ‘Add sufficient amount of aluminium sulphate and filter if any precipitate appears’.

(CHD 15)

Indian Standard

CORRUGATED FIBREBOARD BOXES— SPECIFICATION

PART 1 GENERAL REQUIREMENTS

(*Second Revision*)

1 SCOPE

1.1 This standard lays down guidelines for strength requirements, manufacturing details, sampling and testing of corrugated fibreboard material and boxes, suitable both as inner and outer containers for the transport of goods.

1.2 This standard does not cover the requirements for waterproofness or weatherproofness, compression strength and puncture strength of the corrugated fibreboard boxes which shall be specified by the purchaser depending upon the type of product to be packed by him.

2 REFERENCES

2.1 The following Indian Standards are the necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
1060 (Part 1) : 1966	Methods of sampling and test for paper and allied products, Part 1 (<i>revised</i>)
4006 (Part 1) : 1985	Methods of test for paper and pulp based packaging materials, Part 1
4261 : 1967	Glossary of terms relating to paper and pulp based packaging materials
4661 : 1986	Glossary of terms used in paper trade and industry
6481 : 1971	Guide for principal uses and styles of fibreboard containers
7186 : 1973	Glossary of terms relating to paper and flexible packaging.

3 TERMINOLOGY

3.0 The definitions given in IS 4261 : 1967, IS 4661 : 1986 and IS 7186 : 1973 alongwith the following shall apply.

3.1 Manufacturer's Joint

The manufacturer's joint is that part of the box where the ends of the scored and slotted blanks are joined together by stitching or glueing.

4 MATERIALS

4.1 Corrugated Fibreboard

Consists of one or more sheets of fluted paper (fluting) stuck or interposed between two or more flat sheets of paper or board (liner), usually of kraft. If it is lined on one side only, it is a single face board; If lined on both sides, it is a single wall, 3-ply, or double-faced board. Additional liners yield double-wall or 5-ply and triple-wall or 7-ply board. Fig. 1 illustrates these combinations.

4.2 Corrugated Flutes

The corrugations or flutes impressed in the medium give corrugated board its strength and cushioning qualities. Double and triple wall boards are usually produced by a combination of flutes of the same type or of different types. In corrugated containers, flutes are usually vertical to give maximum stacking strength. They come in four standard sizes as given in Table 1.

Table 1 Details of Types of Flutes

Flute	No. of Corrugations per 30 cm	Height of Corrugations Exclusive of Liners
A (Broad)	32 to 38	4.2 to 4.6
B (Narrow)	50 to 56	2.2 to 2.8
C (Medium)	36 to 43	3.5 to 3.7
E (Micro)	90 to 96	1.2 to 1.6

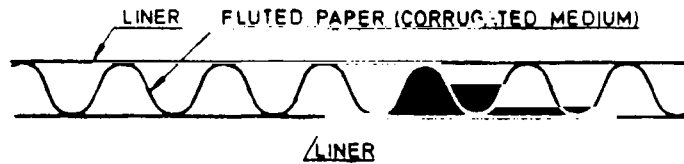
4.2.1 A-flute is used when stacking strength or cushioning is the primary concern. B-flute gives better resistance, folds more easily and is stronger at the score lines than A or C-flutes. C-flute has qualities that fall between A and B making it a good compromise and expanding its wide usage. E-flute is a special grade, that is, easiest to fold, can be printed very well and is used for some folding cartons.

4.2.2 Adhesive

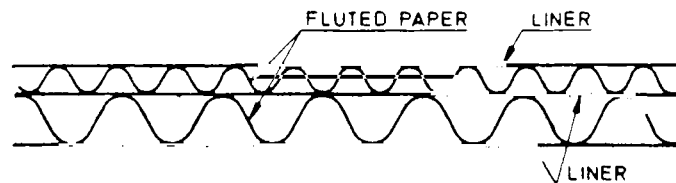
Any suitable adhesive capable of firmly adhering the various plies together may be used. Sodium silicate or any other highly alkaline adhesive shall not be used.

IS 2771 (Part 1) : 1990

a) *Single-Wall Corrugated Fibreboard* — Single-wall board is produced in A, B, C or E flutes.



b) *Double-Wall Corrugated Fibreboard* — Double-wall board is usually produced with combination of A, C and B flutes.



c) *Triple-Wall Corrugated Fibreboard* — Triple-wall board is normally produced with A, B and C flutes, or combination thereof.

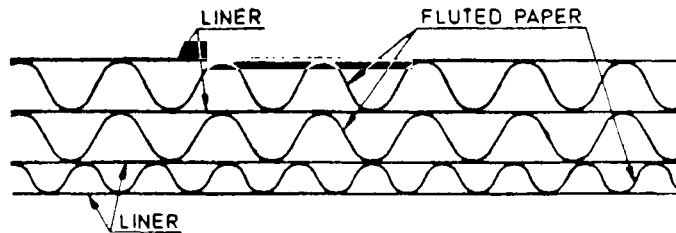


FIG. 1 CORRUGATED FIBREBOARDS

4.3 Joining Materials

4.3.1 *Stitching Wire or Staples*

For staples and stitches, flat wire shall be used as agreed to between the purchaser and the supplier.

4.3.2 *Tape*

The tape used for the manufacturer's joint may be of cambric, suitably prepared for the purpose or of two thicknesses of kraft laminated with reinforcing fibres of cotton linen, fibre glass, nylon or other suitable material as agreed to between the purchaser and the supplier.

4.3.3 *Glue*

The tape used for the manufacturer's joint shall be adequately resistant to moisture and climatic conditions.

5 MANUFACTURE AND WORKMANSHIP

5.1 The boxes shall be manufactured to the style and design as agreed to between the purchaser and the supplier. Various styles of fibreboard boxes are given in IS 6481 : 1971.

5.2 The blanks shall be properly creased and slotted so that when the box is assembled, there shall be no holes at the corners. The flaps shall not crack at the crease when bent through 90° inside and then 90° outside.

5.3 Manufacturer's Joint

The manufacturer's joint may be made either by a lap or by butting the edges, as agreed to between the purchaser and the supplier.

5.3.1 *Lap Joint*

The joint may either be stitched or glued.

5.3.1.1 *Stitches*

The width of the lap shall not be less than 30 mm. Wire staples or stitches shall be not more than 60 mm apart in each row and the first and last not farther than 25 mm from the beginning and the end of the joint respectively. The staples and stitches shall be centrally located along the lap and may be straight or at an angle of 45°.

5.3.1.2 *Glue*

The width of the lap shall be not less than 30 mm with an extension to the normal length of the lap of not less than 25 mm at both ends, unless otherwise agreed to between the purchaser and the supplier. The joint shall be firmly glued throughout the entire area of the joint.

5.3.2 *Butt Joint*

When the joint is made by butting the edges, it shall be secured by the adhesive tape along the complete length of the joint. The tape used shall be not less than 50 mm wide.

6 DIMENSIONS AND TOLERANCES

6.1 The boxes shall conform to the dimensions as ordered. The ordered dimensions are internal dimensions of the erected assembled box as shown in Fig. 2. These are given to the nearest mm and normally in the following order:

Length (L) — the longer dimensions at the opening;

Width (W) — the shorter dimension at the opening; and

Height (H) — the dimension from the top of the opening to the base measured, where applicable, from centre of crease to centre of crease.

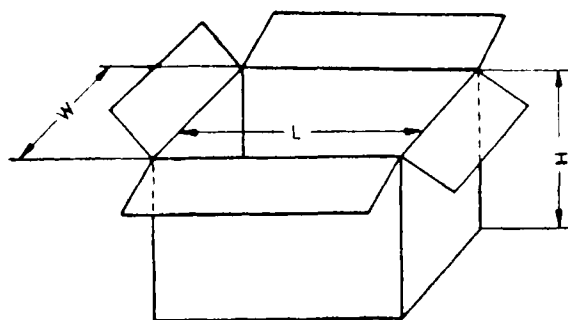


FIG. 2 INTERNAL DIMENSIONS OF BOX

The sum of length, width and height ($L + W + H$) is termed the combined internal dimensions.

6.2 The normal manufacturing tolerances on the individual internal dimension of the erected assembled box shall be as under:

± 3 mm for 3 ply boxes;

± 5 mm for 5 ply boxes; and

± 7 mm for 7 ply boxes.

If special tolerances are required for example, automatic case erection and filling, arrangements shall be made between the manufacturer and the user but tolerances closer than ± 1 mm cannot be expected.

7 QUALITY REQUIREMENTS AND TESTING

7.1 Bursting Strength and Maximum Internal Dimensions of the Box

As a general guide Table 2 may be referred for the selection of single wall and double wall and triple wall corrugated fibreboard used for the construction of general purpose boxes. In certain circumstances, for example for palletized and/or containerized loads, complete rail wagon loads, user's own transport, and for some types of commodities, a lighter grade of board may be used or the contents mass increased beyond that shown in Table 2. Alternatively, a heavier grade of board for a given mass may be necessary for overseas shipment, dangerous goods, and explosives, and to meet hazardous conditions of transit and storage.

Table 2 General Guidance on Fibreboard Boxes and Requirements

Types of Corrugated Board	Maximum Mass of Contents kg	Maximum Combined Internal Dimensions of the Box ($L + W + H$) mm	Minimum Bursting Strength of the Board kgf/cm ² (kPa)
Single wall or 3-ply	5	635	6 (600)
	8	750	8 (800)
	10	1 025	9 (900)
Double-wall or 5-ply	15	1 275	10 (1 000)
	20	1 525	12 (1 200)
	25	1 575	13 (1 300)
Triple-wall or 7-ply	30	1 650	14 (1 400)
	40	1 775	17 (1 700)
	55	1 900	24 (2 400)
	75	2 150	29 (2 900)

NOTES

1 Boxes should be made with no single dimension exceeding 50 percent of the combined internal dimensions.

2 For calculating the maximum combined dimensions for any intermediate mass content, for each 10 percent reduction in mass of contents below the maximum permitted for a box, the calculated combined dimensions from the table may be increased by 5 percent.

7.2 Water Absorption Test

The outer surface of the fibreboard shall be subjected to water absorption test or cobb test for 30 minutes as per method given in 6 of IS 4006 (Part 1) : 1985. The test shall be done on unprinted area wherever possible. When the test is done on the printed area, it shall be reported in the test report and a correction factors of -5 percent shall be applied to the observed values. The increase in the mass of the board after the test shall not be more than 155 g/m².

7.3 Flap Bend Test

The flaps shall not crack at the crease when bent through 90° inside and 90° outside. This test shall not be applicable to triple-wall or 7-ply boxes.

7.4 Joint Strength

The strength of the joints shall be observed by grasping a body or a cover in the hands, one on each side of the joint, and pulling it apart until the joint ruptures. The failure shall occur in the board and not in the fasteners. This test shall not be applicable to triple wall or 7-ply boxes.

8 SAMPLING, CONDITIONING AND TESTING

8.1 The boxes shall be sampled and tested by the purchaser. The number of boxes selected from a lot shall be in accordance with the guidelines given in Table 2 of IS 1060 (Part 1) : 1966.

8.2 Conditioning

8.2.1 The sample of boxes so selected shall be deemed to represent the whole consignment of boxes and shall be conditioned for testing by the method prescribed in 5 of IS 1060 (Part 1) : 1966.

8.3 Testing

8.3.1 The types of tests and selection of boxes for testing shall be as indicated in Table 3.

8.3.1.1 The requirements for the material of construction of box as well as method of test for evaluating these requirements shall be as given in relevant clauses and in Table 3.

8.4 Acceptance and Retesting

8.4.1 Acceptance

The consignment of box shall be deemed to comply with the test requirements of the standard if after specified number of boxes from the test sample as given in Table 3 have been tested as required in relevant clause:

- a) All the boxes pass the test, or
- b) Only one box fails to pass one or more of the tests and on retesting in accordance with 8.4.2 no further box fails to pass the test or tests.

8.4.2 Retests

If only one box from the test sample fails to meet one or more of the test requirements of the specification further boxes shall be selected at random from the consignment of boxes for testing for the defective property or properties. The number of additional boxes to be tested shall be twice the number specified in Table 3 for the test or tests in which the box from the original test sample failed.

9 PACKING AND MARKING

9.1 The boxes shall be packed and supplied as agreed to between the purchaser and the supplier.

9.2 Each box shall be legibly and indelibly marked on the inside with the following particulars:

- a) Cross mass limit,
- b) Minimum bursting strength,
- c) Dimensions ($L + W + H$),
- d) Batch or lot number, and
- e) Indication of the source of manufacture.

Table 3 Testing of Boxes
(Clauses 8.3.1 and 8.3.1.1)

Sl No.	Type of Test	No. of Boxes Selected from Sample for Testing	No. of Test Specimens Obtained from each Box	No. of Tests on each Test Specimen	Methods of Test, Ref to Clause
i)	Bursting Strength	3	1	10 (5 each side)	12.5 of IS 1060 (Part 1) : 1966
ii)	Thickness	3	2	3	7.2 of IS 1060 (Part 1) : 1966
iii)	Water Absorption Cobb/30 Min	3	1	1	6 of IS 4006 (Part 1) : 1985
iv)	Flap Bend	3	2	1	7.3

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publication), BIS.

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. CHD 16 (0829)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:

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

Telephone

{ 2323 7617
2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi
KOLKATA 700054

{ 2337 8499, 2337 8561
2337 8626, 2337 9120

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

{ 60 3843
60 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113

{ 2254 1216, 2254 1442
2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093

{ 2832 9295, 2832 7858
2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD.
GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR.
NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.