

इंटरनेट

मानक

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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 7151 (1991): Corrugated fibreboard boxes for para-dropping of supplies [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”



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भारतीय मानक

ऊपर से सप्लाई गिराने के पनालीदार रेशागत्ते के  
बाक्स — विशिष्ट  
( पहला पुनरीक्षण )

*Indian Standard*

**CORRUGATED FIBREBOARD BOXES FOR  
PARA-DROPPING OF SUPPLIES –  
SPECIFICATION**

UDC 621.798.12 [676.273.31] : 656.7.073.235 : 629.136.1

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

## FOREWORD

This Indian Standard ( First Revision ) was adopted by the Bureau of Indian Standards, 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 1973 and was covering para-dropping boxes of one size only that is 890 mm × 380 mm × 560 mm. In this revision six sizes of para-dropping boxes most commonly used by the Defence Department have been covered. Further bursting strength of the corrugated fibreboard has been specified in place of puncture resistance and compression strength of the boxes. Other tests like flap bend test (*see 5.3*) and joint strength test 7.2 ( c ) have been added to assess crack free creasing of the boxes and strength of the joint of the boxes which is of great relevance in the performance of boxes in para-dropping.

The revision has been based on the following Defence Specifications issued by the Controllorate of Inspection General Stores, Kanpur:

- a) IND/GS/1423 (1) Equipment cargo aerial delivery box, cargo aerial delivery corrugated cardboard 890 mm × 380 mm × 560 mm; 560 mm × 560 mm × 560 mm and 380 mm × 380 mm × 455 mm; and
- b) CIGS/GS-14/4 (1) Equipment cargo aerial delivery box, cargo aerial delivery corrugated cardboard Type SDB 940 mm × 380 mm × 380 mm, parachute supply dropping 5.5 m cotton.

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. 2 JANUARY 1998**  
**TO**  
**IS 7151 : 1991 CORRUGATED FIBREBOARD BOXES FOR**  
**PARA-DROPPING OF SUPPLIES — SPECIFICATION**  
**(First Revision)**

(*Second cover page, Foreword*) — Insert the following as the fourth 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 for para-dropping supplies.'

[*Page 2, Clause 7.3 (see also Amendment No. 1)*] — Insert the following new clauses after **7.3**:

**7.4 Additional Requirements for ECO Mark**

**7.4.1 General Requirements**

**7.4.1.1** The product shall conform to the requirements for quality and performance prescribed under **4.1** to **7.3**.

**Price Group 1**

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**7.4.1.2** 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.

### 7.4.2 Specific Requirements

**7.4.2.1** 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, soft wood and reed
- b) *Type B* — Manufactured from pulp made from 100 percent waste paper or agricultural/industrial waste.

**7.4.2.2** 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 1 when tested according to the methods given in Annex A.

**Table 1 Limits of Contaminants in Paper**

Contaminant	Paper Intended to Come into Contact with Dry Food (mg/kg of paper)	Paper Intended to Come into Contact with Wet Food and Food with Fatty Surface (mg/kg of paper)	Paper for Filtration (mg/kg of paper)
Cadmium (Cd)	—	0.5	0.5
Chromium (Cr <sup>6+</sup> )	—	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

**Amend No. 2 to IS 7151 : 1997**

(Page 2, clause 8.2) — Insert the following new clauses after 8.2:

**'8.3 Additional Requirements for ECO Mark**

**8.3.1** The corrugated fibreboard boxes for para-dropping supplies may display in brief the criteria based on which the product has been labelled as environment friendly.

**8.3.2** The corrugated fibreboard boxes for para-dropping supplies shall be sold along with instruction for proper use and mode of safe disposal so as to maximise its performance and minimise wastage.

**8.3.3** It shall be suitably marked that ECO Mark label is applicable only to the corrugated fibreboard boxes for para-dropping supplies 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 3, clause 9.1) — Insert the following after 9.1:

**'9.2** For ECO Mark, corrugated fibreboard boxes for para-dropping supplies shall be packed in such packages which shall be recyclable/reusable or biodegradable.'

(Page 8, Fig. 7) — Insert the following Annex A after Fig. 7:

**ANNEX A**

(Clause 7.2.2.2)

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

**A-1 DETERMINATION OF CHROMIUM (as Cr<sup>6+</sup>)**

**A-1.1 Principle**

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



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### **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.

#### **A-1.2.2 Shaker**

Any shaker suitable for rotating/moving at  $30 \pm 2$  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  $\mu\text{g}$  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  $\mu\text{g}$  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  $\mu\text{g}$  of chromium (as  $Cr^{6+}$ ).

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**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:

<i>Standard Chromium Solution</i>	<i>Corresponding to Cr<sup>6+</sup></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  $1.0 \pm 0.3$  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.

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### **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  $18 \pm 2$  h using shaker rotating/moving at  $30 \pm 2$  rev/min. Filter the extract through glass fibre filter with 0.45 micron pore size. Add sufficient 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  $\mu\text{g}$  of chromium to a 100-ml volumetric flask. Adjust the pH of the solution to  $1.0 \pm 0.3$  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,  $\mu\text{g}$ ;

$M$  = 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

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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 ( $\text{SnCl}_2$ ) 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 ( $\text{NH}_2\text{OH}$ )<sub>2</sub>  $\text{H}_2\text{SO}_4$  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.

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### 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.

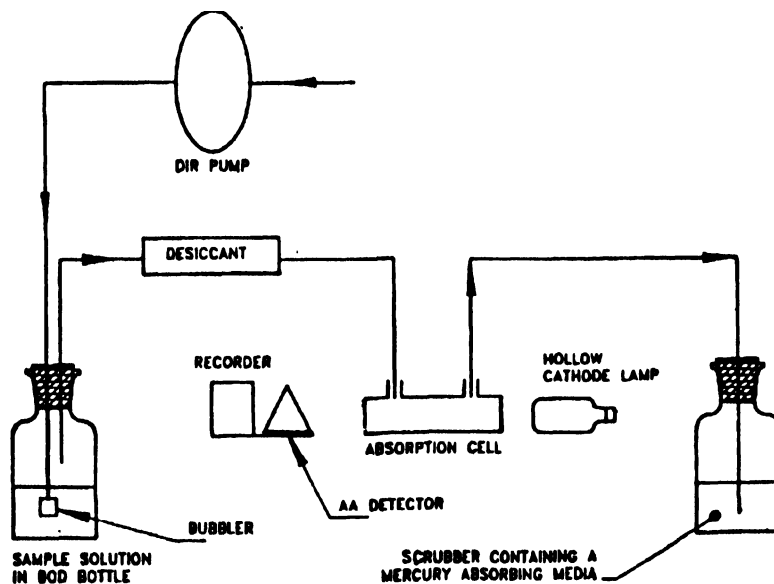


FIG. 1 SCHEMATIC ARRANGEMENT OF EQUIPMENT FOR MEASUREMENT OF MERCURY BY COLD VAPOUR ATOMIC ABSORPTION TECHNIQUE

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### 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  $18 \pm 2$  h using shaker rotating/moving at  $30 \pm 2$  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**.

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### 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  $\text{HNO}_3$  and 100 ml of water and dilute to 1 litre. One millilitre of this solution contains 1.0 mg of lead (as Pb).

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### 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  $18 \pm 2$  h using shaker rotating/moving at  $30 \pm 2$  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 100-ml 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, 0.75 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.



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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).

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### **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  $18 \pm 2$  h using shaker rotating/moving at  $30 \pm 2$  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.

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### **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.

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### 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:

$$\text{PCP content, mg/kg on dry matter} = \frac{A \times B \times V_1 \times 100}{M \times C \times V_1 \times (100 - X)}$$

where

- A = PCP content in µg from the graph;
- B = total volume of hexane extract before derivatization, ml;
- V<sub>1</sub> = volume of eluent injected, ml;
- M = mass of the paper sample taken for testing, g;
- C = volume of hexane extract carried through derivatization, ml;

$V_t$  = volume of total eluent, ml, and  
 $X$  = moisture content, percent by mass

## 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  $\mu$ l, 5  $\mu$ l and 10  $\mu$ 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  $\mu$ m  $\times$  200  $\mu$ 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

## **Amend No. 2 to IS 7151 : 1997**

### **A-6.3.3 Sodium Sulphate Anhydrous**

### **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.

**A-6.4.5** Inject 2 µl 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;
- $V_i$  = volume of eluent injected, ml;
- $M$  = mass of the paper sample taken for testing, g;
- $V_t$  = volume of total eluent, ml; and
- $X$  = moisture content, percent by mass.

(CHD16)



**AMENDMENT NO. 1 JUNE 1997**  
**TO**  
**IS 7151 : 1991 CORRUGATED FIBREBOARD BOXES**  
**FOR PARA-DROPPING OF SUPPLIES —**  
**SPECIFICATION**  
*(First Revision)*

( *Cover page, Title* ) — Insert the words '( *First Revision* )' below the word 'SPECIFICATION'.

( *Page 1, clause 2.1* ) — Substitute the following for the existing clause:

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

<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> )
2771 ( Part 1 ) : 1990	Corrugated fibreboard boxes : Part 1 General requirements ( <i>second revision</i> )
4006 ( Part 1 ) : 1985	Methods of test for paper and pulp based packaging materials : Part 1 ( <i>first revision</i> )
4006 ( Part 2 ) : 1985	Methods of test for paper and pulp based packaging materials : Part 2 ( <i>first revision</i> )
4084 : 1978	Eyelets and washers ( <i>first revision</i> )
4261 : 1967	Glossary of terms relating to paper and pulp based packaging materials
5177 : 1985	Jute lines and ropes ( <i>second revision</i> )
7028 ( Part 4 ) : 1987	Performance tests for complete filled transport packages : Part 4 Vertical impact drop test ( <i>first revision</i> )'

**Amend No. 1 to IS 7151 : 1991**

( Page 1, clause 3.1, line 3 ) — Substitute '1990' for '1977'.

( Page 1, clause 4.3, line 2 ) — Substitute '1985' for '1969'.

( Page 1, clause 5.3, last sentence ) — Delete.

( Page 2, clause 7.2 ) — Insert the following new clauses after the 7.2 (d):

'e) *Puncture Resistance*

When tested by the method given in 9 of IS 4006 ( Part 2 ) : 1985, the average puncture resistance of the corrugated fibre board shall be not less than 150 cm.kg. The average shall be based on at least 4 determinations on unscored areas. No individual reading shall be less than 135 cm.kg. One test shall be made in such a manner that the corrugation of the combined board run in the same plane as the puncture arm and one test with corrugations at right angle to the first test. Such tests shall be made from both sides of the board.

**7.3** Corrugated fibreboard box shall satisfy the following tests:

a) *Compression Strength*

The average compression strength of the box in the top to bottom direction, when determined in accordance with IS 7028 ( Part 4 ) : 1987 shall be not less than 650 kg at a deflection of not more than 15 mm. The average shall be based on 5 determinations.

b) *Flap Bend Test*

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 )

*Indian Standard*

**CORRUGATED FIBREBOARD BOXES FOR  
PARA-DROPPING OF SUPPLIES –  
SPECIFICATION**

*( First Revision )*

**1 SCOPE**

This standard covers the requirements of triple-wall (7-ply) corrugated fibreboard boxes for para-dropping of supplies of internal dimensions as under:

380 mm × 380 mm × 940 mm  
460 mm × 460 mm × 350 mm  
690 mm × 380 mm × 380 mm  
890 mm × 380 mm × 560 mm  
560 mm × 560 mm × 560 mm  
380 mm × 380 mm × 455 mm

**2 REFERENCES**

2.1 The following 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> )
2771 ( Part 1 ) : 1977	Fibreboard boxes: Part 1 Corrugated fibreboard boxes ( <i>first revision</i> )
4006 ( Part 1 ) : 1985	Methods of test for paper and pulp based packaging materials: Part 1 ( <i>first revision</i> )
4084 : 1978	Eyelets and washers ( <i>first revision</i> )
4261 : 1967	Glossary of terms relating to paper and pulp based packaging materials
5177 : 1969	Jute lines and ropes ( <i>first revision</i> )

**3 TERMINOLOGY**

3.1 For the purpose of this standard, the definitions given in IS 4261 : 1967 and IS 2771 ( Part 1 ) : 1977 shall apply.

**4 MATERIAL****4.1 Corrugated Fibreboard**

It shall be triple-wall, 7-ply ( *see* Fig. 1 ) corrugated fibreboard, normally produced with A, B

and C flutes or combination thereof, having the following characteristics:

- a) *Kraft Paper for Facing Interleaving and Fluting* — The kraft paper shall be well-sized and its substance shall be adequate to ensure the minimum bursting strength of fabricated fibreboard as stipulated in 7.2(b).
- b) *Adhesive* — Dextrin or any other suitable adhesive capable of firmly adhering the various plies together. Sodium silicate or any other highly alkaline adhesive shall not be used.
- c) Number of corrugations per 30 cm shall be 50 to 56 ( B-Flute type ).
- d) The face forming the outside surface of the assembled box shall be made water-proof by waxing.

**4.2 Eyelets**

Made to Aluminium, No. 24 and conforming to IS 4084 : 1978.

**4.3 Jute Line**

Jute line, 4 mm dia and conforming to IS 5177 : 1969.

**4.4 Staples**

Mild steel galvanised, 0.8 mm thick, 12 mm crown and 3 mm in width.

**4.5 Waterproofing Material**

Ordinary paraffin wax or its blends, having melting point of not less than 60°C.

**5 MANUFACTURE, WORKMANSHIP AND FINISH**

5.1 The general workmanship and finish shall be satisfactory.

5.2 One face of the board, forming the outer surface of the assembled box: shall be rendered waterproof by waxing.

5.3 The blank shall be properly creased and slotted so that when the box is assembled there shall be no holes at the corners. The flaps of

the box shall be capable of being folded 180° along the line of creasing without fracture of the board or facings.

**5.4** The body joint shall be lapped outside and the lapping shall be not less than 50 mm. The lapped joint shall be secured by two rows of staples, spaced not more than 65 mm apart. The body joint shall be stapled at 45°. The distance between the outer staples and the end of the joint shall not exceed 25 mm. All staples shall completely pass through all the 7 plies of the board, shall be well clinched and shall not show cracks or other indications of weakness.

**5.5** The eyelets shall be correctly spaced and properly fitted, as shown in Fig. 1 to Fig. 7.

**5.6** Four pieces of jute line, each 60 cm long shall be provided with each box and both the ends of each jute line shall be waxed for a distance of approximately 25 mm.

## 6 DIMENSIONS AND TOLERANCES

**6.1** The boxes shall conform to the dimensions as shown in Fig. 2 to Fig. 7.

**6.2** A tolerance of  $\pm 7$  mm shall be permissible on each internal dimension.

## 7 TEST

### 7.1 Conditioning

The corrugated fibreboard shall be conditioned by exposure in an atmosphere maintained at a temperature of  $27 \pm 2^\circ\text{C}$  and  $65 \pm 2$  percent relative humidity for a minimum period of 24 hours [ see IS 1060 ( Part 1 ) : 1966 ].

**7.2** The corrugated fibreboard of the box shall satisfy the following tests:

a) *Acidity and Alkalinity*

The hydrogen ion-concentration ( pH value ) of the water extract shall be not less than 5.5 and more than 8.0, when tested by the method given in **10** of IS 1060 ( Part 1 ) : 1966.

b) *Bursting Strength*

When tested by the method given in **12.5** of IS 1060 ( Part 1 ) : 1966, the average

bursting strength of the corrugated fibreboard shall be not less than  $235 \text{ N/cm}^2$  ( 24 kg/sq-cm ). The average shall be based on at least 5 determinations on each face but no individual reading shall be less than  $206 \text{ N/cm}^2$  ( 21 kg/sq-cm ).

c) *Strength of Joints*

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 until the joint ruptures. Failure shall occur in the board and not in the fasteners.

d) *Waterproofness ( Cobb/30 Minutes )*

The outer waxed face of the corrugated fibreboard shall be subjected to waterproofness test ( cobb/30 minutes ) as per the method given in **6** of IS 4006 ( Part 1 ) : 1985. At the end of 30 minutes the increase in mass due to water absorption shall be not more than  $120 \text{ g/m}^2$ .

## 8 MARKING

**8.1** Each box shall be legibly and indelibly marked, on the inner surface of one of the outer flaps, with the following particulars:

- Supplier's name or initials or recognized trade-mark, if any;
- Size of box and its catalogue number, if any; and
- Year of manufacture.

**8.2** Each bundle shall be legibly and indelibly marked showing the following details:

- Quantity and size packed in each bundle;
- Month and year of packing;
- Name and trade mark of the manufacturer;
- Gross mass of the bundle in kg; and
- Any other information as desired by the purchaser.

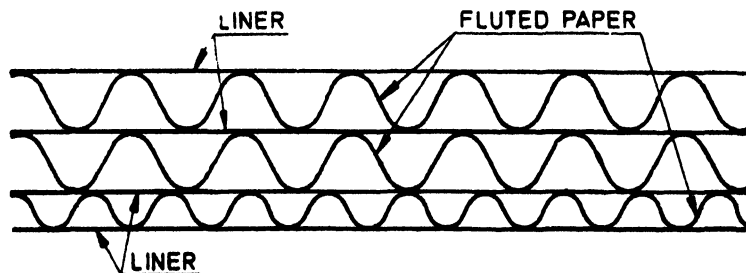
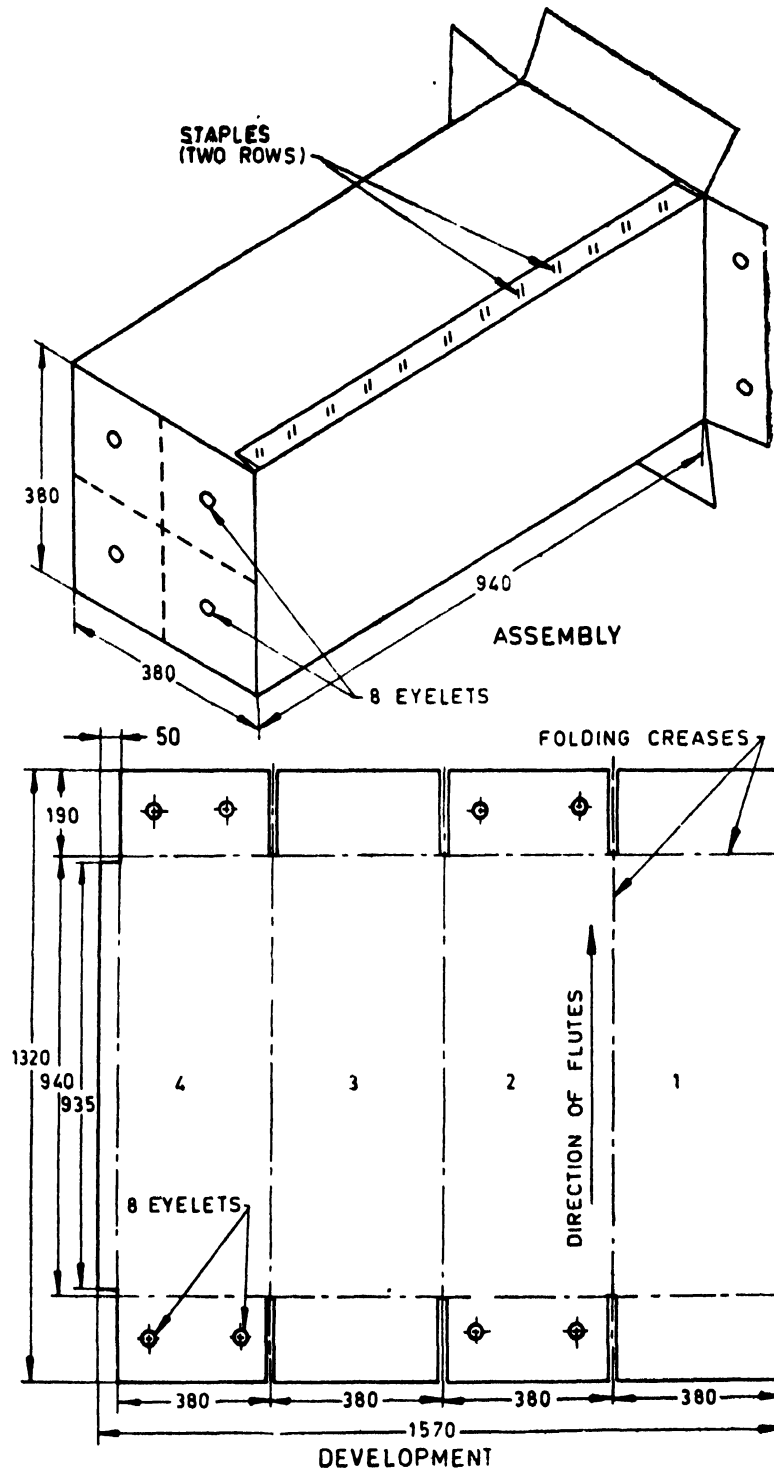


FIG. 1 TRIPLE WALL CORRUGATED FIBREBOARD

9 PACKAGING

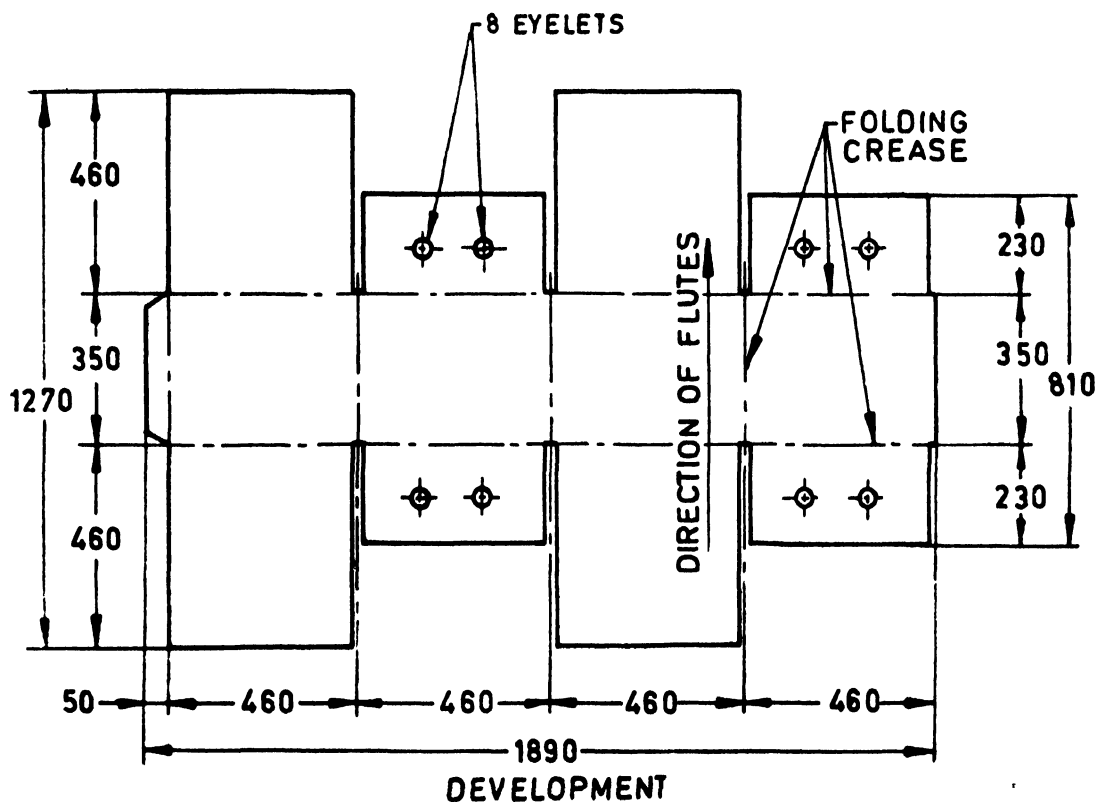
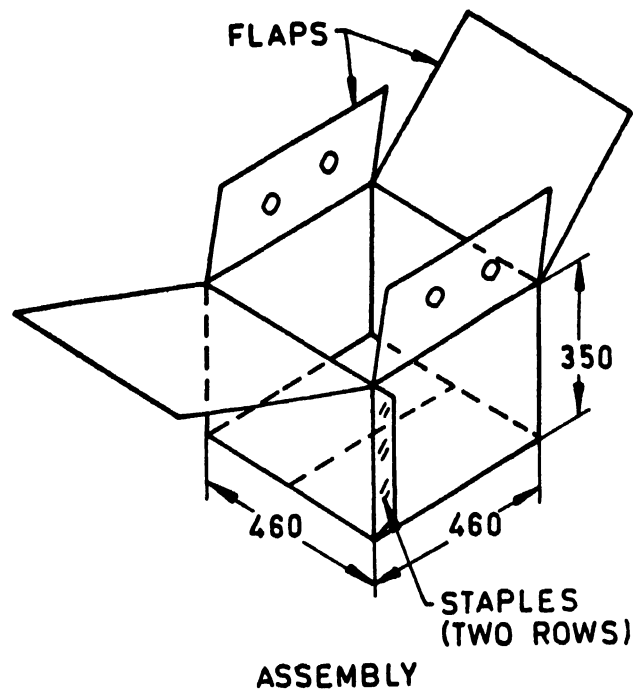
9.1 The boxes shall be supplied in collapsed condition in bundles. The number of boxes per bundle shall be 10 except for size 380 × 380 ×

455 mm which shall be 20 per bundle. The boxes shall be covered with at least one layer of waste fibreboard, securely tied with twine, wrapped in waterpooof paper and then sewn in a single layer of hessian cloth to form a bundle.



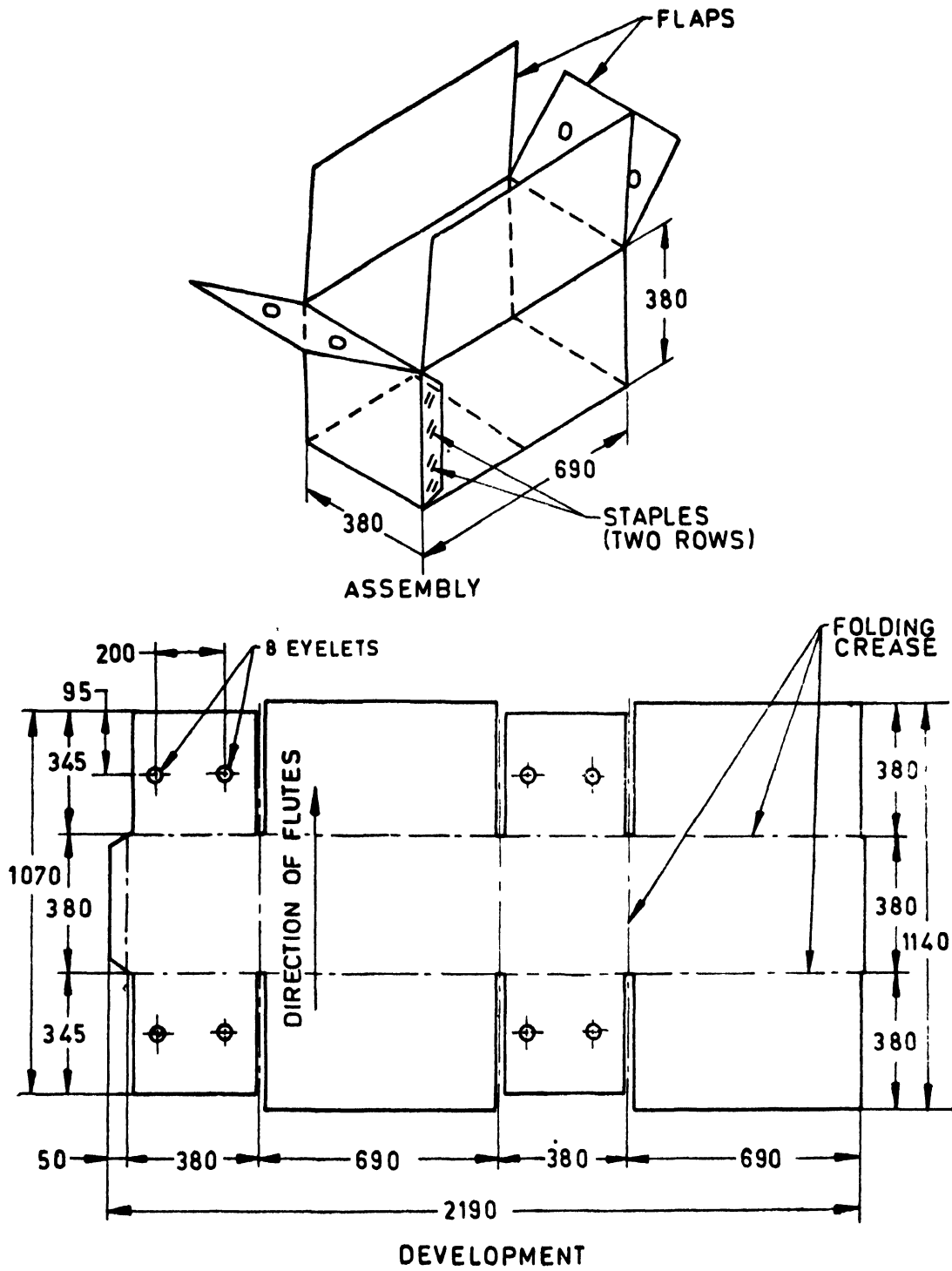
All dimensions in millimetres.

FIG. 2 FIBRBOARD BOX ( SIZE 940 mm × 380 mm × 380 mm )



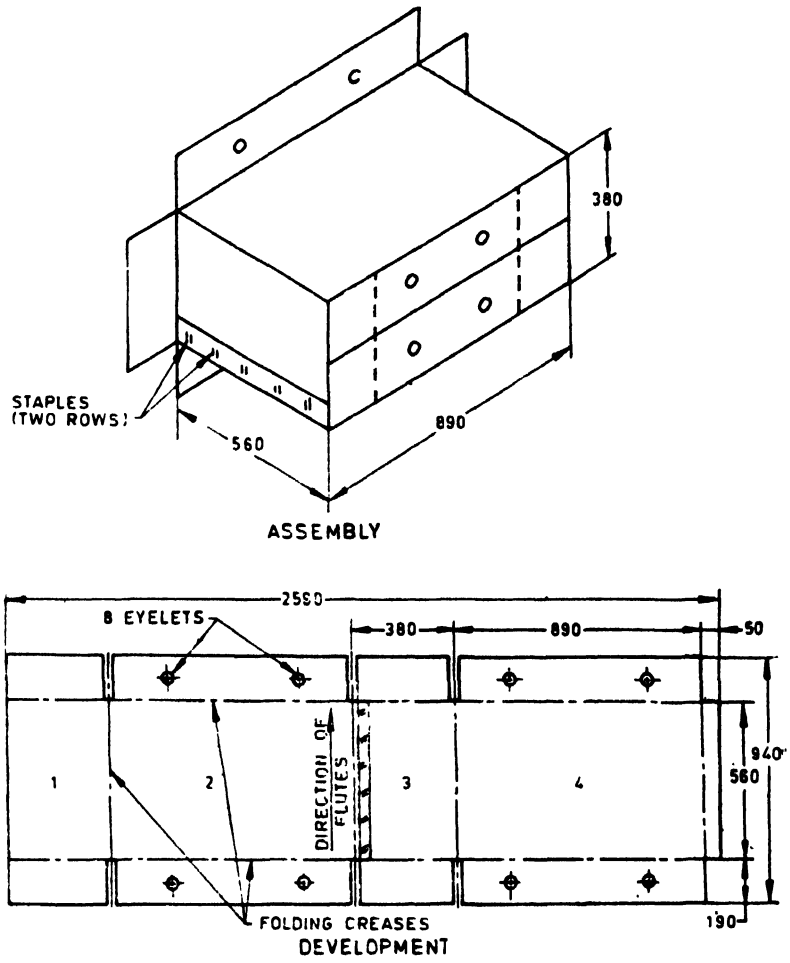
All dimensions in millimetres.

FIG. 3 FIBRBBOARD BOX ( SIZE 460 mm × 460 mm × 350 mm )



All dimensions in millimetres.

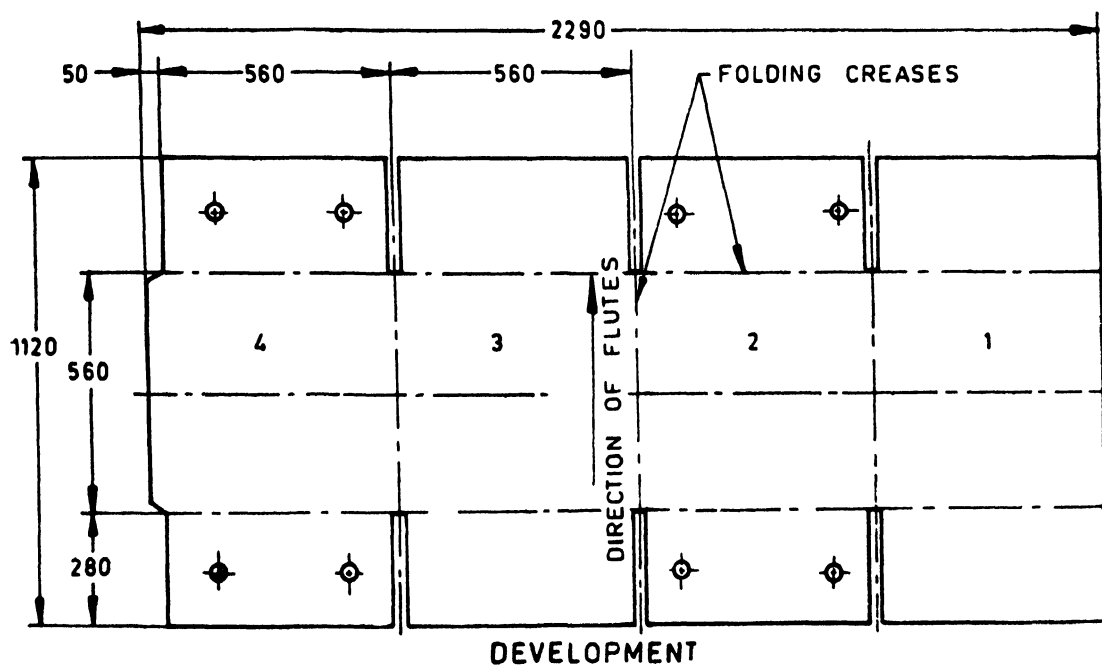
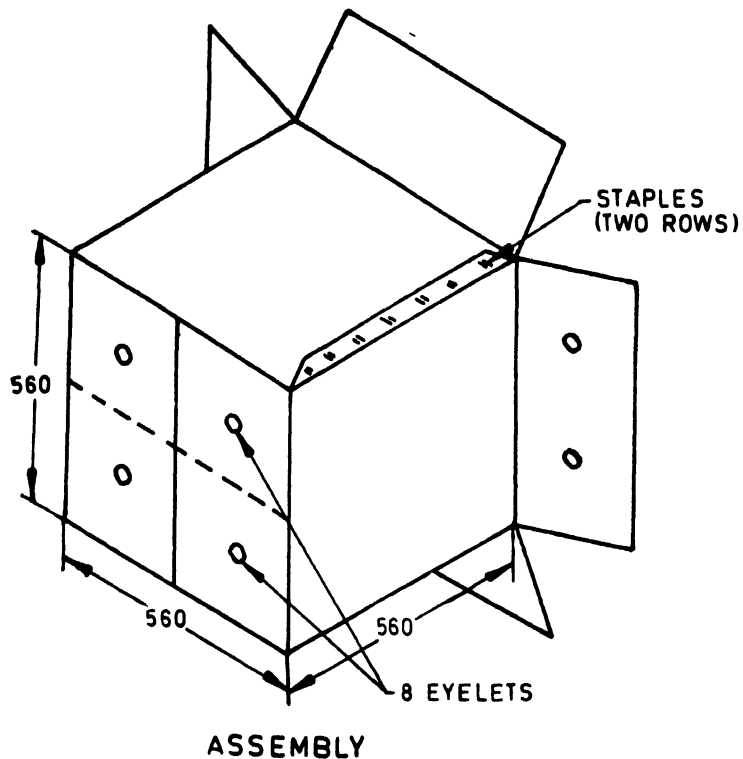
FIG. 4 FIBREBOARD BOX ( SIZE 690 mm × 380 mm × 380 mm )



All dimensions in millimetres.

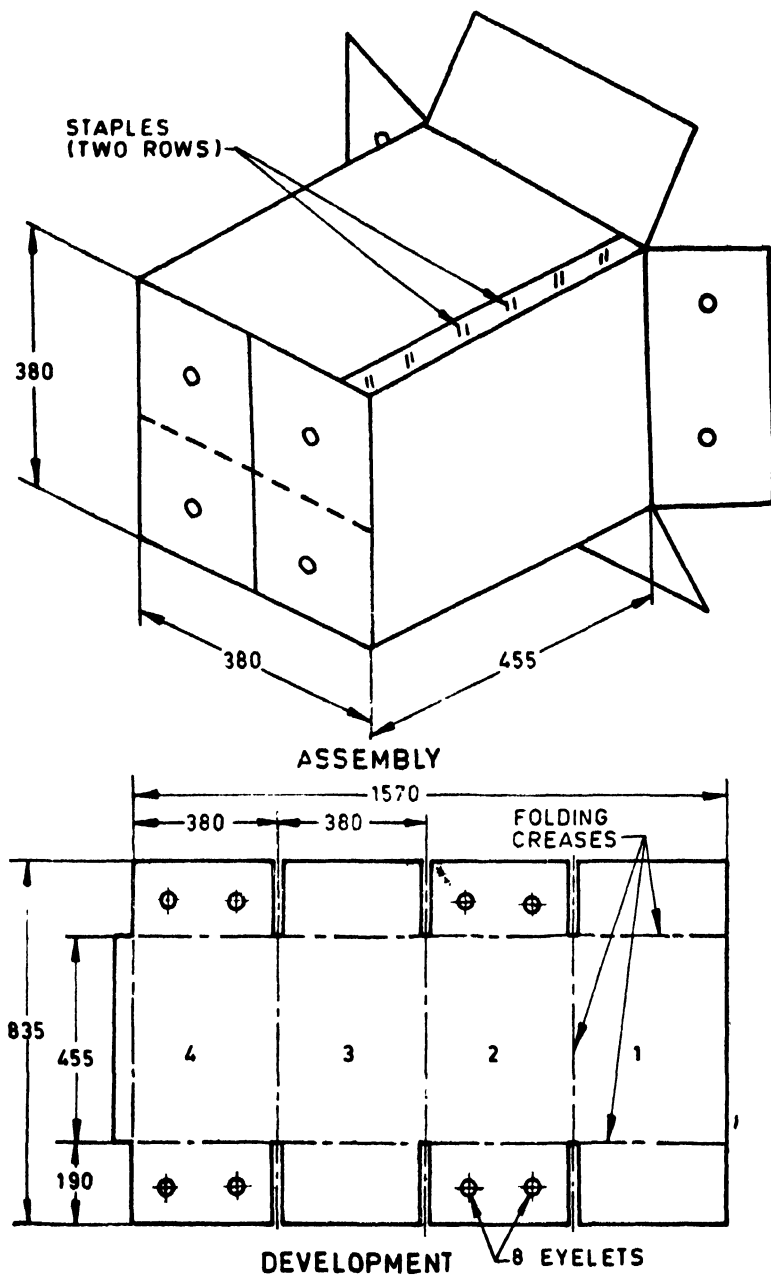
FIG. 5 FIBREBOARD BOXES ( SIZE 890 mm × 380 mm × 560 mm )





All dimensions in millimetres.

FIG. 6 FIBREBOARD BOX ( SIZE 560 mm × 560 mm × 560 mm )



All dimensions in millimetres.

FIG. 7 FIBREBOARD Box ( SIZE 380 mm × 380 mm × 455 mm )

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