

IS 1891 ( Part 1 ) : 1994

भारतीय मानक

संयोजक और उत्पापक के लिए वस्त्रादि पट्टे बनाना — विशिष्ट

भाग 1 सामान्य प्रयोजन के लिए पट्टे बनाना

( चौथा पुनरीक्षण )

*Indian Standard*

**CONVEYOR AND ELEVATOR TEXTILE  
BELTING—SPECIFICATION**

**PART 1 GENERAL PURPOSE BELTING**

**( *Fourth Revision* )**

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**BUREAU OF INDIAN STANDARDS**  
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Price Group 8



# Indian Standard

## CONVEYOR AND ELEVATOR TEXTILE BELTING — SPECIFICATION

### PART 1 GENERAL PURPOSE BELTING

#### ( Fourth Revision )

#### 1 SCOPE

This standard ( Part 1 ) covers the requirements of rubber/plastics conveyor and elevator textile belting for general use on flat or troughed idlers.

NOTE — Rubber belting made to this Indian Standard will not necessarily be electrically insulating at any stage of its life and shall not, therefore, be used as an insulator for any electrical work.

#### 2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
3400	Methods of test for vulcanized rubbers
( Part 1 ) : 1987	Tensile stress strain properties ( <i>second revision</i> )
( Part 3 ) : 1987	Abrasion resistance using a rotating cylindrical drum device ( <i>first revision</i> )
( Part 4 ) : 1987	Accelerated ageing ( <i>second revision</i> )
( Part 9 ) : 1978	Density ( <i>first revision</i> )
4240 : 1984	Glossary of conveyor terms and definitions ( <i>first revision</i> )
5996 : 1984	Cotton belting ducks ( <i>second revision</i> )

#### 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 4240 : 1984 shall apply.

#### 4 TYPES AND GRADES

According to types of belts given in Table 4 and grades of covers given in Table 1.

#### 5 CONSTRUCTION

5.1 The belting shall consist of a carcass having a cover of either rubber and/or plastics. The carcass shall consist of either one or more plies or of woven fabric or of solid woven fabric and shall be impregnated with a rubber or plastic

mix. The whole shall be either vulcanized or fused together in a uniform manner.

#### NOTES

1 Solid Woven Fabric — Fabric consisting of more than one ply, the plies being interlocked in the weave or bound together by binding threads in the course of weaving.

2 In case of cotton carcass, ducks of types 28, 32 and 36 ( *see* IS 5996 : 1984 ) may be frictioned or frictioned and skim coated if so specified by the purchaser. Ducks of types 31, 34, 42 and 48 shall be frictioned and skim coated.

5.2 For carcasses protection, layer or layers of open-mesh or cord fabric ( termed as breaker ) may be placed between the cover and the carcass or may be embedded in the cover. Where such a layer is incorporated, it shall be considered to be part of the cover thickness and not counted as a fabric ply. Alternatively, a fabric pile may be integrally woven with the carcass on either one or both the surfaces, in which case it shall be considered to be a part of the carcass thickness.

#### 6 FABRIC

The fabric used shall be made of cotton or polyamide or any other synthetic material or combination thereof evenly and firmly woven and free from manufacturing faults as is normal in the best manufacturing practice.

#### 7 COVER

7.1 The rubber used in the top and bottom cover of the belting shall be of one of the grades listed in Table 1. The grade of cover should be chosen having regard to the service conditions of the conveyor belt ( *see* Annex A ) when removed from the belt and tested as per the method described in Annex B, the tensile strength and elongation at break shall not be less than the values specified in Table 1.

NOTE — In case plastics or rubber/plastics mix is used for the cover the value of tensile strength and elongation at break shall be as agreed between the manufacturer and the purchaser.

7.2 Where, however, the thickness of the rubber cover as measured by the method contained in Annex C is less than 1.5 mm but not less than



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0.8 mm, the thickness of the test piece shall be the maximum obtainable and a tolerance of -15 percent shall be permitted on the tensile strength and elongation values at break, specified in Table 1. Where the rubber cover is insufficiently thick to give a buffed test piece at least 0.8 mm, no tests are required.

7.3 In case of rubber cover after ageing for 72 h at 70°C ± 1°C in accordance with the requirements of IS 3400 ( Part 4 ) : 1987 the tensile strength and elongation at break shall not vary from the original unaged values by more than the amounts specified below:

	Change Percent, Max
Tensile strength	+ 10 - 20
Elongation	+ 10 - 25

7.4 In case of rubber cover, abrasion loss when tested as per method given in Annex D [ see also IS 3400 ( Part 3 ) : 1987 ] shall not exceed the respective maximum values indicated in Table 1.

**Table 1 Grades of Rubber Cover and Their Physical Properties**  
( Clauses 4, 7.1 and 7.4 )

Grade	Minimum Tensile Strength MPa	Minimum Elongation at Break (Percent)	Maximum Abrasion Loss mm <sup>2</sup>
M-24	24.0	450	150
N-17	17.0	400	200
N-17 ( Synthetic )	17.0	400	150

NOTE — Grade N17 synthetic is a cover compound composed wholly or mainly of synthetic rubber of equivalent wear resistance to grade M24 and suitable for the most arduous conditions. A carcass type that uses a chemical or other superior bonding system should, therefore, be used with this grade.

### 8 COVER THICKNESS

8.1 The cover shall be of not less than 1.0 mm nominal thickness on both the carrying or non-carrying faces of the belting. Cover thickness should be increased as required to that appropriate to the material to be handled ( see Annex A ) and to the type of loading. When measured in accordance with the Method C1 or C2 described in Annex C, the average value of the cover thickness shall not fall below the specified thickness by more than the values given in Table 2.

**Table 2 Tolerance on Cover Thickness**  
( Clauses 8.1 and B-2.2 )

Specified Cover Thickness	Tolerance ( On Average Thickness )
Up to and including 4 mm	0.2 mm
Over 4 mm	5 percent

#### NOTES

1 In the case of straight stepped ply construction, the specified cover thickness will apply at the middle of the belt in the area of the maximum cover thickness within the confines of the innermost steps and shall be so measured.

2 In the case of reverse stepped ply construction, the specified cover thickness will apply at the middle of the belt in the area of the maximum number of plies and shall be so measured.

8.2 The carcass thickness, when specified by the purchaser, is determined by subtracting the sum of the top and bottom cover thickness, from the total belt thickness, as measured in accordance with Method C-1 or C-2 described in Annex C. The average carcass thickness, so determined, shall be within ± 0.5 mm for up to and including 5 mm and within ± 10 percent for over 5 mm specified thickness.

### 9 REPAIRS

Rectification of defects and blemishes, if any, which do not interfere with the satisfactory performance of the belts shall be allowed. The surface blemishes which do not interfere with the performance of the belt may be left unattended.

### 10 EDGES

The belting shall be with either cut edge or moulded edge construction with synthetic carcass as agreed between the manufacturer and the purchaser. However, belts made with cotton or cotton/polyamide carcass shall have moulded edge construction.

### 11 TRANSVERSE JOINTS IN MULTIPLY TYPE BELTING

Transverse joints in fabric plies shall be at an angle of 45° to 70° to the longitudinal axis. The minimum distance between transverse joints in the same ply shall be as follows:

- Outer Plies** — The joints shall be not less than 75 m apart in the same ply. The adjoining edges shall butt closely together but shall not overlap.
- Inner Plies** — There shall be not more than two joints in any one ply in each 150 m of belting. These two joints shall be not less than 15 m apart.
- Adjacent Plies** — The joints shall be not less than 3 m apart.
- Non-adjacent Plies** — The joints shall be not less than 3 m apart.



## 12 LONGITUDINAL JOINTS IN MULTIPLY TYPE BELTING

### 12.1 Spacing of Joints

Longitudinal joints shall be at least 100 mm from either edge of the carcass. Each longitudinal joint shall be at least 100 mm from the joints in the other plies. The longitudinal joints in one ply of any piece of belting shall be separated by at least 300 mm, where the width of the belting permits two or more joints in the same ply.

### 12.2 Number of Joints

The maximum number of longitudinal joints in the plies shall be as follows and the external ply on the non-carrying face shall have no longitudinal joints in the case of belting up to and including 1 200 mm width:

Width of Belts mm	External Plies		Internal Plies	
	Open Edges	Folded Edges	Open Edges	Folded Edges
300, 400, 450 <sup>1)</sup> , 500, 600, 650	0	1	1	1
750 <sup>1)</sup> , 800, 900 <sup>1)</sup> , 1 000, 1 050 <sup>1)</sup> , 1 200	0	2	1	2
1 350 <sup>1)</sup> , 1 400, 1 500	0	2	2	2
1 600, 1 800, 2 000	1	2	2	2

## 13 DIMENSIONS AND TOLERANCES

### 13.1 Length

**13.1.1** The length of belting shall be specified by the purchaser and shall include such lengths as are required by him for testing and such additional lengths as required for making joints.

**13.1.2** Belting which is ordered to a definite open-ended shall be supplied with a tolerance on length of +2 percent and -0.5 percent.

**13.1.3** The length of belt supplied in the spliced endless form shall be specified by the term 'net endless length'. When measured in accordance with the method described in Annex E, the net endless length shall not vary by more than  $\pm 0.5$  percent from the specified length.

**13.1.4** The length actually supplied subject to the specified tolerances shall be charged by the supplier.

### 13.2 Width

Unless otherwise agreed, the belting shall be of any one of the widths specified in Table 3. The tolerance on widths shall be as given in Table 3.

<sup>1)</sup>These widths should be used for replacement belting in existing installations.

**Table 3 Widths and Tolerances on Widths for Conveyor and Elevator Textile Belting**  
( Clause 13.2 )

All dimensions in millimetres.

Width	Tolerance	Total Variation in Any One Belt
(1)	(2)	(3)
300 } 400 } 500 }	$\pm 5$	5
600 } 650 } 800 }		
1 000 } 1 200 } 1 400 }		
1 500 } 1 600 } 1 800 }	$\pm 1$ percent of belt width	1 percent of belt width
2 000 }		

NOTE — The tolerance for widths other than standard width shall be that applicable to the immediate lower standard width.

### 13.3 Tolerance on Belt Thickness Across the Width

When measured in accordance with Method C-1 described in Annex C, the difference between any two measurements of the overall thickness shall not exceed 1 mm for a belt of which the mean of the thickness measurements made does not exceed 10 mm, or 10 percent of the mean for belts over 10 mm thickness.

## 14 FULL THICKNESS BREAKING STRENGTH AND ELONGATION

### 14.1 Full Thickness Breaking Strength

The full thickness breaking strength of the finished belting, when determined in accordance with the method described in Annex F, shall be not less than the values given in Table 4.

**Table 4 Full Thickness Breaking Strength**  
( Clauses 4 and 14.1 )

Type	Longitudinal Direction kN/m Width ( Min )	Transverse Direction kN/m Width ( Min )
(1)	(2)	(3)
160	160	63
180	180	71
200	200	80
224	224	90
250	250	100
280	280	112
315	315	125
355	355	140
400	400	160
450	450	Not specified <sup>1)</sup>
500	500	Not specified <sup>1)</sup>
560	560	Not specified <sup>1)</sup>
630	630	Not specified <sup>1)</sup>
800	800	Not specified <sup>1)</sup>
1 000	1 000	Not specified <sup>1)</sup>
1 250	1 250	Not specified <sup>1)</sup>
1 400	1 400	Not specified <sup>1)</sup>
1 600	1 600	Not specified <sup>1)</sup>
1 800	1 800	Not specified <sup>1)</sup>

<sup>1)</sup>No values have been specified because these type of beltings are generally used with splice joints.

**14.2 Elongation ( Full Thickness )****14.2.1 Elongation at Reference Load**

For this requirement, reference load is defined as being one tenth of the specified full thickness breaking strength of the belt in the longitudinal direction ( see 14.1 ).

**NOTES**

1 This definition does not necessarily imply that a 10 : 1 factor should be in design calculations. The values of the factor will vary depending on the conditions governing a particular installation, for example conveyor gradient, position of drive, type of take-up, starting and stopping conditions which affect the belt, method of joining the belt, etc.

2 The elongation at the reference load is intended as a control test only. It includes some permanent and some elastic stretch and, therefore, cannot be related exactly to stretch characteristics in service.

**14.2.1.1** The elongation of the finished belting in the longitudinal direction at the reference load, when tested by the method described in Annex F, shall not be greater than 4 percent.

**14.2.2 Elongation at Breaking Load**

The elongation of the finished belting in the longitudinal direction at the load corresponding to the maximum breaking strength, when tested by the method described in Annex F, shall be not less than 10 percent.

**15 ADHESION**

The adhesion between cover and the carcass and between the adjacent plies shall be such that when tested in the manner described in Annex G, the force required to cause separation shall be as given in Table 5.

**Table 5 Force for Adhesion Testing**

Sl No.	Test	Force, Min ( kN/m Width )		
		For Cotton or Cotton/Synthetic	For 100 Percent Polyamide	For 100 Percent Synthetic
(1)	(2)	(3)	(4)	(5)
i)	Adhesion between adjacent plies	3.00	5.25	4.50
ii)	Adhesion between cover and carcass:			
	a) Covers up to and including 1.00 mm thick	No test	No test	No test
	b) Covers over 1.00 mm up to and including 1.50 mm thick	2.20	3.15	3.15
	c) Covers over 1.50 mm thick	2.60	4.50	3.50

NOTE — No individual value obtained at the time of measurement shall be below the value specified by more than 0.80 kN/m.

**16 TROUGHABILITY**

**16.1** If agreed to between the purchaser and the manufacturer, the conveyor belting shall be tested for troughability. This will be a type test only.

**16.2** The troughability, when determined in accordance with the method described in Annex H, shall be as given in Table 6.

**Table 6 Minimum Troughability Value**

Troughing Angle Up to and Including	Troughability, Min
(1)	(2)
20°	0.05
25°	0.07
30°	0.09
35°	0.11
45°	0.17
55°	0.23

NOTE — For intermediate troughing angle, the specified troughability shall be calculated by linear interpolation between two relevant adjacent values.

**17 DESIGNATION**

Belting complying with the requirements of this standard shall be designated by IS No., grade of the cover ( see Table 1 ), the type of belting defined by the full thickness breaking strength ( see Table 4 ) and number of plies.

*Example:*

A conveyor belt with cover grade M24 and type 200 having 4 plies shall be designated as:

Conveyor Belt IS 1891 ( Part 1 ) M.24—200/4

**18 MARKING**

**18.1** The belting shall be marked at intervals of maximum 12 m on the carrying surface as follows:

- Manufacturer's name and trade-mark, if any;
- Fabric designation, that is, BB ( cotton-cotton ), NN ( nylon/nylon ), EP ( polyester polyamide ), etc;
- Belt designation;
- Character identifying the grades of rubber and/or plastic cover used;
- Last two figures of the year of manufacture; and



f) Number of this standard.

### 18.2 Certification Marking

Details available with the Bureau of Indian Standards.

**18.2.1** The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

### 19 PACKING

The belting shall be suitably packed as mutually agreed to between the purchaser and the supplier.

### 20 SAMPLING AND TESTING

**20.1** The number of samples to be tested for compliance with the requirements of this specification shall be in accordance with Table 7. Each sample shall be full belt width and not less than 600 mm long.

**Table 7 Sampling Plan for Conveyor Belting**  
( Clause 20.1 )

Length of Belting of One Type and Width in m		No. of Samples
From ( Excluding )	To ( Including )	
(1)	(2)	(3)
—	500	1
500	1 000	2
1 000	2 000	3
2 000	3 500	4
3 500	5 000	5
5 000	7 000	6
7 000	10 000	7

NOTE — For every additional length up to 3 500 m beyond 10 000 m the number of samples will be increased by 1.

### 20.2 Re-tests and Rejections

Should any sample fail to comply with the specified test requirements, two additional samples shall be drawn and tested according to specified procedure. In the event of either of these two samples failing to comply with the test requirements, the supply shall be rejected. If both the samples pass the test, the supply shall be accepted.

## ANNEX A

( Foreword, Clauses 7.1 and 8.1 )

### RECOMMENDATIONS ON SELECTION OF SUITABLE GRADE OF RUBBER COVER FOR CONVEYOR AND ELEVATOR BELTING

Sl No.	Service	Minimum Cover Grade	Minimum Cover Thickness mm			
			Conveyor Carrying Side (4)	Belting Pulley Side (5)	Elevator Carrying Side (6)	Belting Pulley Side (7)
(1)	(2)	(3)				
i)	Sharp and abrasive materials causing service wear, such as metallic ores, limestone, granite, quartz blast furnace clinker and slag, sandstone, stone! chippings, slate, coke, broken glass, and gravel	M-24, N-17 Synthetic	3.0	1.5	1.5	3.0
ii)	Moderately abrasive materials such as rubble, sand, (sharp), superphosphate ( lump and powder ), bone, coal, ashes, unslaked lime cement ( un-ground ), and small coal ( under 100 mm )	N-17	2.5	1.0	1.5	2.5
iii)	Slightly abrasive materials, non-abrasive and dry materials, such as soda, earth, sand ( smooth ), cement ( ground ) clay, slaked lime, charcoal, grain flour dry powders ( inert ), wood chips, and pulp ( dry )	N-17	1.0	1.0	1.0	1.0

## ANNEX B

( Clause 7.1 )

### METHOD OF DETERMINING THE TENSILE STRENGTH AND THE ELONGATION AT BREAK OF THE RUBBER COVER

#### B-1 PRINCIPLE

The method of test to be adopted shall be that described for dumb-bell test piece Type I in IS 3400 ( Part 1 ) : 1987.

#### B-2 PROCEDURE

**B-2.1** The test pieces shall be prepared and conditioned as described in IS 3400 ( Part 1 ) : 1987 and the test carried out at a temperature of  $27 \pm 2^\circ\text{C}$ .

**B-2.2** Where the thickness of the rubber cover is less than 1.5 mm but not less than 0.8 mm, the thickness of the test pieces shall be the maximum obtainable.

**B-2.3** Test shall not be carried out where the rubber cover is insufficiently thick to give a buffed test piece of at least 0.8 mm thickness. Any open mesh of cord fabric reinforcement shall be removed from the cover.

## ANNEX C

( Clauses 7.2, 8.1, 8.2 and 13.3 )

### METHOD OF MEASURING THE THICKNESS OF COVER AND BELT

#### C-1 MICROMETER GAUGE METHOD

##### C-1.1 Preparation of the Sample

Take a 50 mm sample section of the belting, cut across the full width of the belting, both edges of the sample being cut at right angles to the surface and edge of the belting.

##### C-1.2 Procedure

**C-1.2.1** Mark but do not cut, the sample into nine parts by eight lines extending across the cut edges as shown in Fig. 1.

**C-1.2.2** Measure the overall thickness of the belt  $h$  on the each edge at the points marked using a micrometer gauge graduated to 0.01 mm taking eight measurements in all.

**C-1.2.3** Completely remove one cover, including breaker plies, if incorporated, then measure the thickness  $h_1$  at the same points.

**C-1.2.4** Completely remove the other cover, then measure the thickness  $h_2$  at the same points.

##### C-1.3 Calculation

Take the average values of  $h$ ,  $h_1$  and  $h_2$ . Then:

Thickness of belt  $\quad \quad \quad = h$

Thickness of one cover  $\quad \quad \quad = h - h_1$

Thickness of other cover  $\quad \quad \quad = h_1 - h_2$

#### C-2 OPTICAL METHOD ( FOR THICKNESS OF COVER AND CARCASS THICKNESS

##### C-2.1 Apparatus

The measuring instrument shall consist of an optical magnifier incorporating a scale graduated in divisions of 0.1 mm.

##### C-2.2 Procedure

On the surface of a sample of belting, mark a line as shown in Fig. 2A. The line shall not intersect any embossed markings. Cut across this line perpendicularly to the surface. Along the line, mark points as shown in Fig. 2B; the distance between marks shall be equal.

Measure the thickness of each cover at the fabric knuckles ( see Fig. 2B ) nearest to each of the eight points. For each cover, calculate the mean of the eight results.

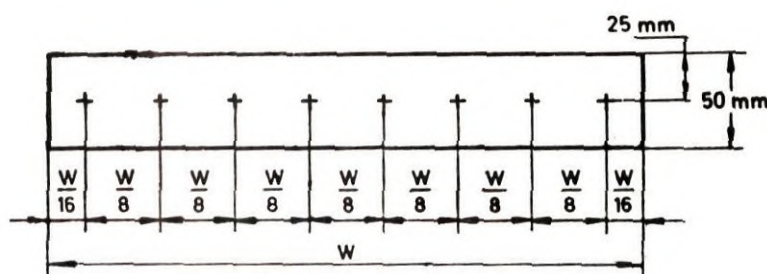


FIG. 1 MEASUREMENT OF THICKNESS



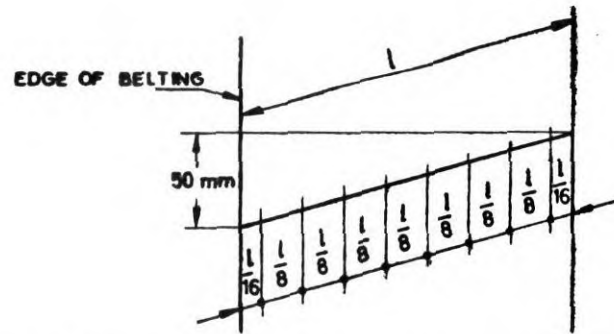


FIG. 2A LINE OF CUTTING BELT TO MEASURE THICKNESS BY OPTICAL METHOD

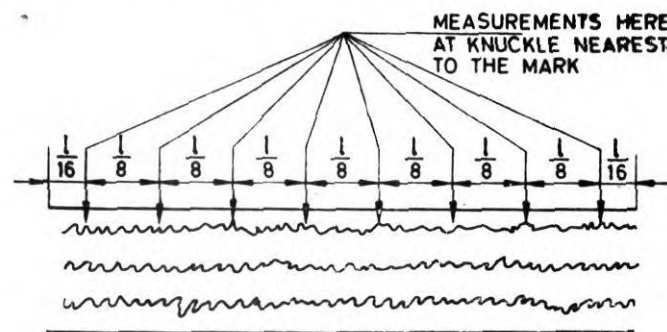


FIG. 2B POSITION OF MEASUREMENT OF COVER THICKNESS AT KNUCKLE NEAREST TO MARK

## ANNEX D

( Clause 7.4 )

### METHOD OF DETERMINING THE ABRASION LOSS OF RUBBER COVER

#### D-1 GENERAL

**D-1.1** The determination of volume loss through abrasive action of emery paper of a given abrasive grade, as carried out according to this method, is suitable for comparative tests and for testing the uniformity of specified products; however, the test results give only limited indication of the wear behaviour of rubbers in service.

#### D-2 DEFINITIONS

##### D-2.1 Abrasion Loss

It is the volume loss ( $V$ ) in cubic millimetre of a rubber test piece when subjected to the abrasive action of an emery-cloth of a specified abrasive grade at a specified contact pressure and over a given distance according to the conditions of this standard.

##### D-2.2 Abrasion Grade

Abrasion Grade of the emery-cloth is the mass loss ( $m$ ) in mg of a test piece of a standard

comparison rubber if abraded by the emery-cloth according to the conditions of this standard.

#### D-3 PRINCIPLE

**D-3.1** A cylindrical standardized test piece is passed over an emery-cloth (corundum graining 60) at a constant load of 10 N and at a constant speed of 0.32 m/s for 40 m (in special cases 20 m). Admissible abrasive grades fall in the region of 170 to 220 mg. The loss in weight (in mg) of the test piece is accurately determined to the nearest mg and the volume loss is calculated by using the density which is determined according to IS 3400 (Part 9): 1978. The volume loss is related to a defined abrasive grade of 200 mg.

#### D-4 TEST PIECE

##### D-4.1 Type and Preparation

The test pieces shall be cylindrical in shape,  $16 \pm 0.2$  mm in diameter and with a minimum height of 6 mm. Test pieces shall be prepared



with a hollow drill ( see Fig. 3 ). The speed of rotation of the drill shall be about 1 000 rpm. For rubber with a hardness of less than 50 IRHD, this may suitably be increased.

NOTE — Punching of the test pieces is not permitted. They can, however, be vulcanized in a mould. If test pieces of the required thickness are not available the necessary thickness may be obtained by bonding separate cylindrical pieces to a base element of a hardness not less than 80 IRHD.

When testing finished products, containing embedded fabrics ( conveyor belts ) the test piece taken from the product shall contain the fabric. Special care shall be taken to ensure that these test pieces are not rubbed down to the fabric or adhesive layer.

#### D-4.2 Number of Test Pieces

A minimum of three test runs shall be carried out. This will normally require three test pieces, but only one test piece may be necessary if the mass loss is very low. In arbitration tests 10 run shall be carried out.

### D-5 APPARATUS AND TEST MATERIALS

#### D-5.1 Abrasion Apparatus

The test apparatus ( see Fig. 4 and 5 ) consists of a laterally movable test piece holder and a rotatable cylinder to which the emery-cloth is fixed tight by three evenly spaced strips of double sided adhesive tape extended along the complete length of the cylinder. The adhesive tape shall be about 50 mm wide and not more than 0.2 mm thick. One of the strips shall be placed where the ends of the emery-cloth should meet but any gap left between them shall not exceed 2 mm.

The cylinder shall have a diameter of  $150.0 \pm 0.2$  mm and a length of about 500 mm. It

shall be rotated at a frequency of  $40 \pm 1$  rev per min, the direction of rotation being as indicated in Fig. 4 and 5.

The test piece holder is mounted on swivel arm which has at the other end a sledge with a spindle to be moved laterally  $4.20 \pm 0.04$  mm per revolution of the cylinder.

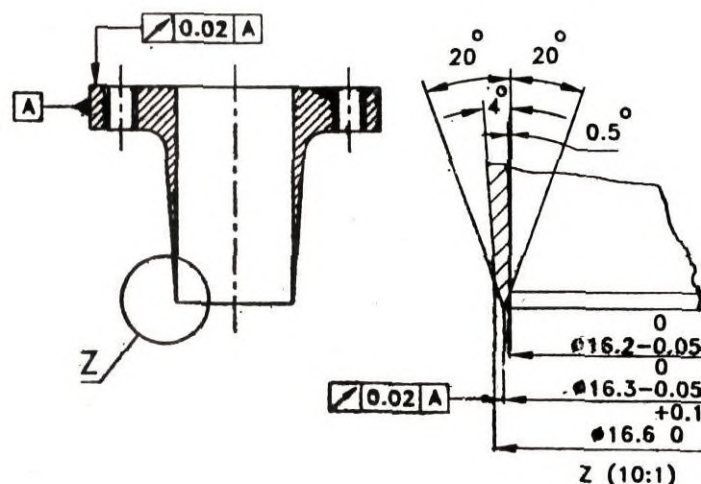
NOTE — With this lateral movement the number of times the test piece passes over any one area of the emery-cloth is four.

The test piece holder consists of a cylindrical opening, the diameter of which can be altered from 15.5 mm to 16.3 mm, and a device for the adjustment to a depth of  $2.0 \pm 0.2$  mm, of the test piece protruding from the opening. The centre axis of the test piece holder shall have an inclination of  $3^\circ$  to the perpendicular in the direction of rotation.

The centre of the test piece shall be placed above the longitudinal axis of the cylinder with an accuracy of 1 mm. The swivel arm and the test piece holder shall be free from vibration during operation and so disposed that the test piece is pressed against the cylinder with a vertical force of  $10.0 \pm 0.2$  N. Setting of the test piece on the emery-cloth at the beginning of a test run, and its removal after abrasion over a distance of  $40 \pm 0.2$  m ( 84 rotations ), shall be automatic. In special cases of very high volume loss of the sample an abrasion of  $20 \pm 0.1$  m ( 42 revolutions ) may be used.

#### D-5.2 Emery ( Abrasive ) Cloth

Emery-cloth of grain size 60, at least 400 mm wide, 473 mm long and about 1 mm average thickness shall be used as the abrasive medium. In the test with standard rubber ( see D-5.3 ), this emery-cloth must have an abrasive grade of 170 mg to 220 mg for an abrasive distance of 40 m. The direction of motion shall be indicated on each sheet as it is important that this shall be the same for every test. The emery-clothes



All dimensions in millimetres.

FIG. 3 RECOMMENDED TEST PIECE PREPARATION DRILL

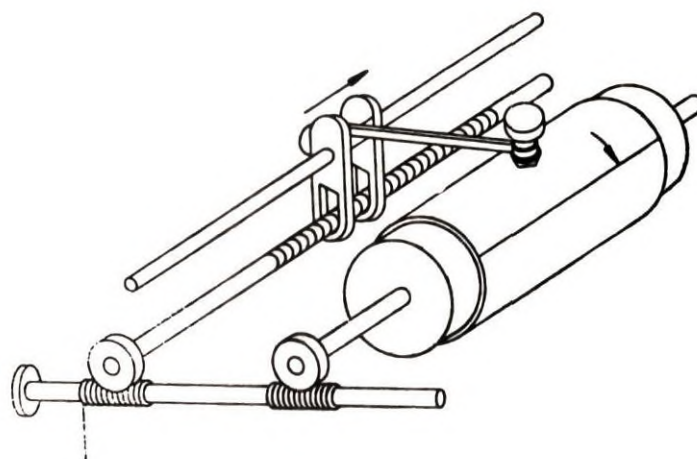
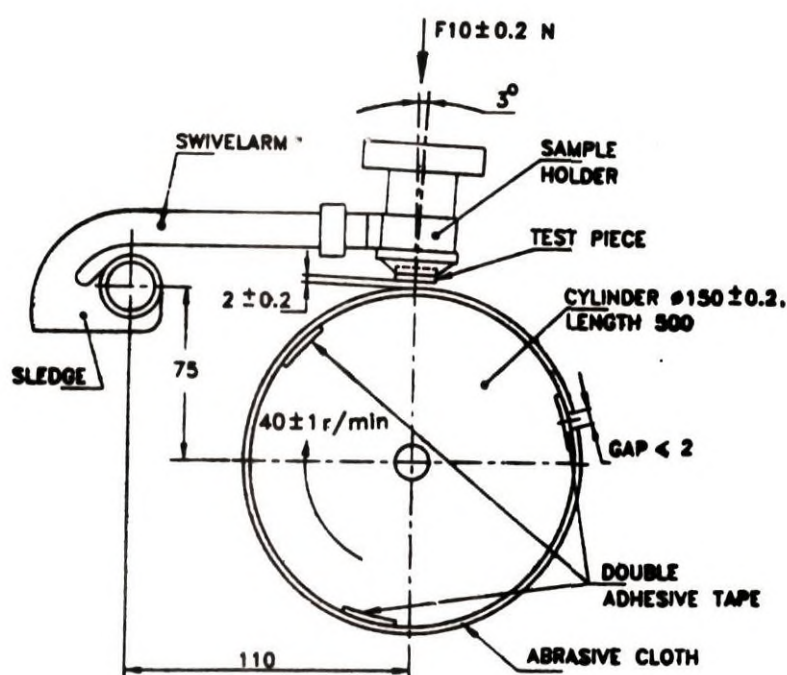


FIG. 4 SCHEMATIC ILLUSTRATION OF THE TEST APPARATUS



All dimensions in millimetres.

FIG. 5 DRAWING OF THE TEST APPARATUS

are produced with a much higher abrasive grade. Before using for abrasion test, the abrasive grade must be lowered to a value of less than 220 mg by one or two runs with a steel test piece, followed by careful cleaning, and two runs with the standard comparison rubber (see D-5.3). With an emery-cloth of an initial abrasive grade of 210 mg to 220 mg a few hundred test runs are possible.

#### D-5.3 Standard Comparison Rubber

The standard reference rubber material shall conform to the formulation given below:

Ingredient	Parts by Mass
1) Natural rubber with a Monney viscosity, ML (1 + 4) of $80 \pm 5$ at $100^\circ\text{C}$	100.0



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Ingredient	Parts by Mass
2) Accelerator Debinzothiazyle disulphide	1.2
3) Stabilizer N-isopropyl-N-phenyl-p-phenylene diamine ( Vulkanox 4010 NA )	1.0
4) Zinc oxide	50.0
5) HAF Carbon black	36.0
6) Sulphur	2.5
Total	190.7

#### D-5.3.1 Mixing and Vulcanization

The statements about the manufacture method serve as a guideline. The mixing is undertaken in an internal mixer ( capacity 2.8 kg ), fully cooled, about 55 rev/min. The mixing sequence shall be as follows:

Time ( min )	Position
0	1
5	2, 3, 4 ( well mixed )
8	5, 6
30	end

Give the mix to an open mill, roll diameter  $150 \pm 5$  mm speed of the slow roll  $24 \pm 1$  rev/min, and gear ratio 1.4 : 1. The clearance between the rolls shall be 10 mm. Sheet out the mix from the mill after 5 min.

Bring the mould to vulcanization temperature. Insert pieces of the mix ( approximately 10% excess ) which have been preheated to min at  $70^\circ\text{C}$ .

Vulcanize in the closed press at  $150 \pm 2^\circ\text{C}$  for  $30 \pm 1$  min using a moulding pressure of 3.5 MPa which is applied slowly.

The sheets shall be stored in a cool place and shall be protected from the effect of light by wrapping with materials which are capable of absorbing ozone ( for example, polyethylene ).

For all test purposes the minimum time between vulcanization and testing shall be 16 h.

#### D-5.3.2 Quality Control

The quality of the standard comparison rubber is examined by determining the abrasion of a test piece taken from a corner of the sheet according to this standard, and then comparing this abrasion value with the mean value of at least 3 test pieces of a 'reference sheet' in immediate consecutive tests. The difference between these abrasion values shall not exceed 8 mg.

NOTE — On the same test piece 3 runs can be carried out. A hollow grinding before the first run is not necessary.

A standard comparison rubber sheet is considered to be a 'reference sheet', if the abrasion measured of 6 different places ( 4 at the corners and 2 in the middle ) differ by not more than 10 mg and the mean value differs by not more than 5 mg from the mean value of the 6 single values of another 'reference sheet' in stock.

#### D-6 PROCEDURE

**D-6.1** The test is carried out at room standard temperature not earlier than 16 h after vulcanization.

#### D-6.2 Determination of the Abrasive Grade of the Emery-Cloth

Determine the abrasive grade of the emery-cloth over a minimum of three runs ( in arbitration tests 5 runs ) with the standard comparison rubber before and after each test series. For rubbers which have a tendency to smear, the mass loss of the standard rubber shall be determined before and after each test.

Use the mean value of the abrasive grade before and after the test runs in the calculation of the volume loss.

#### D-6.3 Test Run

Fix the test piece in the test piece holder so that it protrudes from the opening to a depth of  $2.0 \pm 0.2$  mm. This shall be controlled by a gauge. Move the sledge with the swivel arm and the test piece holder to the starting point and start the run. If the setting of the test piece is not automatically done place it by hand on the emery-cloth before starting. Vibration of the test piece holder must be avoided. The cylinder is stopped automatically after an abrasion distance of 40 m. If relatively high mass losses ( 400 mg in 40 m ) occur, the cylinder can be stopped halfway and the original depth of  $2.0 \pm 0.2$  mm can be adjusted so that the test can be restarted and completed. At no time the height of the test piece shall be less than 5 mm.

NOTE — If the mass loss is higher than 600 mg in 40 m, the test should only be carried out for half the distance ( i.e. 20 m ) and this shall be indicated in the test report. Then the results shall be multiplied by 2 so that the volume loss can still be given for an abrasion distance of 40 m.

Before each test, remove any dust left from the previous abrasion test with a brush or by a vacuum cleaner. Weigh each test piece to an accuracy of 1 mg before and after each test. Sometimes a small edge hanging from the test piece has to be pulled off before weighing. Normally only one run per test piece is carried out, but if the abrasion is relatively small, several runs can be done. In this case care shall be taken to ensure that the sample is always placed in the sample holder in the same position and that the minimum thickness of the test piece is never less than 5 mm.

#### D-7 CALCULATION

**D-7.1** The abrasion is related to a defined



emery-cloth abrasive grade of 200 mg per 40 m abrasion distance and is calculated as the volume loss  $V$  given in cubic millimetre according to the following equation:

$$V = \frac{m \cdot S}{p \cdot a}$$

where

$V$  = volume loss in cubic millimetre,  
 $m$  = weight loss in mg,  
 $S$  = defined abrasive grade ( = 200 mg ),  
 $p$  = density in mg/cubic millimetre, and  
 $a$  = mean abrasive grade of emery-cloth in mg ( see D-6.2 ).

## D-8 REPORT

D-8.1 The report shall include the following particulars:

- Grade of the belting being tested;
- Density of the test pieces;
- Number of test pieces ( three );
- The average volume loss  $V$  in cubic millimetre;
- Any deviation from this standard, specially use of only half of the abrasion distance; and
- Testing date.

## ANNEX E

( Clause 13.1.3 )

### DETERMINATION OF NET LENGTH OF ENDLESS BELTING

#### E-1 PRINCIPLE

The length of endless belting is determined by the summation of a number of consecutive measurements made along the internal surface of the untensioned belting while laid out flat and then making a correction for thickness.

#### E-2 PROCEDURE

E-2.1 The belting shall be measured along the internal surface while laid out on a flat surface free from tension by making a number of consecutive measurements, reference marks being made to indicate the beginning and end of each measurement. Measurement shall be made to the nearest 5 mm.

E-2.2 The minimum increment of measurement shall be as follows:

Belting Length	Increment
Less than 30 m	Not less than one-quarter of the nominal length circumference
More than 30 m	Not less than 10 m

E-2.3 The sum of the individual measurements is the pitch length,  $l_p$ .

#### E-3 CALCULATION

The true internal circumference, termed 'net endless length', shall be determined by correcting the pitch for radius by subtracting the product of  $\pi \times$  thickness.

$$l_1 = l_p - \frac{\pi h}{1\ 000}$$

where

$l_1$  = net endless length ( true internal circumference ) in m,

$l_p$  = true pitch length in m, and

$h$  = thickness in mm.

NOTE — This formula applies to flat belting without ribs and channels which may produce a non-symmetrical cross-section. Whilst the formula is strictly correct only for homogeneous material, it is regarded as being sufficiently accurate for the purpose of belting measurement.

## ANNEX F

( Clauses 14.1, 14.2.1.1 and 14.2.2 )

### DETERMINATION OF FULL THICKNESS BREAKING STRENGTH AND ELONGATION

#### F-1 TENSILE TESTING APPARATUS

F-1.1 The accuracy of the tensile testing machine shall be within  $\pm 1$  percent.

F-1.2 The range of the machine shall be so chosen that the loads to be measured fall within 10 and 90 percent of the full scale deflection.

F-1.3 The load shall be applied smoothly and the rate of traverse of the driven grip shall be  $100 \pm 10$  mm per minute.

F-1.4 The method of holding the test piece shall be such as to ensure proper alignment of the test pieces eliminating slip or damage during



testing. The use of transverse serrated grips as illustrated in Fig. 6 are permissible. For very thick belts, double compartment grips as illustrated in Fig. 7 are permitted. The grip shall be free to move without undue friction and incorrect alignment.

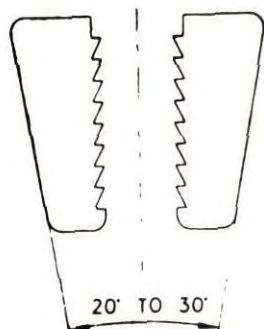


FIG. 6 SINGLE COMPARTMENT GRIPS

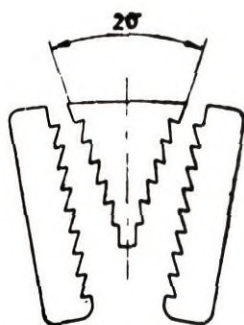


FIG. 7 DOUBLE COMPARTMENT GRIPS

## F-2 TEST PIECES

The test pieces shall conform to the shape and dimensions of any one of the types shown in Fig. 8 and shall be cut by the use of the suitable die, the cutting angle of which shall not exceed  $18^\circ$  ( see Fig. 9 ).

## F-3 PREPARATION AND CONDITIONING OF TEST PIECES

**F-3.1** The test pieces shall be cut not less than 3 days from the date of the manufacture of the belt and test pieces shall be conditioned for 3 days at  $27 \pm 2^\circ\text{C}$  and  $65 \pm 5$  percent relative humidity, and tested at the same conditions of temperature and humidity. Conditioning may be increased to a maximum of 14 days when agreed between the manufacturer and the purchaser.

**F-3.2** No test piece shall be cut from the sample with its longitudinal edge less than 25 mm from any edge of the sample.

**F-3.3** The thickness of the test piece shall be that of the belting under test. Three test pieces cut parallel to the centre line of the belt and three test pieces cut at right angle to the length of the belt shall be prepared. Test pieces shall be cut so as to contain no joints such as may be permitted under 11 and 12.

**F-3.4** If the covers of the belt are very thick or of very different thicknesses, the test shall be performed without cover in order to avoid slip of the test piece in the grip. Cover should only be removed if this is found to be necessary to obtain necessary breaks.

**F-3.5** In the event of a test piece having covers of different thicknesses, the reference line as shown in Fig. 8 should be marked on the thinner cover.

## F-4 PROCEDURE

**F-4.1** The test piece shall be placed in the grips or jaws of the machine so that the widest part of the shoulders of the test piece are carefully positioned in line with the front edge of the jaws and the axis of the test piece coincides with the centre line of the jaws.

**F-4.2** The machine shall be started and the driven jaw traversed at the specified rate until rupture of the test piece occurs, at which point the maximum load applied shall be noted.

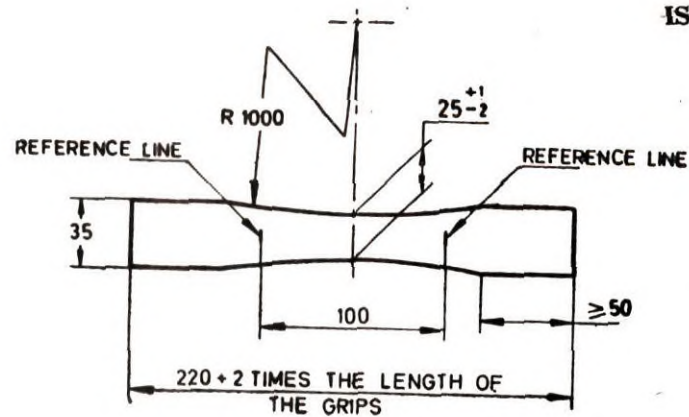
**F-4.3** The results of breaks occurring outside the reference lines on the test piece shall normally be discarded, but if results of such tests are required they shall be reported as 'jaw-breaks'.

**F-4.4** The elongation shall be determined by measuring the distance between the reference lines at 10 percent of the specified breaking strength of the belt ( reference load ) and at the moment of break of the test piece.

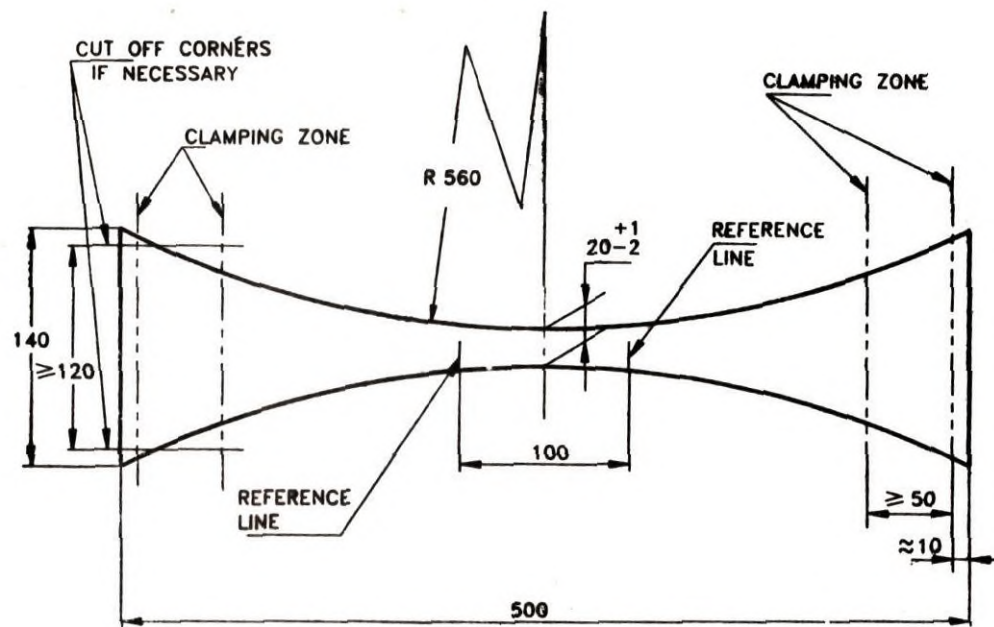
## F-5 RESULTS

**F-5.1** The breaking strength of each test piece shall be expressed in kN/m width and the mean value for each of the two sets of three tests made parallel to and at right angles to the length of the belt shall be reported.

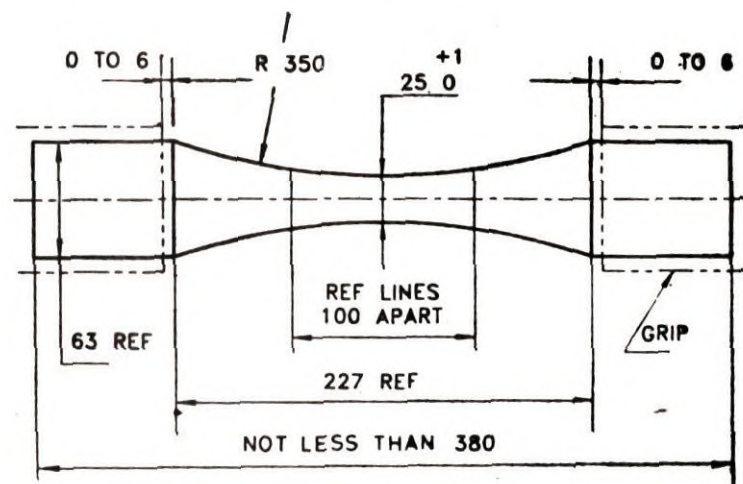
**F-5.2** The elongation values in the longitudinal direction shall be expressed as a percentage of the initial distance between the reference lines. The mean value for the three tests made in the longitudinal direction shall be reported.



TYPE A



TYPE B



TYPE C

All dimensions in millimetres.

FIG. 8 TYPES OF TENSILE TEST PIECE



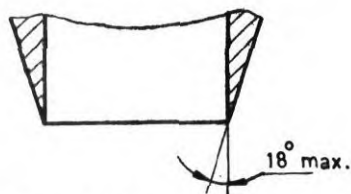


FIG. 9 CROSS SECTION OF DIE

## ANNEX G

( Clauses 15 )

### METHOD OF TEST FOR CONDUCTING ADHESION TEST

#### G-1 TEST PIECES

Cut four test pieces each  $25.0 \pm 1.0$  mm wide and of sufficient length to allow a minimum test length of 100 mm from the sample in the direction of warp and weft ( making two test pieces in each direction ), using sharp tool which leave a clean edge. The thickness of the ply which is to be separated shall not exceed 6 mm in thickness. If the ply which is to be separated exceeds 6 mm in thickness, cut it down to the requisite thickness before proceeding with the test. The thickness of this ply shall be not greater than the thickness of the remainder of the test piece. The test piece shall be cut about 10 cm from edge of the belt.

#### G-2 CONDITIONING OF TEST PIECES

Before testing, expose the pieces to moisture equilibrium in a standard atmosphere of  $65 \pm 5$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for at least 24 h and then immediately test at the same conditions of temperature and humidity.

#### G-3 TEST MACHINE

The test machine shall ensure substantially constant speed of traverse of the moving grip.

#### G-4 PROCEDURE

G-4.1 Break the bend to be tested over a dis-

tance of approximately 75 mm using sharp knife and pincers. Mount the test piece in the machine with the body of the test piece in the non-driven grip and the ply to be separated in the power driven grip so that the angle of separation is approximately  $180^\circ$ . Adjust the test piece in the grips so that the tension is distributed uniformly and no twisting occurs in the ply to be separated during the test. Start the machine and maintain the rate of travel of the power-drive grip at  $100 \pm 10$  mm per minute. Take the readings of the load causing separation at intervals of 12.5 mm over a length of 100 mm. Alternatively, an autographic recording of the test may be taken. Repeat the procedure on separate plies from the face ply to the centre ply. Test the second test piece in the same way commencing with the back ply and proceeding again to the centre ply. Repeat the whole test with a second pair of test pieces.

G-4.2 One pair of the test pieces in the warp direction and one pair in the weft direction shall be tested as mentioned in G-4.1.

#### G-5 RESULTS

Express the adhesion values as the average force kN/m width required to cause separation of the plies. The results are the average for four test pieces.

## ANNEX H

( Clause 16.2 )

### DETERMINATION OF TROUGHABILITY OF CONVEYOR BELTING

#### H-1 PRINCIPLE

A test piece consisting of a transverse full width section of belt is suspended at both ends with the carrying face uppermost so that the upper edges of these ends are in the same horizontal plane. The suspending forces act vertically and

the deflection of the test piece under gravity is unaffected by any other external force. The troughability is determined by measuring the maximum deflection of the test piece under its own weight and is expressed as the ratio of the deflection to the flat length of the test piece ( that is, the width of the belt ).

**H-2 APPARATUS** — See Fig. 10.

**H-2.1 Clamps** — See Fig. 11.

Two clamps hold the ends of the test piece;  
Each clamp shall:

- a) hold the test piece across a width of at least 140 mm and to depth into the clamp of not more than 10 mm;
- d) permit suspension of the test piece so that the horizontal axis of rotation of each clamp corresponds with a line across the

- b) prevent curvature across the end of the test piece;
- c) be balanced about a horizontal axis of rotation; and
- d) permit suspension of the test piece so that the horizontal axis of rotation of each clamp corresponds with a line across the

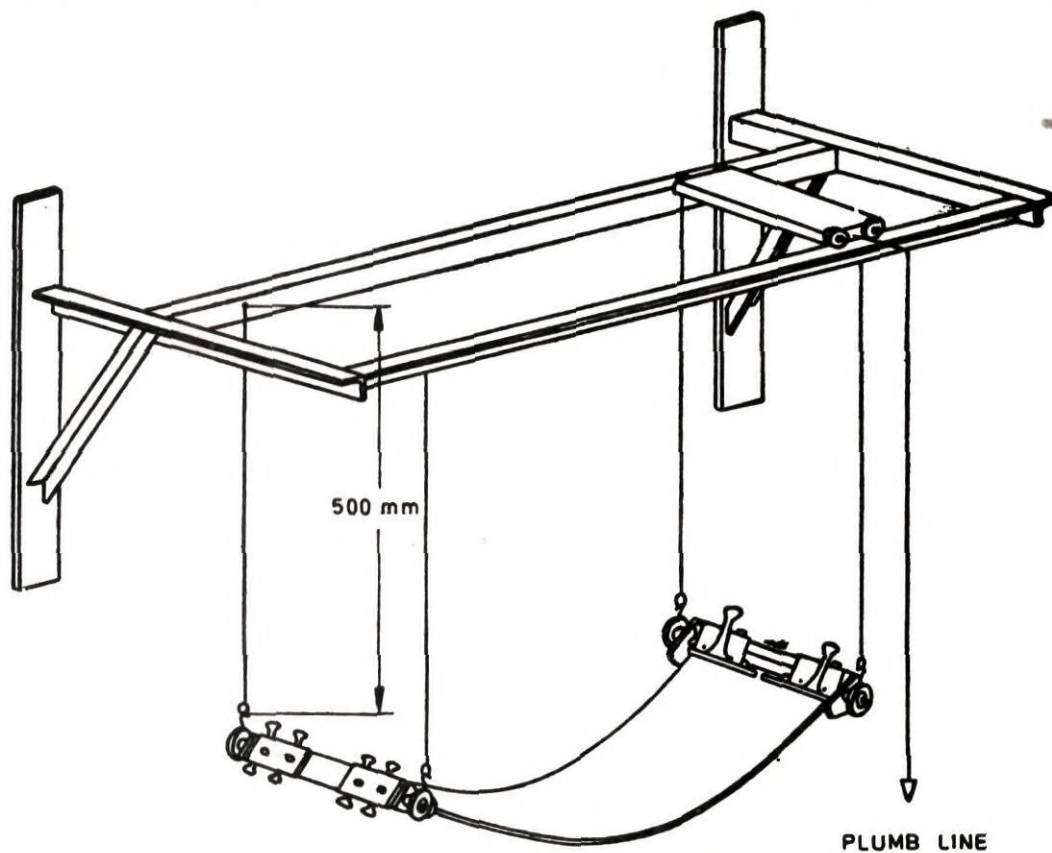
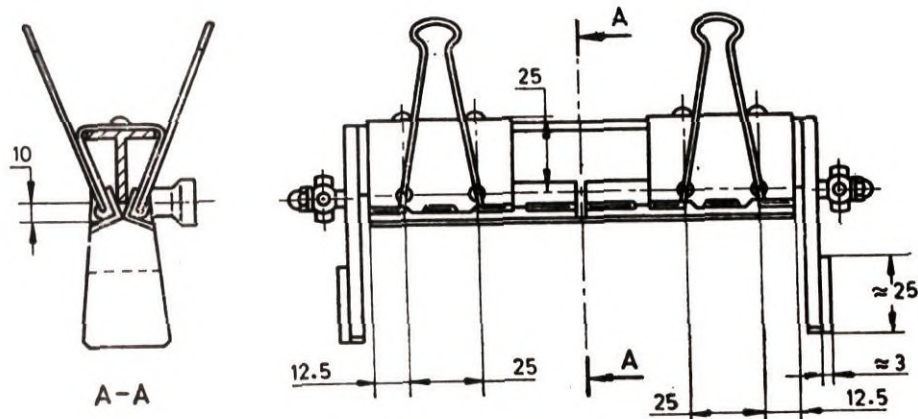


FIG. 10 APPARATUS FOR MEASURING TROUGHABILITY



**All dimensions in millimetres.**

**FIG. 11 CLAMPS**



respective end of the test piece midway between the top and the bottom surfaces.

## H-2.2 Suspension System for the Clamps

This system shall:

- maintain the axis of rotation of the clamps parallel and in the same horizontal plane;
- permit free rotation of each clamp with frictional forces reduced to a negligible value; and
- be adjustable to make the suspending forces act vertically through the axis of rotation of the clamps.

## H-2.3 Means of Measuring the Deflection of the Test Piece — See Fig. 12.

NOTE — To ensure the greatest possible accuracy when measuring deflection  $F$ , it is recommended that the clamps be suspended at an accurately known distance ( $A_1$  or  $B_1$ ) below or above a horizontal reference plane so that for the determination of  $F$ , it is only necessary to carry out one measurement, that is, the vertical distance ( $A_2$  or  $B_2$ ) from the horizontal reference plane to the lowest point on the edge of the surface of the carrying face, the measurement, in conjunction with the suspension threads, lengths and the belt thickness (measured with a micrometer) will enable  $F$  to be calculated accurately:

$$F = A_2 - A_1 + \frac{h}{2} = B_1 - B_2 + \frac{h}{2}$$

## H-3 TEST PIECE

### H-3.1 Preparation

Take the test piece at least 5 days after the manufacture of the belt.

H-3.1.1 The test piece shall comply with the following conditions:

- |           |  |
|-----------|--|
| Form      | — Rectangular parallel piped;  |
| Length    | — In the transverse direction of the belt, the flat width of the belt; |
| Width     | — In the longitudinal direction of the belt, 150 mm; and               |
| Thickness | — The thickness of the belt with covers.                               |

## H-3.2 Conditioning

Unless there is an agreement to the contrary, the test piece shall be conditioned before the test for at least 24 hours at a temperature of  $27 \pm 2^\circ\text{C}$ . During this period, it shall be maintained in a flat condition so as to remove residual curvature.

## H-4 PROCEDURE

H-4.1 Unless there is an agreement to the contrary the test shall be performed at a temperature of  $27 \pm 2^\circ\text{C}$ .

H-4.2 Prior to test, the operator shall satisfy himself that the clamps are free to rotate and will exert no bending moment on the test piece.

H-4.3 Measure the flat length  $L$  and the thickness of the test piece.

H-4.4 Fit the test piece, carrying face uppermost, while in the flat position, into the suspended clamps:

H-4.5 Then allow the test piece to fall under its own weight from the flat position to the troughed position.

H-4.6 Adjust the apparatus so that the suspending forces act vertically throughout the period of the test.

H-4.7 After 5 minutes, measure the vertical deflection  $F$  of the test piece. This deflection is the vertical distance from the end of the test piece to the lowest point on the vertical curve, midway between the top and the bottom surfaces (see Fig. 12).

## H-5 EXPRESSION OF RESULTS

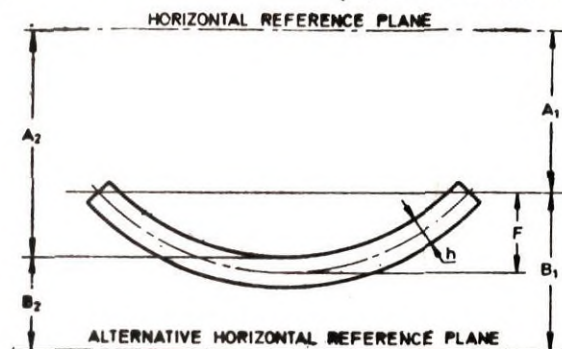
The results shall be expressed by the ratio  $F/L$ : where

$F$  = deflection, in mm, taken by the test piece; and

$L$  = flat length, in mm, of the test piece (width of the belt).

## H-6 REPORT

In addition to the value obtained for the ratio  $F/L$ , the value of  $L$  shall be reported.



All dimensions in millimetres.

FIG. 12 DETERMINATION OF DEFLECTION  $F$

## ANNEX J

( Foreword )

RECOMMENDED MAXIMUM WORKING TENSION IN BELT AND  
RECOMMENDED MINIMUM PULLEY DIAMETERS

**J-1** The working tension in the belt including initial tension should not exceed the following:

Type	Mechanical Joints kN/m	Spliced Joints kN/m
160	16	16
180	18	18
200	20	20
224	22	22.4
250	24	25
280	26	28
315	31	31.5
355	35	35.5
400	40	40
450	45	45
500	50	50
560	55	56
630	63	70
800	80	90
1 000	Mechanical fasteners not recommended	110
1 250		140
1 400		155
1 600		180
1 800		200

2) Delivery pulleys under full tension;

3) Loop pulleys in the triper; and

4) Terminal head pulleys in the case of tail driving, etc.

b) Snub pulleys in the return run under lower belt tension, for example:

1) Terminal tail pulleys in the case of head driving;

2) Terminal head pulleys for down-hill conveying, if the terminal tail pulley is brake; and

3) Snub and bend pulleys in take-up devices.

c) Bend pulleys for a change of direction of the belt less than 30°.

**J-2.2 Belt Carcass Thickness**

The belt carcass thickness  $e$  is the distance between the highest points of the upper layer of fabric and the lowest points of the lower layer ( see Fig. 13 ).

**J-2 RECOMMENDED PULLEY DIAMETERS****J-2.1 Types of Pulleys**

a) Driving pulleys and pulleys exposed to high belt tension, for example:

1) Main driving pulley on the head or on the tail;

**J-2.3** The use of pulleys of diameters that are too small for the thickness of belting and type of fabric used may lead to ply separation and, in extreme cases the actual fracture of the fabric. It is, therefore, recommended that pulleys' diameters should not be less than those given in Table 8.

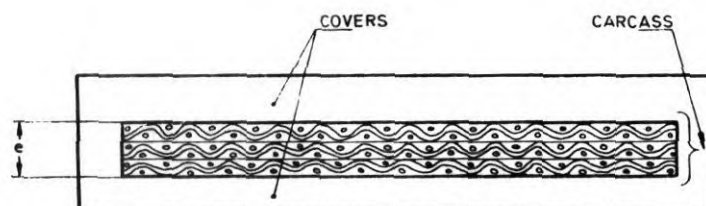


FIG. 13 BELT CARCASS THICKNESS



Table 8 Recommended Minimum Pulley Diameters

( Clause J-2.3 )

Carcass Thickness, in mm						Recommended Minimum Diameter in mm for Percentage of RMBT <sup>1)</sup> Used								
Cotton		100 Percent Polyamide		Polyester Polyamide		Over 60 Up to 100 Percent Type of Pulley			Over 30 Up to 60 Percent Type of Pulley			Up to 30 Percent Type of Pulley		
From	To	From	To	From	To	A	B	C	A	B	C	A	B	C
—	1.2	—	1.1	—	0.9	100	—	—	—	—	—	—	—	—
1.3	1.5	1.2	1.3	1.0	1.1	125	100	—	100	—	—	—	—	—
1.6	2.0	1.4	1.7	1.2	1.4	160	125	100	125	100	—	100	100	—
2.1	2.5	1.8	2.2	1.5	1.8	200	160	125	160	125	100	125	125	100
2.6	3.1	2.3	2.7	1.9	2.3	250	200	160	200	160	125	150	160	125
3.2	3.9	2.8	3.5	2.4	2.9	315	250	200	250	200	160	200	200	160
4.0	5.0	3.6	4.4	3.0	3.7	400	315	250	315	250	200	250	250	200
5.1	6.2	4.5	5.5	3.8	4.6	500	400	315	400	315	250	315	315	250
6.3	7.8	5.6	7.0	4.7	5.8	630	500	400	500	400	315	400	400	315
7.9	10.0	7.1	8.8	5.9	7.4	800	630	500	630	500	400	500	500	400
10.1	12.5	8.9	11.1	7.5	9.2	1 000	800	630	800	630	500	630	630	500
12.6	15.6	11.2	13.8	9.3	11.5	1 250	1 000	800	1 000	800	630	800	800	630
15.7	17.5	13.9	15.5	11.6	12.9	1 400	1 250	1 000	1 250	1 000	800	1 000	1 000	800
17.6	20.0	15.6	17.7	13.0	14.8	1 600	1 250	1 000	1 250	1 000	800	1 000	1 000	800
		17.8	20.0	14.9	16.6	1 800	1 400	1 250	1 400	1 250	1 000	1 250	1 250	1 000
				16.7	18.5	2 000	1 600	1 250	1 600	1 250	1 000	1 250	1 250	1 000

<sup>1)</sup> RMBT — Recommended maximum belt tension.

A — Driving pulleys and pulleys exposed to high belt tension.

B — Snub pulleys in the return run under lower belt tension.

C — Bend pulleys for a change of direction of the belt of less than 30°.

**ANNEX K**

( Foreword )

**INFORMATION TO BE SUPPLIED BY THE PURCHASER WITH ENQUIRY OR ORDER****K-1 CONVEYOR REPLACEMENT BELTING**

When the belt is to be a replacement on an existing conveyor, the following information will be required:

- 1) Details of existing belt;
- 2) Belt width;
- 3) Belt speed;
- 4) Pulley diameters;
- 5) Method of take-up and amount available;
- 6) Type of drive including coupling and configuration of drive;
- 7) Whether drive pulleys are lagged or bare;
- 8) Angle of carrying idlers; and
- 9) Profile sketch indicating position of drive, take-up, tripper and vertical curve radii should be available, if possible.

**K-2 CONVEYOR BELTING FOR A NEW INSTALLATION**

The following additional information, wherever possible and applicable, shall be supplied when the belt is to be used for a new installation:

- 1) Material to be conveyed;
- 2) Conditions — wet, dry, sticky, greasy, abrasive, hot or cold, state temperature if known or describe conditions, whether cleaners are required;
- 3) Bulk density of material in kg/m<sup>3</sup>;
- 4) Size of largest lumps ( 3 dimensions );
- 5) Average size of materials;
- 6) Percentage of largest pieces;
- 7) Method of handling material immediately prior to feeding the plant;



- 8) State if the feed is to be regulated and type of feeder preferred;
  - 9) Height of material fall at loading;
  - 10) Conveyor duty — mass per hour per day of hours;
  - 11) Peak load which will be fed to conveyor mass per minute;
  - 12) Type of belt joint required;
  - 13) Method of discharging conveyor;
  - 14) Amount of lift or fall;
  - 15) Initial length ( centres of head and tail pulleys );
  - 16) Ultimate length ( centres of head and tail pulleys );
  - 17) Position of drive;
  - 18) Power supply—volts, ac or dc, and if ac cycles per second and number of phases;
  - 19) Type of motor to be used and starting torque;
  - 20) Contour sketch of proposed installation;
  - 21) Arc of contact of belt with driving pulley;
  - 22) Preferred idler arrangement and troughing angle;
  - 23) Environmental conditions; and
  - 24) Any special features of test requirements.
- 5) If belt is for new installation, the width of belt for which installation is designed;
  - 6) Belt speed, metres per minute;
  - 7) Type of belt joint required;
  - 8) Material to be conveyed;
  - 9) Mass of material in kg/m;
  - 10) Is material sized or unsized?
  - 11) Average size of material in mm ( 3 dimensions );
  - 12) Condition of material ( hot, cold, dry, wet, slimy, sticky, corrosive, abrasive, soft, hard, brittle, etc ); if hot, state temperature;
  - 13) Mass of material carried in tonnes per hour;
  - 14) Peak load per minute in tonnes;
  - 15) Centre-to-centre distance of elevator in metres;
  - 16) Is elevator vertical or inclined? If inclined, state angle or elevation;
  - 17) Diameter of head and tail pulleys;
  - 18) Width of head and tail pulleys;
  - 19) Situation, indoor or outdoor;
  - 20) Are pulleys bare or legged?
  - 21) Type of motor to be used and starting torque;
  - 22) Amount of adjustment available in the take-up device for tensioning the belt, Is boot adjustable?
  - 23) Weight of boot pulley ( if it is acting as a gravity take-up );
  - 24) Are bucket spaced or continuous?
  - 25) Distance between buckets;
  - 26) Width of bucket in mm ( along width of belt );
  - 27) Mass of each empty bucket in kg;
  - 28) The extent to which the buckets are filled, percent;
  - 29) Projection of bucket from belt face in mm;
  - 30) Method of attaching buckets to belt ( sketch to be given showing position of belts ); and
  - 31) Dimensions of bucket with a sketch.

### K-3 ELEVATOR BELTING FOR REPLACEMENT/NEW INSTALLATION

The following information will be required when an elevator belt is required for a new installation or replacement:

- 1) Is belt for replacement? If so, details of old belt; belt width in mm, bucket side cover thickness in mm, pulley side cover thickness in mm; number of plies; grade; type of fabric and make;
- 2) How long did the old belt last ?
- 3) How did the old belt fail? Cover failure or carcass failure?
- 4) Performance details of old, excessive belt stretch or cover peeling; bucket tearing out or fastener trouble;