

BUREAU OF INDIAN STANDARDS

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भारतीय मानक मसौदा
गास्केट तथा पैकिंग — एस्बेस्टस ग्लैंड पैकिंग — विशिष्टि
(तीसरा पुनरीक्षण)

DRAFT Indian Standard

**GASKETS AND PACKINGS — GLAND
PACKINGS ASBESTOS — SPECIFICATION**

(Third Revision of IS 4687)

ICS 21.140

**Gasket and Packing Sectional Committee,
MED 30**

**Last date for receipt of
comments is 16 May 2022**

FOREWORD

(Adoption clauses to be added later)

This standard was originally published in 1968 and subsequently revised in 1980 and 1995.

Major changes in this revision are as follows:

- a) A reference clause has been added mentioning the latest version of all the referred standards; and
- b) Editorial corrections have been incorporated.

Gland packings are used to contain fluids, gases, and slurries, under extreme pressures, temperatures, abrasives, and other difficult conditions. This standard deals with asbestos gland packing only and the requirements of other types of packings, that is, proofed cotton duck gland packing, jute and hemp or flax packing are covered in a separate standard.

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.

DRAFT *Indian Standard*
GASKETS AND PACKINGS — GLAND
PACKINGS ASBESTOS — SPECIFICATION
(*Third Revision*)

1 SCOPE

- 1.1** This standard covers the requirements of gland packings made from asbestos intended to contain gases, fluids, and slurries at different temperatures and pressures.
- 1.2** Gland packings covered by this standard are not applicable for use in the food industry.
- 1.3** These packings shall be either in round or square sections.

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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

<i>IS No.</i>	<i>Title</i>
10330: 1982	Specification for formed asbestos packing rings for high pressure and high temperature valves

3 TYPES

- 3.1** The asbestos packing shall be manufactured in the following grades:
- a) Type 1 — Dry asbestos gland packings (excluding those for corrosive acid services);
 - b) Type 2 — Lubricated and graphited gland packings for medium pressure conditions; and
 - c) Type 3 — Lubricated and graphited gland packings for high pressure conditions.

NOTE — The grade of yarn specified by the standard is as per Grade A of IS 10330. However, superior grades of yarn type, AA, AAA, AAAA may be used depending on the service condition (*see 6*).

If desired by the customer, these may be supplied with a metallic wire reinforcement in each yarn by prior agreement between the purchaser and the manufacturer.

4 MATERIAL

4.1 The material for the manufacture of the three grades of asbestos gland packing shall be as follows.

4.1.1 Type 1

The yarn of which these packings are composed shall be spun from long-staple, white chrysotile variety of asbestos fibre free from grit or rocky matter, chalk barytes in the yarn as well as in the packing rope after drying the same and from the inclusion of spun cotton thread in the packing. The packings shall be plaited throughout from yarns reasonably uniform in appearance and thickness.

4.1.1.1 The loss of drying two grams of material for one hour at 104°C shall not exceed 25 percent by weight. The further loss on ignition of the portion thus dried, determined by heating in an open crucible in a muffle furnace for 30 minutes at a temperature of 850 ±25°C shall not exceed 25 percent by weight of the original undried sample. For special asbestos requirements like acid services, etc, the purchaser shall specify the acid test in his order.

4.1.1.2 Mass

Mass per metre of the packing in grams shall not exceed:

Round section $0.825 \times d^2$

Square section $0.963 \times S^2$

where

d = diameter of the packing in m; and

S = length of the side of the cross-section of the packing in mm.

4.1.2 Type 2

The yarn for the manufacture of these packings shall be of the same quality as described in **4.1.1** and **4.1.1.1**.

4.1.2.1 The count of the single-ply yarn shall be not coarser than 1 240 tex.

4.1.2.2 Lubricating oil used shall be of a high grade and have an open flash point of not less than 200°C and a viscosity of not less than 36 centistokes at 98.5 °C. No powders, fillers, or pigments shall be added to the high-grade lubricating oil with the exception of the requisite amount of graphite as specified. The lubricating oil shall be free from organic or mineral acids and also from sulphur compounds.

4.1.2.3 Graphite used shall be flake graphite containing not less than 90 percent carbon. If desired by the user, mica may be used in place of graphite.

4.1.2.4 Each yarn shall be previously or during the construction of the packing be steeped in or impregnated with high-grade lubricating oil and graphite, so that each individual yarn shall be thoroughly treated. Only pure and original lubricant supplied by renowned manufacturers shall be used in the packing.

4.1.2.5 An analysis of the packing shall give results within the following mass limits:

- a) Asbestos yarn content : Not less than 50 percent;
- b) Lubricant : Not more than 49 percent; and
- c) Graphite : Not more than 4 percent.

4.1.2.6 The mass per metre in grams of the packing shall not exceed:

Round section : $1.37 d^2$

Square section : $1.67 S^2$

where

d = diameter of the packing in mm, and

S = length of the side of the cross-section of the packing in mm.

4.1.3 Type 3

The yarn for the manufacture of these packings shall be of the same quality as described in **4.1.1** and **4.1.1.1**.

4.1.3.1 The count of the single-ply yarn shall not be coarser than 650 tex.

4.1.3.2 The high-grade lubricating oil shall be as described in **4.1.2.2**.

4.1.3.3 The graphite shall be as described in **4.1.2.3**.

4.1.3.4 The yarn shall be treated as described in **4.1.2.4**.

4.1.3.5 An analysis of the packing shall give results within the following mass limits:

- a) Asbestos yarn content : Not less than 64 percent;
- b) Lubricant : Not more than 33 percent; and
- c) Graphite : Not more than 11 percent.

4.1.3.6 The mass per metre in grams of the packing shall not be more than the following:

Round section : $1.27 d^2$

Square section : $1.57 S^2$

where

d = diameter of the packing in mm; and

S = length of the side of the cross-section of the packing in mm.

4.2 The packing shall be braided in suitable lubricant which should be pure and original lubricant manufactured by renowned manufacturers and under no circumstances burnt axle oil and other substandard residue of the actual lubricant should be used in the packing.

5 DIMENSIONS

5.1 The preferred dimensions for asbestos packing shall be 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 16, 18, 20, 22, 25, 30, 32, 35, 38, 40, 42, 45, 48, and 50 mm. Packing of other dimensions may be supplied subject to an agreement between the purchaser and the manufacturer. The cross-

section of the packing shall be circular, square or rectangular and shall be specified as given in the example below:

Examples:

- 1) '4 mm' circular means a packing of diameter 4 mm.
- 2) '4 mm' square means a square packing of dimensions 4 mm x 4 mm.
- 3) '4 x 3 mm' means a rectangular packing of length 4 mm and breadth 3 mm.

5.2 The maximum permissible variations in dimensions shall be ± 0.5 mm for sizes up to and including 10 mm and ± 1 mm for sizes above 10 mm.

5.3 The asbestos packing shall be manufactured in coils and the section and length of asbestos packing shall be agreed to between the manufacturer and the purchaser.

5.4 The surface of the packing shall be smooth and it shall not have torn out threads.

6 SELECTION OF ASBESTOS YARN FOR GLAND PACKING

6.1 The asbestos yarn to be used for the manufacture of gland packing will depend on the service temperature for which the gland packing is to be used. A general guideline for selection of yarn is given below:

<i>Sl No.</i>	<i>Grade of Yarn</i>	<i>Asbestos Content (Percent)</i>	<i>Service Temperature (°C) Approx</i>	<i>Loss on Ignition (Percent)</i>
(1)	(2)	(3)	(4)	(5)
i)	A	85-90	290	25
ii)	AA	90-95	315	20
iii)	AAA	95-99	400	17
iv)	AAAA	99-100	480	14-15

7 DESIGNATION

7.1 The designation of the packing shall indicate the following:

- a) Type;
- b) Dimensions of packing;
- c) Material and diameter of wire reinforcement and lubricant;
- d) Number of this standard; and
- e) Any other details as per agreement between the purchaser and the manufacturer.

8 SAMPLING

8.1 Lot

The quantity of coils of packing of the same size designation and of one definite quality, delivered to one buyer against one despatch note shall constitute a lot.

8.2 The conformity of a lot to the requirement of this standard shall be determined on the basis of the tests carried out on the samples selected from the lot.

8.3 Unless otherwise agreed to between the manufacturer and the purchaser the number of coils to be selected at random from a lot shall be in accordance with column (2) and (3) of Table 1.

Table 1 Sample Size and Criteria for Conformity

(Clause 8.3)

SI No.	No. of Coils in the Lot	For Visual and Dimensional Characteristics		Sample Size of Other Characteristics
		Sample Size	Permissible No. of Defectives	
(1)	(2)	(3)	(4)	(5)
i)	Up to 100	8	0	3
ii)	101 to 300	13	1	4
iii)	301 to 500	20	1	5
iv)	501 to 1 000	32	2	6
v)	1 001 and above	50	3	7

8.4 The coils selected according to **8.3** shall be inspected for construction, workmanship and dimensions. If the number of coils found not in conformity with the specified requirement are less than or equal to the corresponding number given in column (4) of Table 1, the lot shall be declared conforming to the requirements of visual and dimensional characteristics.

8.5 In case of those lots which have been found satisfactory according to **8.4**, the number of coils equal to the sample size given in column (5) of Table 1 shall be selected from those coils tested according to **8.4** and found satisfactory. The required test specimen cut from these coils shall be subjected to tests given in **9.2** and **9.3**. The lot shall be declared conforming to the requirements of this specification if all the coils satisfy the relevant requirements.

9 TESTS

9.1 Visual and Dimensional Inspection

Each coil of packing taken in accordance with column (3) of Table 1 shall be inspected for construction, workmanship, and dimensions. The dimension shall be measured to an accuracy of 0.1 mm with a slide gauge at three different places in two perpendicular directions. The mean of the six measurements thus made shall be within the variation specified in **5.2**.

9.2 Flexibility

A suitable length of packing when bent through 180° around the rod, the diameter of which is 4 times the thickness of the packing shall not separate into layers.

NOTE — For gland packing to be used under special environment the suitability of gland packing shall have to be proved for the same. The tests to be conducted and the criteria for conformity shall be agreed to between the manufacturer and the purchaser.

9.3 Determination of Lubricant Content

9.3.1 Lubricant Content

Unplait a representative section of the packing not less than 5 g weight, taking care to collect all pieces which are dislodged. Place a Soxhlet thimble in a weighing bottle and with the lid offset, place in an oven at 105 to 110°C, replace the lid, cool in a desiccator to room temperature and weigh (W_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 (W_2), place the thimble with the dried sample in a vapour jacketed Soxhlet traction apparatus and extract for 1 h with carbon tetrachloride. The volume of solvent to be used shall be at least three times the volume of the Soxhlet liner.

9.3.1.1 Grease, oil and binder content

Dry an evaporating basin in an oven at 105°C, cool to room temperature and weigh (W_3). Transfer the solution from the extraction flask to the basin and evaporate off the solvent. Place the basin and its content in an oven for half an hour at 105°C. Cool to room temperature and weigh (W_4).

$$\text{Grease, oil or binder content, percent} = \frac{W_4 - W_3}{W_2 - W_1} \times 100$$

9.3.2 Graphite 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 graphite flakes by gently un-twisting the yarn. Return the graphite to the thimble. Replace the thimble in the weighing bottle used originally and replace in an oven for one hour. Cool to room temperature and reweigh (W_5).

$$\text{Graphite Content, percent} = \frac{W_5 - W_1}{W_2 - W_1} \times 100$$

9.3.3 The asbestos yarn content shall be 100 minus lubricant content and graphite content and after determining this factor, the yarn shall be tested to ascertain the suitability according to **4.1.1.1**.

10 MARKING

10.1 Each coil of packing shall be marked with the following:

a) Indication of the source of manufacture;

- b) Dimension of packing;
- c) Grade of packing; and
- d) Year and month of manufacture.

10.2 BIS Certification Marking

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.

11 PACKAGING

11.1 Packaging shall be as agreed between the manufacturer and the purchaser.