भारतीय मानक

Indian Standard

IS 10330 : 2024

उच्च दाब और उच्च तापमान वाल्वों के लिए रूपित एस्बेस्ट्स पैकिंग वलय — विशिष्टि

(पहला पुनरीक्षण)

Formed Asbestos Packing Rings for High Pressure and High Temperature Valves — Specification

(First Revision)

ICS 21.140; 23.060; 83.140.50

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May 2024 **Price Group 7**

Gaskets and Packing Sectional Committee, MED 30

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Gaskets and Packing Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1982. This standard is being revised again to keep pace with the latest technological developments and international practices. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act*, 2016. The following major modifications have been incorporated in this revision of the standard:

a) The reference standards have been updated;
b) Terminologies have been added; and
c) Safety requirement for asbestos have been added.

Handling and processing of asbestos, manufacture of any article of asbestos and any other process of manufacture or otherwise in which asbestos is used in any form are regulated as per schedule — XIV [*Model Factories Rules* 120 (MFR 120) under Section 87] of Directorate General, Factory Advice Service and Labour Institutes.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FORMED ASBESTOS PACKING RINGS FOR HIGH PRESSURE AND HIGH TEMPERATURE VALVES — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard covers the dimensional, constructional, functional, and qualitative requirements of metal wire reinforced and formed asbestos gland packing rings intended for use in valves to contain non-toxic gases, fluids, slurries, etc, at different temperatures and pressure ranges.

1.2 The asbestos gland packing rings covered by this standard are not applicable for food industry.

NOTE — The asbestos gland packing rings shall be hereinafter referred as 'packing' in this standard.

2 REFERENCES

The standard listed below contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard listed below:

IS No.	*Title*
IS 2500 (Part 1) : 2000/ISO 2859-1 : 1999	Sampling procedures for inspection by attributes: Part 1 Sampling schemes indexed by acceptance quality limit (AQL) for lot by lot inspection (*third revision*)
IS 11707 : 1986	Glossary of terms relating to asbestos
IS 11768 : 1986	Recommendations for disposal of asbestos waste material
IS 12081 (Part 2) : 1987	Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos: Part 2 Asbestos and its products

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 11707 shall apply, in addition to the following:

3.1 Asbestos — Asbestos is a collective name given to naturally occurring fibrous silicate material. The most commonly used is chrysotile fiber.

3.2 Gasket — Deformable material (or combination of materials) intended to be clamped between flanges to prevent leakage of contained fluid.

3.3 Lubricant — A substance capable of reducing friction, heat, and wear when introduced as a film between solid surfaces.

3.4 Yarn — A continuous strand of fibres grouped or twisted together.

4 MATERIAL REQUIREMENTS

4.1 Fibre

The yarn used in the manufacture of packing shall be the long staple white chrysotile asbestos fibre containing long staple organic fibre. The percentage of organic fibre used shall correspond with the grade of the yarn as indicated in Table 1. The organic fibre used shall be evenly distributed throughout the asbestos and shall be free from grit or rocky matter and from the inclusion of spun cotton threads. The grade of asbestos to be determined as described in **A-5** shall be as agreed between the purchaser and the supplier. The count of the single ply of asbestos yarn, used in the construction, shall be not coarser that 1 100 tex[1)].

4.2 Wire Reinforcement

The material of wire reinforcement shall be higher nickel alloy, monel, or any austenitic stainless steel. The exact material used shall be as agreed between the purchaser and the supplier.

Table 1 Grades of Asbestos Yarn (Without Reinforcement)
(*Clause* 4.1)

Sl No.	Grades of Yarn	Percent Asbestos Content	Approximate Service Temperature of Packing
(1)	(2)	(3)	(4)
i)	A	85 to 90	290 °C
ii)	AA	90 to 95	315 °C
iii)	AAA	95 to 99	400 °C
iv)	AAAA	99 to 100	480 °C

4.3 Binder

The asbestos yarn or fibre, unless specified otherwise, may be treated with a suitable binder including grease, oil, rubber, etc, to suit the requirement of the manufacturing process. The total content of the binder when determined as described in **A-3** shall be less than 1 percent by weight.

4.4 Lubricant

The lubricant used shall be free graphite, PTFE, mica, molybdenum disulphide or tungsten disulphide. It shall be evenly distributed over the entire surface of the packing and mixed with pure asbestos fibre in the plastic core. The exact lubricant to be used shall be selected by the purchaser taking into consideration the properties of medium sealed, temperature, contamination, etc. The percentage of mica or graphite may be determined by the procedure described in **A-4**, and the percentage of molybdenum disulphide or tungsten disulphide can be determined by suitable chemical analysis. The percentage of lubricant content by weight shall be not less than the values indicated in Table 2.

4.5 Corrosion Inhibitor

If graphite is used as lubricant, the packing shall contain corrosion inhibitor. The inhibitor shall be in the plastic core and also on the surface of the packing.

5 DIMENSION

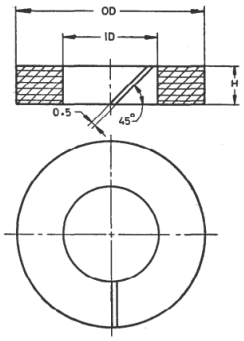
The cross section of the packing shall be square or rectangular within the variations permitted for dimensions. The packing shall be ring shaped with one inclined cut as indicated in Fig. 1. The dimensional details of the packing shall be as agreed to between the purchaser and the supplier. The square or rectangular cross section shall have edges as sharp as possible with corner radii used preferably not greater than 0.5 mm.

The diameter of the reinforcement metal wire shall be between 0.15 mm to 0.19 mm.

Table 2 Minimum Lubricant Content
(*Clause* 4.4)

Sl No.	Type of Packing	Percent Lubricant Content
(1)	(2)	(3)
i)	Braid over braid	3
ii)	Braid over twisted core	3
iii)	Braid over plastic core	
	a) In the braided jacket	3
	b) In the plastic core	30

[1)]Tex : Weight of single ply of asbestos yarn expressed in grams/kilometre length of yarn.



All dimensions in millimetres.

FIG. 1 GLAND PACKING

6 MANUFACTURE AND WORKMANSHIP

Surface of the packing shall be smooth and it shall not have torn out threads.

6.1 The construction of the packing shall be one of the following types and the exact type shall be as agreed to between the purchaser and the supplier.

6.1.1 *Braid over Braid*

These packings consist of a series of braided tubes laid one over the other and separate from one another. This is braided round, then calendered square (*see* Fig. 2A).

6.1.2 *Braid over Twisted Core*

In this type, the core material is twisted asbestos yarns. Braided jacket is of wire reinforced asbestos yarns (*see* Fig. 2C).

6.1.3 *Braid over Plastic Core*

This is made of wire inserted asbestos yarn jacket over a core of pure asbestos fibre mixed with lubricant and corrosion inhibitor; if specified (*see* Fig. 2B).

6.2 It is preferable to have the asbestos yarn spun with the reinforcement wire in its core, rather than plaiting the wire along with the yarn.

6.3 The slit between the two free ends of packing shall be parallel and at 45° to the axis of the packing ring. The width of slit shall be controlled within the specified limits.

6.4 Ignition Loss

The ignition loss on dried material when determined as described in **A-6** shall not exceed the value in Table 3.

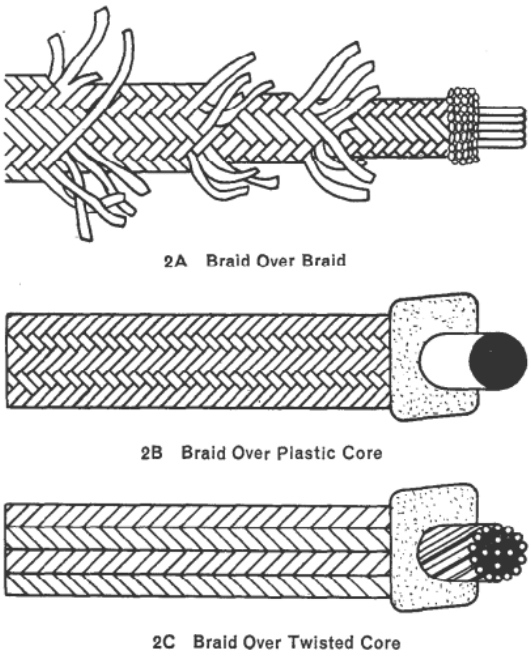


FIG. 2 TYPES OF PACKING

Table 3 Loss on Ignition

(*Clause* 6.4)

Sl No.	Grades	Asbestos Content	Percent Loss[1)] on Ignition
(1)	(2)	(3)	(4)
i)	A	85 - 90	27.0
ii)	AA	90 - 95	22.5
iii)	AAA	95 - 99	18.5
iv)	AAAA	99 - 100	15.0

6.5 *p*H Value

The *p*H value of the packing shall be in the range of 7 to 9.

6.6 Chloride Content

The leachable chloride content of the packing shall be less than 200 ppm.

7 DETAILS TO BE SPECIFIED BY PURCHASER

The purchaser while placing order shall specify the following details:

a) Packing construction;
b) Grade of asbestos yarn;
c) Reinforcement material;
d) Lubricant;
e) Corrosion inhibitor;
f) Binder content;
g) Medium to be sealed:
h) Medium temperature;
j) Medium pressure;
k) Dimensions (OD × ID × height); and
m) Number of rings to be packed in a set.

8 PACKING

The packing rings shall be stacked and covered by cellophane paper. The number of rings to be stacked in a set shall be specified by the purchaser based on the application requirements. If not specified, the manufacturer shall decide the number of rings to be stacked in a set. These stacks shall be packed in cardboard boxes of convenient dimensions. The package shall be airtight and durably intact without giving way during transit and subsequent storage and handling.

9 MARKING

9.1 The packing rings shall be marked with the following:

a) Manufacturer's name;
b) Packing dimensions;
c) Month and year manufacture; and
d) Pictorial warning sign as per IS 12081 (Part 2).

9.2 BIS Certification Marking

The packing rings may also be marked with the Standard Mark.

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

10 SAMPLING

10.1 Unless otherwise agreed to between the purchaser and the supplier the procedure given in IS 2500 (Part 1) shall be followed for sampling inspection. The level (AQL) for various characteristics shall be as given in **9.2**.

10.2 For dimensional and visual requirements, the single sampling plan with inspection level III and AQL 25 percent given in Table 1 and Table 2 of IS 2500 (Part 1) shall be followed.

10.3 For remaining characteristics the sampling plan with inspection level II and AQL 1 percent given in Table 1 and Table 4 of IS 2500 (Part 1) shall be followed.

11 SAFETY

12 WASTE DISPOSAL

Disposal of waste shall be in accordance with provisions laid down in IS 11768.

[1)]The percent loss on ignition includes water of crystallization, organic materials and impurities.

13 WARNING

The product shall bear a pictorial warning sign and precautionary notice as given in IS 12081 (Part 2) to caution the users that these products contain asbestos fibres and improper use of these materials may result in generation of asbestos dust, inhalation of which may cause serious damage to health.

14 MATERIAL DATA SHEET

Asbestos containing materials are required to be accompanied by material safety data sheet containing the following information:

a) Name and address of manufacturer of the product;
b) Precautionary information regarding handling of the product; and
c) Procedure for cleaning and safe disposal of waste.

ANNEX A

(*Clause* 4.1)

METHODS OF TESTS

A-1 SAMPLE PREPARATION

Unplait a representative section of the packing not less than 5 g mass, taking care to collect all pieces which are dislodged.

A-2 METHOD OF TEST

Place a soxhlet thimble in a weighing bottle and with the lid offset, place in an oven at 105 °C to 110 °C for 1 h. Replace the lid, cool in a desiccator to room temperature and weigh (M_1). Transfer the sample prepared as above to the soxhlet thimble and replace in the oven for 1 h as before. Cool in a desiccator to room temperature and weigh (M_2). Place the thimble with the dried sample in a vapour jacketed soxhlet extraction apparatus and extract for one hour with carbon tetrachloride. The volume of solvent to be used should be at least three times the volume of the soxhlet liner.

A-3 DETERMINATION OF BINDER CONTENT

Dry an evaporating basin in an oven at 105 °C cool to room temperature and weigh (M_3). Transfer the solution from the extraction flask to the basin and evaporate off the solvent. Place the basin and its contents in an oven for half an hour at 105 °C. Cool to room temperature and weigh (M_4).

$$\text{Binder content, percent} = \frac{M_4 - M_3}{M_2 - M_1} \times 100$$

A-4 DETERMINATION OF GRAPHITE (OR MICA) CONTENT

Dry the soxhlet thimble and its contents in an oven. Carefully remove the extracted yarn from the soxhlet thimble on to a sheet of clean smooth paper. Dislodge the mica or graphite flakes by gently twisting the yarn. Return the mica or graphite to the thimble. Replace the thimble in the weighing bottle used originally and replace in oven for one hour. Cool to room temperature and reweigh (M_5).

A-5 DETERMINATION OF ASBESTOS CONTENT IN THE YARN

Take a number of test specimens each of 5 g of dried material from which all lubricants and binders have been extracted and wire reinforcements removed, and proceed as follows.

A-5.1 Procedure for Determining Presence of Carbonates

A-5.1.1 Place a specimen of approximately 0.5 g in a test tube. Wet the specimen thoroughly with 10 ml of distilled water by stirring and tamping with a glass rod, so that no air bubbles are visible in the wet specimen. Add 5 ml of hydrochloric acid (specific gravity 1.19) and again stir and tamp gently with a glass rod, taking care not to introduce any air bubbles. Warm gently.

A-5.1.2 If no gas bubbles are detected, proceed as directed in **A-5.2**.

A-5.1.3 If gas bubbles form on the surface of the submerged specimen, proceed as directed in **A-5.3** and **A-5.4**.

A-5.2 Procedure for Asbestos Content by Ignition (Carbonates Absent)

A-5.2.1 Take two test specimens, each weighing not less than 5 g. Place the specimens in tared crucibles which have been previously heated to 800 °C to 840 °C for 1 h, cool in a desiccator and weigh to the nearest 0.061 g.

Dry each specimen to constant weight at 105 °C to 110 °C and record the mass to the nearest 0.001 g. Subtract the mass of the crucible to obtain the mass of the oven-dry specimens and record as M.

A-5.2.2 Place the crucible containing the specimens in the muffle furnace and heat for not less than 1 h at 800 °C to 840 °C. Remove the specimen and crucible from the furnace, and cool in a desiccator to room temperature. Weigh to the nearest 0.001 g and subtract the tared mass of the crucible to obtain the mass of the residue (ash). Record this mass as A.

A-5.2.3 *Calculations*

When carbonates are not present, calculate the asbestos content to the nearest 0.1 percent as follows:

$$\text{Asbestos content, percent} = (A/0.86\,M) \times 100$$

where

M = Mass of the specimen after drying but prior to ignition, in grams (*see* **A-5.2.1**);

A = Mass of residue (ash) from the specimen after ignition grams (*see* A-5.2.2); and

0.86 = factor to correct for 14 percent water of crystallization lost when heating.

A-5.3 Procedure for Quantitative Test for Carbon Dioxide

A-5.3.1 The carbon dioxide content shall be measured using knorr alkalimeter, consisting of the following parts connected as shown in Fig. 3 and Fig. 4.

A-5.3.1.1 *Gas washing bottle* (*A*)

It is filled with concentrated sulphuric acid which serves to indicate the rate of gas flow and to prevent any water vapour entering the systems from the atmosphere.

A-5.3.1.2 *Drying tube or cylinder* (*B*)

It is filled two-thirds full of soda-asbestos absorbent (ascarite) and one-third full drying agent to remove all carbon dioxide from the air.

A-5.3.1.3 *Knorr alkali unit* (*C*)

It consists of a dropping funnel, a distillation flask, and a condenser fitted with standard taper joints to form a unit assembly.

A-5.3.1.4 *Gas welding bottle* (*D*)

It contains solution of 5 percent to 10 percent by mass of silver sulphate (Ag_2, SO_4) in concentrated sulphuric acid. This serves to absorb any water vapour that escapes from the condenser and to remove any hydrochloric acid from the evolved gases.

A-5.3.1.5 *Drying tube* (*E*)

It contains copper sulphate to absorb hydrogen sulphide generated by the absorption of hydrochloric acid.

A-5.3.1.6 *Drying tube* (*F*)

It is filled with a suitable drying agent to effect complete drying.

A-5.3.1.7 *Absorption tube* (*G*)

It is filled two-thirds full of soda-asbestos absorbent (ascarite) land one-third full of drying agent to absorb the carbon dioxide.

A-5.3.1.8 *Absorption tube* (*H*)

It is filled with a drying agent and soda-asbestos absorbent (ascarite) in the reverse direction to prevent carbon dioxide from entering the system (*see* Fig. 4).

A-5.3.1.9 *Trap* (*I*)

It is used to prevent back flow of water from the aspirator.

A-5.3.1.10 *Valve or pinched tubing* (*J*)

It is used to control the rate of air flow pulled through the system by the aspirator.

A-5.3.1.11 *Source of suction*

Suction pump with regulator.

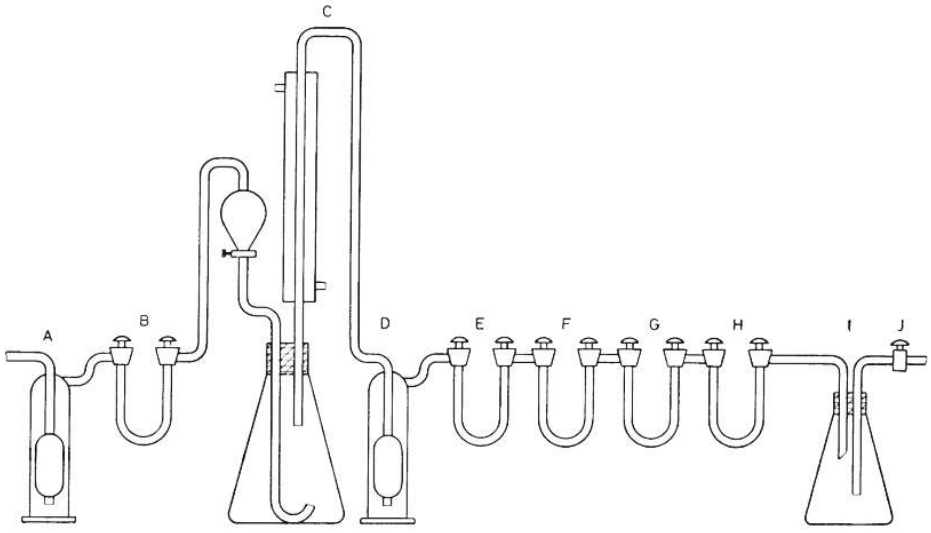


FIG. 3 KNORR ALKALIMETER FOR DETERMINATION OF CARBON DIOXIDE CONTENT

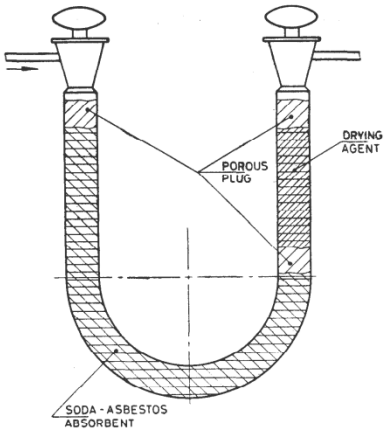


FIG. 4 ABSORPTION TUBE FOR CARBON DIOXIDE DETERMINATION

A-5.3.2 Aspirate a current of air through the system at the rate of about two bubbles per minute for a period of 10 min. Stop the air current and remove the absorption tube. Place the absorption tube (*G*) in the balance case and allow it to stand for several minutes. Just before weighing, open the stop cocks momentarily and then close-them. Weigh the tube and repeat the above procedure. The second reading should agree with the first within 0.005 g. If it does not, repeat the process until the two successive weighing agree When a constant mass is reached, replace the absorption tube in the gas train.

A-5.3.3 Place-a specimen of approximately 1 g weighed to the nearest 0.001 g in the distillation flask Wash down any adhering particles on the inside neck of the flask with distilled water, Add enough distilled water to the flask so that when the apparatus is reconnected the tip of the dropping funnel will be 5 mm to 10 mm below the surface of the liquid. Place 50 ml of dilute hydrochloric acid (1 : 1) in the dropping funnel and replace the guard gas absorption tube at the top of the funnel. Start the flow of water in the condenser and open all stop cocks fully except the one in the dropping funnel. Turn on the aspirator for medium suction. Adjust the stop cock on the dropping funnel so that the suction will draw the acid slowly into the flask. When all the acid is in the flask, open the funnel stop cock full and adjust the aspirator to pull air through the system at a rate of two or three bubbles per second. After the reaction in the flask has subsided, heat the contents slowly to boiling. When condensation appears in the condenser, turn off the heat. Continue to draw air through the apparatus for 30 min to 35 min. Reweigh the absorption tube (*G*) as before. The gain in mass represents the carbon dioxides in the specimen. Record this mass as *D*.

A-5.3.4 Calculate the mass of carbon dioxide recovered per gram of specimen as follows:

$$E = D/F$$

where

F = mass, in g, of the specimen used for the knorr alkali meter test;
D = gain in mass, in g, of the absorption tube (*G*); and
E = mass, in g, of carbon dioxide released per gram of specimen.

A-5.3.5 Repeat the procedure on another specimen of similar size and calculate the average value of E in the two determinations. If desired, use the mass of the absorption tube (*G*) after the first determination as the starting point for the second determination without repeating the initial process of obtaining constant weight of the tube (*G*).

A-5.4 Procedure for Asbestos Content by Ignition (Carbonates Present)

A-5.4.1 Proceed as directed in A-5.2.1 and A-5.2.2.

A-5.4.2 *Calculation for Asbestos Content*

Use the values for carbon dioxide content, *E* as determined in **A-5.3.3** and calculate the asbestos content using either of the two equations given below:

$$\text{Asbestos content, percent} = \frac{\frac{A - 1.27ME}{0.86} + 2.27ME}{M} \times 100, \text{ or}$$

$$= \frac{A + 0.68ME}{0.86} \times 100$$

where

M = mass, in g, of the specimen after drying but prior to ignition (*see* A-5.2.1);

A = mass, in g, of the residue (ash) from the specimen after ignition (*see* A-5.2.2);

E = mass, in g, of carbon dioxide recorded per gram of specimen as calculated in A-5.3.3;

1.27 = factor to be calculated from E, the grams of calcium carbonate per gram of specimen; and

2.27 = factor to be calculated from E, the grams of calcium carbonate per gram of specimen.

A-6 DETERMINATION OF IGNITION LOSS ON DRIED MATERIAL

A-6.1 Prepare the test specimens as described in A-5. Determine whether carbonates are present in the asbestos, by the procedure described in A-5.1.

A-6.2 If carbonates are present in the asbestos, determine the mass of carbon dioxide released per gram of specimen by the procedure described in A-5.3. Record this mass as E.

A-6.3 Proceed as described in A-5.2.1 and A-5.2.2.

A-6.4 Calculations

A-6.4.1 If no carbonates are present in the asbestos, calculate the percentage loss on ignition as follows:

$$\text{Ignition loss percentage} = \left(\frac{M - A}{M}\right) \times 100$$

where

M = mass, in g, of the specimen after drying but prior to ignition (*see* A-5.2.1); and

A = mass, in g, of the residue (ash) from the specimen after ignition (*see* A-5.2.2).

A-6.4.2 If carbonates are present in the asbestos, calculate the percentage loss of ignition as follows:

$$\text{Ignition loss percentage} = \left(\frac{M - A - ME}{M}\right) \times 100$$

where

E = mass, in g, of carbon dioxide released per gram of specimen (*see* A-5.3.3);

M = mass, in g, of the specimen after drying but prior to ignition (*see* A-5.2.1); and

A = mass, in g, of the residue (ash) from the specimen after ignition (*see* A-5.2.2).

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Gasket and Packing Sectional Committee, MED 30

Organization	*Representative(s)*
Engineers India Limited, New Delhi	SHRI U. CHAKRAVARTY **(*Chairperson*)**
Bharat Corrub Industries, Vadodara	SHRI B. M. TOLIA SHRI S. R. DESAI (*Alternate*)
Bharat Heavy Electricals Ltd, Delhi	SHRI SUBRATA RAY SHRI R. ELAYARAJA (*Alternate* I) SHRI S. SUBBA RAO (*Alternate* II)
Bharat Petroleum Corporation Ltd, Noida	SHRI S. MANIVANNAN
Champion Jointings Pvt Ltd, Mumbai	SHRI FARZAD J. PALIA SHRI MANOHAR S. DHANDEKAR (*Alternate*)
Crompton Greaves Ltd, Mumbai	SHRI P. S. RAMACHANDRAN
Defence Research and Development Organization, Research Centre Imarat, Hyderabad	SHRI A. K. MANDAL SHRI I. S. DAS (*Alternate*)
Department of Scientific and Industrial Research, New Delhi	SHRI PURUSHOTTAM KUMAR
Directorate of Steam Boilers, Mumbai	SHRI G. D. WANKHEDE SHRI S. S. SOLANKE (*Alternate*)
Engineers India Ltd, New Delhi	MOHAMMED ISMAEEL SHRI G. BALAJI (*Alternate* I) MS SULAKSHNA NAGNATH (*Alternate* II)
Ferolite Jointings Ltd, Ghaziabad	SHRI AKSHAY SHARMA SHRI PRADEEP KUMAR (*Alternate*)
GAIL (India) Ltd, New Delhi	SHRI NITIN NIMJE SHRI AMRESH BEDAR (*Alternate* I) SHRI ASHIF TADVI (*Alternate* II) SHRI ANUP S. S. KONGARI (*Alternate* III)
Hindustan Petroleum Corporation Ltd, Visakhapatnam	SHRI SANDIPTA NATH SHRI PRABHUDATTA PADARBINDA (*Alternate*)
ICAR - National Institute of Natural Fibre Engineering and Technology, Kolkata	DR SANJOY DEBNATH
I.G.P. Engineers Pvt Ltd, Chennai	SHRI G. GANESAN SHRI P. SUNDAR (*Alternate*)
Indian Sealing Association, New Delhi	SHRI RASIKLAL M. DOSHI SHRI DARSHAN A. PAREKH (*Alternate*)
Indian Valve and Actuator Manufacturers Association (IVAMA), Coimbatore	SHRI VISHAL WAKCHOURE SHRI R. MURUGANANTHAM (*Alternate*)

Organization	*Representative(s)*
L&T-Sargent & Lundy Limited, Vadodara	SHRI MANISH V. SANE SHRI PINKESH PATEL (*Alternate*)
Mecon Limited, Ranchi	SHRI GURNEK SINGH SHRI SUJOY BANERJEE (*Alternate*)
Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade, New Delhi	SHRI SHAISH KUMAR SHRI M. Z. KHAN (*Alternate*)
Ministry of Science and Technology, Department of Science & Technology, New Delhi	SHRI PURUSHOTTAM KUMAR
NTPC Limited, Noida	SHRI U. K. MUKHOPADHYAY SHRI S. CHAKRABORTY (*Alternate*)
Nu-Cork Products Pvt Ltd, Gurugram	SHRI SWAPAN KUMAR DATTA
Ordnance Factory Board, Jabalpur	SHRI RAJNISH LODWAL SHRI M. K. MISHRA (*Alternate*)
Projects and Development India Ltd, Noida	SHRI HARISH KUMAR SHRI JITENDER KUMAR SINGH (*Alternate*)
RITES Ltd, Gurugram	SHRI PANKAJ AGARWAL SHRI MUKESH SINHA (*Alternate*)
Spareage Sealing Solution, Mumbai	SHRI SHIVA SHINDE
Super Waudite Jointing Pvt Ltd, Ahmedabad	SHRI PRADEEP J. PANDYA SHRI C. D. GAZDAR (*Alternate*)
Superlite Jointings Private Limited, Ghaziabad	SHRI VARUN AGARWAL SHRI PHERU SINGH (*Alternate*)
The Tata Power Company Ltd, Mumbai	SHRI DHIRAJ B. KAMATH SHRI V. V. NAMJOSHI (*Alternate*)
Uni Klinger Limited, Pune	SHRI MAHESH AVACHAT
BIS Directorate General	SHRI RAJNEESH KHOSLA, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (MECHANICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
MS KHUSHBU JYOTSNA KINDO
SCIENTIST 'C'/DEPUTY DIRECTOR
(MECHANICAL ENGINEERING), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

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 website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

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