Designation: D378 – 10

Standard Test Methods for Rubber (Elastomeric) Conveyor Belting, Flat Type[1]

This standard is issued under the fixed designation D378; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods (and references) cover the procedures for evaluating the physical properties of flat conveyor belting. Performance criteria for belting will not be detailed here, but can be found through the RMA (Rubber Manufacturers Association) Conveyor and Elevator Belt Handbook, ANSI (American National Standards Institute), various governmental authorities, and the International Organization for Standardization (ISO). Belting for conveying and elevating materials generally is designated and defined as follows:

1.1.1 *Heavy Duty Conveyor*—A heavy duty belt is defined as belting designed for bulk haulage of materials, such as stone, crushed rock, sand, metals ores, coal, wood chips, etc., and has a carcass strength (design) substantial enough to withstand conveyor system tensions of 160 PIW[2] (pounds per inch of width) and above.

1.1.2 *Light Duty Conveyor*—A light duty belt is defined as belting designed for conveying a variety of lower weight (density) materials, packages, industrial and electronic goods, and food products. These belts often are shorter in length and width, with less overall thickness than heavy duty belting, and are generally used in conveyor systems with tensions less than 160 PIW.

1.1.3 *General Description*—Belting can have elastomeric coverings on one side, both sides, or neither side depending upon the specific application requirements. Belt coverings are comprised of various synthetic or natural rubber polymers, PVC, or other elastomeric materials, dependent upon application or customer requirements. The strength (load bearing) member(s) of most belting generally is a woven or interwoven carcass of synthetic or natural fibers, such as, but not limited to, polyester, nylon, polyaramide and cotton, as well as steel (cable/cord type or woven mesh).

1.2 *This standard does not purport to address all of the application specific testing available or safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D413 Test Methods for Rubber Property—Adhesion to Flexible Substrate

D471 Test Method for Rubber Property—Effect of Liquids

D573 Test Method for Rubber—Deterioration in an Air Oven

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D1415 Test Method for Rubber Property—International Hardness

D1894 Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting

D2240 Test Method for Rubber Property—Durometer Hardness

D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products

D3767 Practice for Rubber—Measurement of Dimensions

D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries

D5963 Test Method for Rubber Property—Abrasion Resistance (Rotary Drum Abrader)

2.2 *ISO Standards:*[4]

ISO 282 Conveyor Belts—Sampling

ISO 283 Textile Conveyor Belts—Full Thickness Tensile Strength, Elongation at Break and Elongation at the Reference Load—Test Method

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.31 on Rubber Hose and Belting.

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[2] PIW is not an SI unit.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

ISO 284 Conveyor Belts—Electrical Conductivity—Specification and Test Method
ISO 340 Conveyor Belts—Laboratory Scale Flammability Characteristics—Requirements and Test Method
ISO 505 Conveyor Belts—Method for the Determination of the Tear Propagation Resistance of Textile Conveyor Belts
ISO 4649 Rubber—Determination of Abrasion Resistance Using a Rotating Cylindrical Drum Device
ISO 7590 Steel Cord Conveyor Belts—Methods for the Determination of Total Thickness and Cover Thickness
ISO 7622–1 Steel Cord Conveyor Belts—Longitudinal Traction Test—Part 1: Measurement of Elongation
ISO 7622–2 Steel Cord Conveyor Belts—Longitudinal Traction Test—Part 2: Measurement of Tensile Strength
ISO 7623 Steel Cord Conveyor Belts—Cord-to-Coating Bond Test—Initial Test and After Thermal Treatment
ISO 8094 Steel Cord Conveyor Belts—Adhesion Strength Test of the Cover to the Core Layer
ISO 9856 Conveyor Belts—Determination of Elastic and Permanent Elongation and Calculation of Elastic Modulus

2.3 *RMA Technical Bulletins and Test Methods:*[5]

RMA IP-1 Conveyor and Elevator Belt Handbook

2.4 *U.S. Mine Safety and Health Administration (MSHA):*[6]

30 CFR 14 Requirements for the Approval of Flame-Resistant Conveyor Belts
30 CFR 18.65 Flame Test of Hose

3. Summary of Test Methods

3.1 ASTM test methods are specified to the extent that they can be applied to testing of flat belts.

3.2 Some of the test methods specified for flat belts are specific to flat belts only and do not appear in any other ASTM standard; however, some of these may involve use of ASTM test methods.

3.3 The test methods include the following:

Test Methods	Section
Measurement of Dimensions	8
Physical Properties of Elastomeric Covers	9
Immersion Tests	10
Adhesion Tests	11
Breaking Strength and Modulus Testing	12
Flame Test for Belting	13
Carcass Tear Test	14
Troughability Test	15
Breaking Strength of Mechanical Fastenings (Static Test Method)	16
Elevator Belt Bolt Holding Strength Test	17
Steel Cord/Cable Belt Testing	18

4. Significance and Use

4.1 Flat conveyor belts are used in many industrial applications in which they are subjected to a great variety of stresses and conditions. Service conditions can be calculated or measured. Design levels and test requirements are established by manufacturers, or end-users, or both. The tests (test methods) are used to measure the characteristics of conveyor belting as they relate to service conditions.

4.2 The tests outlined by these test methods are commonly applied by belt manufacturers to control the quality of their products.

4.3 Research and product development activities in flat belting involve extensive testing as outlined by these test methods.

4.4 In case of conflict between the provisions of these test methods and those of detailed specifications or test methods for a particular belt, the latter shall take precedence.

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5. Sampling

5.1 Test samples shall be the full width and thickness of the belt and shall be of sufficient length and width to perform the desired tests.

5.2 The level or number of samples required from each belt (or lot) shall be sufficient to cover the primary characteristic(s) being tested. Adhesion, overall thickness, hardness, and cover thickness testing usually requires a sample from each end of the belt or lot as a minimum. Reference ISO 282 for international sampling requirements.

6. Number of Tests

6.1 When minimum requirements are established, one specimen shall be tested for each physical characteristic required in the detailed specifications for a particular belt.

6.2 If minimum requirements are not established, a median of the values for three specimens shall be taken as the characteristics of the piece, except that under referee conditions the mean value for five specimens shall be used.

6.3 When doing immersion and aging tests it is necessary to test three specimens both before and after immersion or aging to determine a percentage change.

7. Test Conditions

7.1 Unless otherwise specified, conditioning and testing shall be carried out at a temperature of 23 ± 2°C (73.4 ± 3.6°F) and 50 ±5 % RH. Unless otherwise specified (for other than quality control), sample specimens shall be conditioned for at least three days at the standard conditions. Any and all test temperatures and conditions are reported.

7.2 For time between manufacture and test unless otherwise specified (for other than quality control), test pieces shall be cut or prepared at least five days after the belt is manufactured.

8. Measurement of Dimensions

8.1 *Width*—Determine the width using a steel rule or tape graduated in millimeters (or sixteenths of an inch) in conformance with Method C of Practice D3767. Record the width (length) in millimeters (or inches) to the nearest 1 mm (0.04 in.).

8.2 *Belt Length*—Belt length is determined using a calibrated wheel meter or calibrated tape rule. Length should be

[5] Available from the Rubber Manufacturers Association, 1400 K St. N.W., Suite 900, Washington D.C. 20005, www.rma.org.

[6] Available from Mine Safety & Health Administration, U. S. Department of Labor, 1100 Wilson Boulevard, Arlington, VA 22209, www.msha.gov.

measured on a line parallel to the sides of the belt. Record the length in meters or feet.

8.3 *Total Belt Thickness*—The thickness of a full width belt sample is determined as a mean average of measurements (sample points) across the full width of the sample. The number of sample points required varies according to width: three equidistant measurement points for belt widths of 600 mm (24 in.) or less, five measurement points for belts greater than 600 mm (24 in.), up to 1200 mm (48 in.), and eight points for belts greater than 1200 mm (48 in.). Report the thickness to the nearest 0.02 mm (or 0.001 in.).

8.4 *Thickness of Covers*—The thickness of the top or bottom cover shall be determined as follows: first, measure the over-all thickness of the test specimen; then, strip the elastomeric cover from one surface and measure the thickness of the carcass, including the remaining cover. The difference between the first and second measurements will represent the thickness of the cover removed. Follow the same procedure on the test specimen from which the first cover has been removed when the thickness of the other cover is required. The test specimen may consist of a small section cut from the belt. In many cases, especially with PVC or TPE (thermoplastic elastomer) belting of interwoven (solid woven) carcass construction, the covers cannot be removed without distorting the sample. Buffing, to remove thermoplastic cover(s) from the specimen, may be necessary. In other cases, a hand-held micrometer or optical micrometer is used to measure the thickness of the components.

8.5 *Thickness of Cover When a Breaker Is Used*—The thickness of the cover shall include the breaker, unless otherwise specified.

9. Physical Properties Of Elastomeric Covers Or Belt Surfaces (Or Both)

Scope—A number of specific test procedures for determining a variety of physical properties of conveyor belt cover material are detailed in this section. These tests are extensive and are referenced to established test procedures; primarily existing ASTM and ISO standards. It is beyond the scope and necessity of this section to detail every procedure in its entirety. This section is intended to serve as a guide for the testing of these materials. The routine tests (and references) for tensile, elongation, hardness, tear resistance, and accelerated aging are covered through Section 9.6. More specific tests (references) for other properties, such as coefficient of friction, abrasion resistance, ozone deterioration, and static conductivity are covered through Sections 9.7-9.10, respectively.

9.1 *Apparatus*—The dies, bench marker, stamp, pad, micrometer, testing machine, testing machine grips, and calibration of the testing machine shall conform to Test Methods D412.

9.2 *Test Specimens:*

9.2.1 *Preparation of Cover Pieces*—Separate the covers from the carcass according to Practice D3183. Buff the covers if necessary to obtain smooth parallel surfaces. If possible, cover pieces should be about 150 mm (6 in.) long, at least 25 mm (1 in.) wide, and 2.0 ±0.2 mm (0.08 ±0.008 in.) thick. In no case shall the thickness exceed 3 mm (0.12 in.) or be less than 1 mm (0.04 in.). A meat slicer or commercial skiving tool can be used to remove adequate sample specimens from the belt cover. If cover pieces cannot be obtained from the belt, molded sheets prepared from the same unvulcanized rubber compound with an equivalent state of vulcanization may be requested from the belt manufacturer.

9.2.2 *Preparation of Test Specimen*—The test specimen shall be stamped out from the separated cover with a steel die conforming to A, B, or C of Fig. 1 of Test Methods D412. Die B shall be used when the size of the sample and the tension and stretch limits of the testing machine permit, with exceptions as explained below. If the tension limit is too low for the machine, Die A shall be used. If the stretch limit is too high for the machine, Die C shall be used. Die C shall be used for samples that are too small for Die A or B.

9.2.3 *Marking*—Dumbbell specimens shall be marked with the prescribed stamp pad and either of the prescribed bench markers described in Test Methods D412. Aged or immersed dumbbell specimens shall be marked after oven aging or immersion testing.

9.3 *Procedure*—Use the procedure for tensile testing, measuring and recording in accordance with Test Methods D412. Measure and record the elongation to the nearest 10 % of the original distance between bench (reference) marks.

9.3.1 *Calculations:*

9.3.2 *Tensile Strength*—The tensile strength (stress) is the applied force relative to the original cross-sectional area. It is calculated by dividing the force in N (lbf) by the cross-sectional area of the unstressed specimen in square meters ($in.^2$) and is expressed in MPa or psi.

9.3.3 *Elongation*—The elongation (strain) is the extension between bench (reference) marks, produced by a tensile force applied to a specimen, relative to the original distance between the marks. It is calculated by dividing the distance extended beyond the original distance by the original distance and is multiplied by 100 to get percent.

9.4 *Cover Hardness*—Refer to either Test Method D1415 or D2240 for procedures and calculation. The values should be expressed in International Hardness or Durometer Hardness units.

9.5 *Cover Tear Test*—Testing is conducted per Test Method D624. Results are expressed in units of pounds per inch (thickness), ppi, or kilo Newtons per meter, kN/m. The type die, B, C, or trouser test method shall be included in the test report. Preparation of the samples is accomplished as described in 9.2.1.

9.6 *Procedure For Physical Properties Of Elastomeric Covers After Heat Aging*—Proceed in accordance with either Test Method D573 or D865.

9.7 *Coefficients Of Friction, Static And Kinetic*—Test Method D1894 is used to determine relative values for these surface properties.

9.8 *Abrasion Resistance*—Test methods used and referred to most frequently in the conveyor belt industry are Test Method D5963 and ISO 4649.

9.9 *Ozone Resistance*—The effect of exposure to ozone is determined by Test Methods D1149 with results reported as pass/fail (cracking) for exposures to specified ozone concentrations in parts per hundred million (pphm), at specific temperatures and time duration(s).

9.10 *Electrical Surface Resistance*—The electrical surface characteristics of conveyor belting are tested based on the original RMA procedure (RMA 808) since adopted as ISO 284. An abbreviated procedure for this testing is detailed.

9.10.1 *Principle*—An electrical current of specified voltage is passed through electrodes of a suitably prepared test piece taken from the belt.

9.10.2 *Apparatus (see* Fig. 1*):*

9.10.2.1 A sheet of insulating material slightly larger than the test specimen.

9.10.2.2 Two cylindrical and coaxial brass electrodes, the base of one being circular and the other annular. The circular electrode will have an OD of 150 mm (6 in.) and an ID of 125 mm (5 in.) and a height of 22 mm (0.9 in.), with a mass of 900 g (31.8 oz). The annular electrode has a diameter of 25 mm (1 in.) and a height of 32 mm (1.25 in.), with a mass of 115 g (4.06 oz). The bases of these electrodes will be machined flat and polished. Flexible insulated wire is connected to each electrode.

9.10.2.3 *Resistance Measuring Instrument*—capable of giving readings between 10^5 and 10^{10} ohms, ±5 %.

9.10.2.4 Source of direct current at 1000 V maximum.

9.10.3 *Test Pieces*—two belt samples.

9.10.3.1 *Shape and Dimensions*—square samples including covers, 300 mm × 300 mm (12 in. × 12 in.).

9.10.3.2 *Preparation*—Both surfaces of the specimen(s) are cleaned thoroughly by rubbing with Fuller's earth, using a clean cloth. All traces of residue are to be removed and the surface wiped with a clean cloth and distilled water and dried. A solution of anhydrous polyethylene glycol (mol. wt. 600), 800 parts by mass and distilled water 200 parts by mass with one part of soft soap, is applied on one surface of the test specimen in areas corresponding to the electrode surfaces.

9.10.4 *Conditioning*—Sample should be conditioned for at least 2 h at 23 ± 2°C (73.4 ± 3.6°F) and 50 ±5 % RH.

9.10.5 *Procedure*—Place test piece on the insulating material with the liquid pattern facing up. Clean the lower faces of the brass electrode and place them on the liquid contact agent. Connect the outer electrode to the earth (lower voltage) terminal of the measuring instrument and the inner electrode to the high voltage terminal. Measure the resistance after applying full voltage for 1 min. Repeat the procedure for the other side (surface) of the test piece (and again for both sides of the second sample piece).

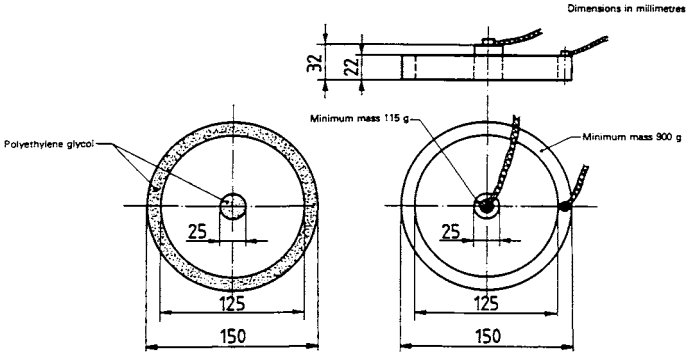


FIG. 1 Apparatus for Testing of Electrical Surface Resistance

9.10.6 *Expression of Results*—Record the electrical resistance (mean value) for each surface of the sample(s) in ohms.

9.10.7 *Report:* a) The identification of the belt sample.

b) Test conditions.

c) The results (in ohms) for each surface (side) of the sample.

9.11 *Report—Cover Properties:*

9.11.1 Follow the reporting format according to the referenced procedures.

10. Immersion Tests

10.1 *Purpose*—Immersion tests are necessary when determining the effects of various fluids, oils, and service media on elastomeric belt covers and belts.

10.2 *Test Method*—Use Test Method D471.

10.3 *Specimens*—Cover samples are obtained and prepared as in Section 9.2.

10.4 *Test Liquids*—For standard oil exposure use ASTM Oil No. 1 or IRM 903. For non-oil applications, use the actual service fluid or representative test media. Designate this medium for the test report.

10.5 *Test Conditions*—For ASTM test Oil No. 1 or IRM 903, the test shall be 70 h at 100°C (212°F). When the actual service fluid is used, the user and the manufacturer should agree on the test conditions.

10.6 *Report*—List the changes in tensile strength, elongation, and volume after exposure to the test fluid. Record the test fluid and the time and temperature of exposure.

11. Adhesion Tests

11.1 *Apparatus*—Use the static mass or machine method apparatus in accordance with Test Methods D413.

11.2 *Test Specimens*—The 25 mm (1 in.) wide by 150 mm (6 in.) minimum long test specimen shall be cut with the longer dimension longitudinally from belts less than 150 mm (6 in.) wide but transversely from belts 150 mm (6 in.) and greater in width. Separate each layer a sufficient distance to permit securing it in the jaws of the testing clamp.

11.2.1 *Number*—One specimen, cut longitudinally, or transversely, or both.

11.2.2 *Conditions*—Standard in accordance with Section 7.

11.3 *Test Procedure(s)*—Test in accordance with Test Methods D413 noting the method used (Strip Type A, Type B, static-mass or machine) and direction of separation (longitudinal/transverse).

11.4 *Results and Report*—The report shall include the following information:

11.4.1 Identification of the belt (and type), number of plies, cover thickness, condition (new or used), and any significant characteristics, which may have an effect on the test results.

11.4.2 Test method (and conditions) and direction of pull.

11.4.3 Mean value of cover to carcass adhesion (if applicable), expressed in pounds per inch of width, or kilonewtons per meter (kN/m), as well as the thickness (top or bottom) of the cover(s).

11.4.4 The mean value of the ply to ply adhesion (if applicable), expressed as in 11.4.3.

12. Breaking Strength and Modulus Testing of Conveyor Belting

12.1 *Apparatus*—The apparatus shall be a tensile testing machine or dynamometer capable of applying stress sufficient for the belt being tested. The clamps used for holding the test pieces should ensure perfect fixing of the pieces without slippage during the test. A transverse serrated grip surface is usually required. The heads of the testing machine shall be constructed to provide uniform lateral alignment of the clamps. The inner surfaces of the wedge-shaped slots shall be machined to within 0.1 mm (0.004 in.) of a true plane. The included angle of the two sides shall be from 17.5° to 22°. This angle must be identical to the angle of the clamps.

NOTE 1—The test apparatus, sample configuration, and procedures for testing very high tension belting, such as steel cable or aramid cord type, may be substantially different from that described here. Please refer to the manufacturers for appropriate test protocol.

12.2 *Test Specimens*—A minimum of three test specimens. No specimen shall contain a ply joint.

12.2.1 *Conditioning*—For other than quality control, testing shall take place after conditioning the specimens for three days at standard conditions, unless otherwise agreed to by the manufacturer and the user.

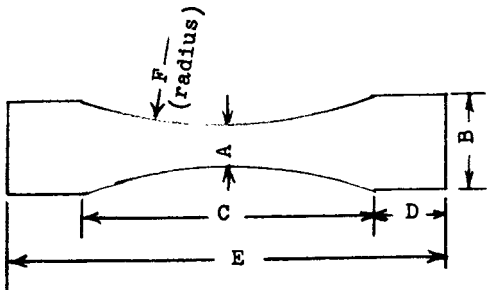
12.2.2 *Rubber Covers*—Rubber cover in excess of 3-mm (0.12-in.) thickness can be removed from the test specimen as they may be conducive to slippage in the clamps.

12.2.3 *Longitudinal (Warp) Test Specimen*—The longitudinal test specimen shall not be cut closer than 50 mm (2 in.) from the belt edge. The test specimen shall be cut parallel to the longitudinal belt axis.

12.2.4 *Transverse (Weft or Filling) Test Specimen*—The transverse test specimen shall be cut perpendicular to the longitudinal belt axis.

12.2.5 *Shape and Dimension of Test Specimens*—Test samples shall be of rectangular or dumbbell configuration (see Fig. 2). The rectangular test piece generally obtains the highest strength values, but tends to show breaks at the edges of the test piece or in the clamps. The waisted or dumbbell specimen should be used when the sample exhibits excessive slippage or jawbreaks.

12.2.5.1 *Rectangular Test Specimen*—The rectangular test specimen shall be not less than 50 mm (2 in.) wide or not less than 150 mm (6 in.) plus two times the clamp length. The rectangular test specimen shall be used for elongation and modulus testing, as well as, breaking strength (tensile) until the specimen slips or breaks in the clamps. Specimen slippage in the clamps can be minimized by rubbing rosin on the portion of the specimen that will be in the clamps, removing any excess rosin and enclosing both sides of the rosin coated specimen with coarse emery cloth. Fold the emery cloth over the ends of the specimen with the coarse side of the cloth next to the rosin coated surfaces as the specimen is inserted into the clamps. When the rosin/emery cloth treatment will not prevent the rectangular specimen from slipping out of the clamps use the dumbbell type specimen. The ratio of specimen width in the clamp to clamp width should approach one; however, if this is not possible, excess clamp width should be filled in with additional specimen material. Longer specimens will be required when the clamp length is incompletely filled. The extension reference marks for the elongation test shall be not less than 100 mm (4 in.) apart and not less than 25 mm (1 in.) from the adjacent clamp.



	mm	in.
A	25 (–0 + 1)	1.0 (–0 + 0.04)
B	65 (min)	2.5 (min)
C	220 (min)	8.65 (min)
D	50 (min)	2 (min)
E	C + 2 (clamp length), (min)	
F	312 (min)	12.3 (min)

Other recommended dimensions are 1000 mm (39 in.), 560 mm (22 in.), and 350 mm (14 in.) (For other dimensions see ISO 283).

FIG. 2 Dimensions of Dumbbell Test Specimen

12.2.5.2 *Dumbbell Test Specimen*—The dumbbell test specimen shall conform to the dimensions in Fig. 2. The clamps shall be not less than 220 mm (8.65 in.) apart when the test specimen is inserted. The extension reference marks for the elongation test shall be 100 mm (4 in.) apart.

12.3 *Procedure: Breaking Strength*—Exert an uninterrupted tensile stress on the test specimens, at a separation rate of 100 mm/min ±10 mm/min (4 in./min ±0.4 in./min). Discard test data for specimens that break outside the extension reference marks for elongation measurements or for test pieces breaking in the clamps.

12.3.1 *Elongation*—Elongation measurements, taken during breaking strength testing, are obtained by measuring the difference of the initial reference marks at a specific load(s) and expressing this difference from the original reference distance as a percentage. The ultimate elongation at break, as well as, elongation under any specific load(s) and reference load (10 % of rated breaking strength) is determined with a steel scale or suitable extensometer.

12.4 *Expression of Results*—The median value of three tests or mean of five tests shall be used in the calculations.

12.4.1 *Belt Breaking Strength*—This strength is expressed as force per unit of width, that is, either pounds per inch (PIW) or kilo newtons per meter (kN/m).

12.5 Report the following information:

12.5.1 The direction of break (longitudinal or transverse) and number of plies of fabric (and material, such as polyester, nylon, etc.), or carcass construction shall be noted.

12.5.2 The ultimate stress and elongation at break, as well as, elongation at any specific reference load.

12.6 *Determination of Elastic Modulus—Method and Calculation (Reference ISO 9856):*

12.6.1 *Procedure*—Pre-stress the sample (rectangular specimen) with a load equivalent to 0.5 % of the ultimate (or specified minimum) belt tensile. Position the extensometer clamps (or optical marks) on the axis of the test piece with a separation of at least 100 mm (4 in.). Zero the recording unit to 0 strain. Load (stress) the rectangular test specimen between 2 % and 10 % of the minimum breaking load (or 20 % to 100 % of the rated or design working tension) in a sinusoidal manner for at least 200 cycles at a frequency of 0.1 Hz. A graph of applied stress (load) versus strain (elongation) is developed from the first and last cycle of the test.

12.6.2 Elastic Modulus, M, is expressed in N/mm (or lb/in.) of width of the test piece and is given by the formula:

$$M = \frac{\Delta F}{\varepsilon} \quad (1)$$

where:

ΔF = the variation/change in stress amplitude between 2 % and 10 % of the belt tensile load (or 20 % to 100 % of the design/rated working tension), expressed in N/mm or lb/in. of width,

ε = the relative strain/elongation. The relative strain/elongation, ε, is given by

$$\varepsilon = \frac{\Delta L}{L1} \quad (2)$$

where:

ΔL = the elastic elongation, expressed in millimeters (in.).

$L1$ = the initial length of the test specimen.

12.6.3 Calculate the arithmetic mean of the values and express the number, M, rounded to one decimal place.

12.7 *Report*—The test report shall contain the following information.

12.7.1 Identification of the belt(s) tested; manufacturer, type, design and material of carcass (plain weave, solid/interwoven, nylon, polyester, filament, spun, etc.), and number of plies, as applicable;

12.7.2 The type of stress/strain tests performed and reference to all applicable standard test procedures;

12.7.3 Results of the tests including specimen shape (die), and dimensions;

12.7.4 Test conditions and conditioning period; and,

12.7.5 Any deviation from referenced standards or procedures.

13. Flame Tests for Belting

13.1 *Flame Test for Underground Belting:*

13.1.1 This procedure is used to measure and describe the properties of conveyor belting in response to flame under controlled laboratory conditions and should not be used for the description or appraisal of the fire hazard of materials, products, or systems under actual fire conditions (see 30 CFR 14). This test applies to RMA-FR Class I belt (see RMA IP-1).

13.1.2 The following test method shall be used to measure flame propagation under a standard set of laboratory conditions and shall not be construed as indicating what will happen under actual fire conditions. Under some fire conditions, the belting may be consumed.

13.1.3 *Apparatus:*

13.1.3.1 *Test Chamber*—A horizontal test chamber 66 in. (167.6 cm) long by 18 in. (45.7 cm) square (inside dimensions) constructed from 1-in. (2.5-cm) thick Marinite I[supreg], or equivalent insulating material.

13.1.3.2 *Ventilation*—A 16-gauge (0.16 cm) stainless steel duct section which tapers over a length of at least 24 in. (61 cm) from a 20-in. (51-cm) square cross-sectional area at the test chamber connection to a 12-in. (30.5-cm) diameter exhaust duct, or equivalent. The interior surface of the tapered duct section must be lined with ½-in. (1.27-cm) thick ceramic blanket insulation, or equivalent insulating material. The tapered duct must be tightly connected to the test chamber.

13.1.3.3 *Burner*—A U-shaped gas-fueled impinged jet burner ignition source, measuring 12 in. (30.5 cm) long and 4 in. (10.2 cm) wide, with two parallel rows of 6 jets each. Each jet is spaced alternately along the U-shaped burner tube. The 2 rows of jets are slanted so that they point toward each other and the flame from each jet impinges upon each other in pairs. The burner fuel must be at least 98 % methane (technical grade) or natural gas containing at least 96 % combustible gases, which includes not less than 93 % methane.

13.1.3.4 *Support Stand*—A removable steel rack, consisting of 2 parallel rails and supports that form a 7 ± ⅛ in. (17.8 ± 0.3 cm) wide by 60 ± ⅛ in. (152.4 ± 0.3 cm) long assembly to hold a belt sample.

(1) The 2 parallel rails, with a 5 ± ⅛ in. (12.7 ± 0.3 cm) space between them, comprise the top of the rack. The rails and supports must be constructed of slotted angle iron with holes along the top surface.

(2) The top surface of the rack must be 8 ± ⅛ in. (20.3 ± 0.3 cm) from the inside roof of the test chamber.

13.1.4 *Test Specimens:*

13.1.4.1 *Shape and Dimensions*—A rectangular test piece shall be cut from the belt having a length of 60 ± ¼ in. long (152.4 ± 0.6 cm) by 9 ± ⅛ in. (22.9 ± 0.3 cm) wide.

13.1.4.2 *Number and Distribution*—Three test specimens shall be prepared.

13.1.5 *Procedure:*

13.1.5.1 Lay three samples of the belt, 60 ± ¼ in. (152.4 ± 0.6 cm) long by 9 ± ⅛ in. (22.9 ± 0.3 cm) wide, flat at a temperature of 70 ± 10°F (21 ± 5°C) for at least 24 h prior to the test;

13.1.5.2 For each of three tests, place one belt sample with the load-carrying surface facing up on the rails of the rack so that the sample extends 1 ± ⅛ in. (2.5 ± 0.3 cm) beyond the front of the rails and 1 ± ⅛ in. (2.5 ± 0.3 cm) from the outer lengthwise edge of each rail;

13.1.5.3 Fasten the sample to the rails of the rack with steel washers and cotter pins. The cotter pins shall extend at least ¾ in. (1.9 cm) below the rails. Equivalent fasteners may be used.

Make a series of 5 holes 9⁄32 in. (0.7 cm) in diameter along both edges of the belt sample, starting at the first rail hole within 2 in. (5.1 cm) from the front edge of the sample. Make the next hole 5 ± ¼ in. (12.7 ± 0.6 cm) from the first, the third hole 5 ± ¼ in. (12.7 ± 0.6 cm) from the second, the fourth hole approximately midway along the length of the sample, and the fifth hole near the end of the sample. After placing a washer over each sample hole, insert a cotter pin through the hole and spread it apart to secure the sample to the rail;

13.1.5.4 Center the rack and sample in the test chamber with the front end of the sample 6 ± ½ in. (15.2 ± 1.27 cm) from the entrance;

13.1.5.5 Measure the airflow with a 4-in. (10.2-cm) diameter vane anemometer, or an equivalent device, placed on the centerline of the belt sample 12 ± ½ in. (30.5 ± 1.27 cm) from the chamber entrance. Adjust the airflow passing through the chamber to 200 ± 20 ft/min (61 ± 6 m/min);

13.1.5.6 Before starting the test on each sample, the inner surface temperature of the chamber roof measured at points 6 ± ½, 30 ± ½, and 60 ± ½ in. (15.2 ± 1.27, 76.2 ± 1.27, and 152.4 ± 1.27 cm) from the front entrance of the chamber must not exceed 95°F (35°C) at any of these points with the specified airflow passing through the chamber. The temperature of the air entering the chamber during the test on each sample must not be less than 50°F (10°C);

13.1.5.7 Center the burner in front of the sample's leading edge with the plane, defined by the tips of the burner jets, ¾ ± ⅛ in. (1.9 ± 0.3 cm) from the front edge of the belt;

13.1.5.8 With the burner lowered away from the sample, set the gas flow at 1.2 ± 0.1 standard cubic feet per minute (SCFM) (34 ± 2.8 L/min) and then ignite the gas burner. Maintain the gas flow to the burner throughout the 5 to 5.1-min (5 to 5 min and 6 s) ignition period;

13.1.5.9 After applying the burner flame to the front edge of the sample for a 5 to 5.1-min (5 to 5 min and 6 s) ignition period, lower the burner away from the sample and extinguish the burner flame;

13.1.5.10 After completion of each test, determine the undamaged portion across the entire width of the sample. Blistering without charring does not constitute damage.

13.1.6 *Report*—Report the following information for each belt tested:

13.1.6.1 Specification and description of each belt tested;

13.1.6.2 The remaining length of the tested sample that exhibited an undamaged portion across its entire width.

13.1.6.3 Description of any unusual behavior of the specimen(s) noted during the test.

13.2 *Flame Test for Above Ground Belting:*

13.2.1 This procedure is used to measure and describe the properties of conveyor belting in response to flame under controlled laboratory conditions and should not be used for the description or appraisal of the fire hazard of materials, products, or systems under actual fire conditions (see 30 CFR 18.65). (Since the adoption of 30 CFR 14, Section 18.65 is no longer a U.S. Federal requirement for conveyor belting. However, this test procedure is recommended by the U.S. conveyor belt manufacturing industry as a suitable test procedure for Above Ground Belting). This test applies to RMA-FR Class II belt (see RMA IP-1).

13.2.2 The following test method shall be used to measure the duration of flame and afterglow under a standard set of laboratory conditions and shall not be construed as indicating what will happen under actual fire conditions. Under some fire conditions, the belting may be consumed.

13.2.3 *Apparatus:*

13.2.3.1 *Test Chamber*—The chamber shall be a 0.53 m (21 in.) cubicle.

13.2.3.2 *Support Stand,* with a ring clamp and wire gauze.

13.2.3.3 *Pittsburgh—Universal Bunsen—Type Burner,* (inside diameter of burner tube shall be 11 mm (0.44 in.)) or equivalent, mounted in a burner placement guide in such a manner that the burner may be placed beneath the test specimen or pulled away from it by an external knob on the front panel of the test chamber.

13.2.3.4 *Variable Speed Electric Fan and an ASME Flow Nozzle,* 406 to 216 mm (16 to 8.5 in.) reduction to attain constant air velocities at any speed between 0.25 to 2.5 m/s (50 to 500 ft/min). The fan must reach proper speed in 3 s.

13.2.3.5 *Electric Timer or Hand-Operated Stopwatch,* accurate to 1 s, to measure the duration of the tests.

13.2.3.6 *Mirror,* mounted inside the test chamber to permit the test specimen to be viewed from the back through the viewing door.

13.2.3.7 *Exhaust System*—An electrically driven exhaust fan, controlled by a variable autotransformer is connected at the exhaust side of the cabinet (opposite from the air flow nozzle) to produce the air flow over the specimen. The fan must be equipped with an "on/off" switch. If the exhaust system is equipped with a damper, it must not be used to turn the air flow on and off. Independent studies by MSHA and NIST have both shown that afterflame times are directly dependent on the acceleration or time to go from 0 to 300 ft/min air flow. The "on/off" switch must be used for starting the motor used to produce the air flow. The airflow must go from 0 to 300 ft/min in 8.5 ± 1.0 s.

13.2.3.8 *Direct Air Velocity Meter,* or an equivalent instrument, must be used to measure the air velocity in the chamber.

13.2.4 *Test Specimens:*

13.2.4.1 *Shape and Dimensions*—A rectangular test piece shall be cut from the belt having a length of 150 mm (6 in.) and a width of 12.7 mm (0.5 in.).

13.2.4.2 *Number and Distribution*—Four test specimens shall be prepared, that is two parallel to the length (longitudinal) and two parallel to the width (transverse) of the belt.

13.2.5 *Procedure:*

13.2.5.1 Clamp the specimen in a support with its longitudinal axis horizontal and its transverse axis inclined at 45° to the horizontal. Clamp a piece of 20-mesh iron wire gauze, 125 mm (5 in.) square under the test specimen in a horizontal position, 6 mm (0.25 in.) below the pulley cover edge of the specimen and with about 13 mm (0.5 in.) of the specimen extending beyond the edge of the gauze.

13.2.5.2 Position the support stand, with the test specimen mounted as described in 13.2.5.1, in the burner placement guide within the test chamber.

13.2.5.3 Adjust the bunsen burner to give a blue flame 75 mm (3 in.) in height, when using Pittsburgh natural gas or equivalent as fuel.

13.2.5.4 Move the burner so the test specimen shall be positioned in the flame at a distance of 25 mm (1 in.) above the top of the burner. Center the free end of the specimen in the flame.

13.2.5.5 Keep the observation door of the chamber closed for the entire test.

13.2.5.6 Apply the burner flame to the test specimen for 60 s in still air.

13.2.5.7 At the end of 60 s, remove the burner flame, turn on the ventilating fan to give an air current having a velocity of 1.5 m/s (300 ft/min), and measure the duration of the flame.

13.2.5.8 After the test specimen ceases to flame, keep it in the current for at least 3 min to determine the presence and duration of afterglow. If a glowing specimen bursts into flame within 3 min, add the duration of the flame to the duration of the flame as measured per 13.2.5.7.

13.2.6 *Report*—Report the following information for each belt tested:

13.2.6.1 Specification and description of each belt tested;

13.2.6.2 Time duration for the initial belt flame to cease following removal of the burner for both longitudinal and transverse samples;

13.2.6.3 Afterglow duration of each of the two sets of samples tested; and

13.2.6.4 Whether or not re-ignition occurred and total duration of flame(s);

13.2.6.5 Description of any unusual behavior of the specimen(s) noted during the test.

14. Carcass Tear Test (see ISO 505)

14.1 *Scope and Field of Application*—This test method specifies the measurement of the propagation resistance of an initial tear in the carcass of conveyor belts. This test is intended for application to belts used in mines and in installations where there is a risk of longitudinal tearing.

14.2 *Principle*—The test consists of measuring, by means of tensile testing at a given speed, the force necessary to propagate an initial tear made in a test piece from which the covers have been removed.

14.3 *Apparatus*—The apparatus consists of a dynamometric tensile testing machine with the following essential characteristics:

14.3.1 The machine shall be chosen so that the forces to be measured come within the upper 90 % range of its full rated capacity;

14.3.2 The speed of separation of the clamps shall be capable of being adjusted to 50 ±10 mm/min (2 ±0.4 in./min);

14.3.3 The free distance between the clamps shall be capable of being adjusted to at least 300 mm (12 in.).

14.3.4 The machine shall be provided with a device for the graphical recording of the force necessary to continue tearing the test piece.

14.4 *Test Pieces:*

14.4.1 Shape and dimensions;

14.4.1.1 Shape: rectangular;

14.4.1.2 Length: 300 mm (12 in.);

14.4.1.3 Width: 100 ±1 mm (4 ±0.04 in.); and,

14.4.1.4 Thickness: belt thickness, without covers.

14.4.2 *Number*—Two test pieces shall be used: one in Sense A and one in Sense B (see Fig. 3).

14.4.3 *Method of Sampling*—Test pieces shall be taken from the sample in the longitudinal direction of the belt and at a minimum distance of 10 mm (0.4 in.) from the edges of the belt.

14.4.4 *Preparation*—The covers of the test pieces shall be removed by stripping or by buffing (see Fig. 4). If there is a breaker ply, strip the corresponding covers without cutting the breaker ply over a width of 20 mm (0.8 in.) only, that is, 10 mm (0.4 in.) on each side of the longitudinal axis of the test piece with the exception of the zone held in the clamps of the machine (see Fig. 5). Cut the test pieces from the middle of one of their ends over a length of about 100 mm (4 in.) parallel to the length (see Figs. 4-6). If necessary the width of the test piece (cut edge) may be adjusted to the gripping width of the clamps by tapering the edges symmetrically on a length at most the same as that of the cut, as indicated in Fig. 6, with the width at the end of the cut part as great as the width of the clamps permits.

14.5 *Method of Test:*

14.5.1 *Conditioning of Test Pieces*—The test shall be performed on test pieces taken at least five days after manufacture.

14.5.1.1 Select the following conditions by preference:

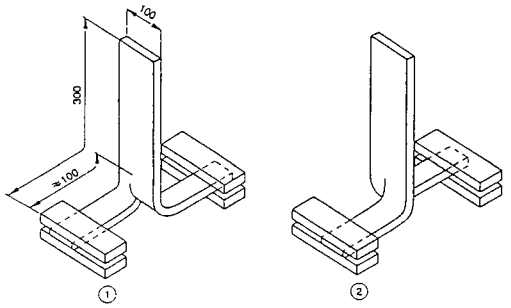
Temperature: 23 ± 2°C (73.4 ± 3.6°F)

Relative humidity: 50 ±5 % RH

14.5.1.2 In the case of belts with a textile carcass, the test results of which can be affected by the humidity, a temperature of 20 ± 2°C (68 ± 3.6°F) and 65 ±5 % RH may be selected, by agreement between the parties, provided that this is indicated clearly in the test report.

14.5.1.3 In the special case of tropical conditions (27 ± 2°C (80.6 ± 3.6°F), 65 ± 5 % RH) or in the event of dispute, or both, the conditioning period shall be increased to at least 14 days (with the same temperature and humidity conditions). The exact value of this period may be specified by agreement between the interested parties.

Dimensions in millimetres



① = Sense A
② = Sense B

FIG. 3 Mounting of the Two Cut Ends of the Test Piece

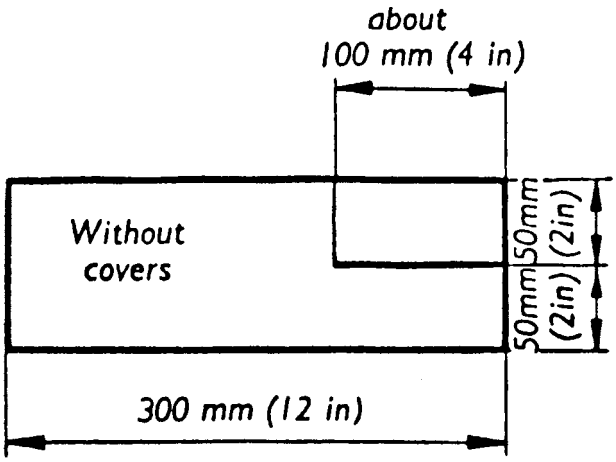


FIG. 4 Test Piece Without Breaker

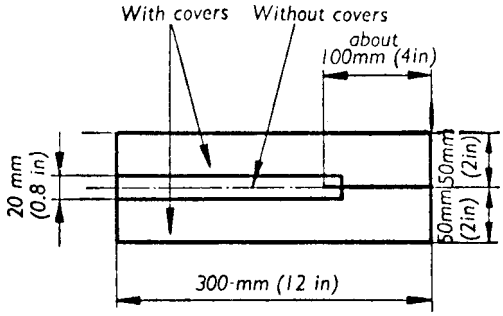


FIG. 5 Test Piece With Breaker

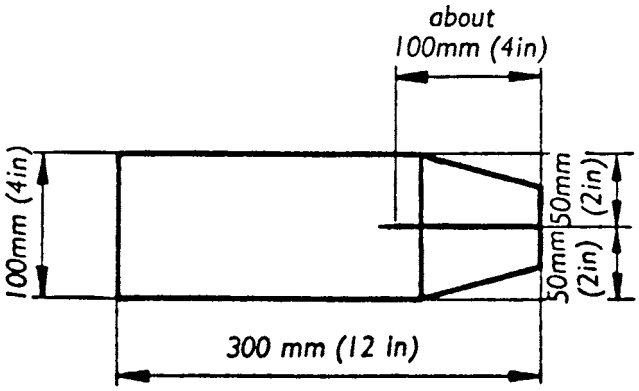


FIG. 6 Tapered Test Piece

14.5.2 *Test Conditions*—The test conditions with regard to temperature and humidity shall be those adopted in 14.5.1.

14.5.3 *Procedure*—Mount the two cut ends of the test piece in the clamps of the tensile testing machine either in Sense A or in Sense B as indicated in Fig. 3, so that the inner edges of the cut are situated at the center of each clamp.

14.5.3.1 Fix the speed of separation of the clamps at 50 ±10 mm (2 ±0.4 in.)/min and continue testing until the tear has extended for at least 100 mm (4 in.).

NOTE 2—The mean tearing force by means of the graphical recording device over the length of the curve corresponding to at least a 75 mm (3 in.) tear.

14.5.4 *Expression of Results*—The tear resistance of a test piece is expressed as the mean tearing force recorded during the test. Indicate the resistance of each test piece separately and then indicate the mean value of the resistance of the two test pieces.

14.5.5 *Test Report*—The test report shall make reference to this test method and shall include the following information:

14.5.5.1 The identification of the belt tested;

14.5.5.2 Conditions of temperature and relative humidity adopted for the conditioning of the test pieces and the tests;

14.5.5.3 The results expressed in accordance with 14.5.4 and the way in which tearing occurred (if weft threads have been pulled out without any characteristic tear, this is considered a tear);

14.5.5.4 An account of any test or operating conditions not specified in this test method.

15. Troughability Test

15.1 *Scope*—This test is used to determine belt flexibility or capability to conform to troughing idlers on heavy duty conveyor systems.

15.2 *Apparatus:*

15.2.1 *Suspension System,* a level frame, with a length greater than the belt width being tested (see Fig. 7).

15.2.2 Clamps may be standard stationer's binder clips, such as shown in the sketch. Two of these clamps are attached to a 25 mm (1 in.) "T" bar that is 150 mm (6 in.) long. At either end of the" T" bar a stud is located (see Fig. 8), and the clamp assembly is balanced while suspended on the hooks in accordance with 15.2.1. Two of these clamp assemblies are needed.

15.3 *Test Procedures:*

15.3.1 Prepare the test specimen according to the following specifications:

15.3.1.1 *Form*—A rectangular parallel-piped piece of the whole belt.

15.3.1.2 *Length (Transverse Direction of Belt)*—The flat width, width "L" of the belt.

15.3.1.3 *Width (Longitudinal Direction of Belt)*—150 mm (6 in.).

15.3.1.4 *Thickness*, *e*, the thickness of the belt, with covers.

15.3.2 Allow specimen to condition for three days at standard temperature and humidity, on a flat surface. For conditioning refer to 7.1.

15.3.3 Attach the clamp assembly to the belt ends.

15.3.3.1 Check clamp assemblies on hooks in accordance with 15.2.2 for balance and free rotation before attaching the belt.

15.3.4 Place the clamp assemblies with the test specimen on the test assembly hooks (see Fig. 7) with the carrying surface up.

15.3.5 Allow the test specimen to hang under the force of its own mass from the flat position to form a trough.

15.3.6 Move the carriage until the suspension lines, from which the specimen is suspended, are vertical as checked by a plumb line on the carriage (see Fig. 7 and 15.2.1).

15.3.7 Take readings after 5 min (see Fig. 9).

15.4 *Measurements:*

15.4.1 Determination of *F*: $F = A_2 - A_1 + {}^{e}/2$

15.4.2 Alternative Determination of *F*: $F = B_1 - B_2 - {}^{e}/2$

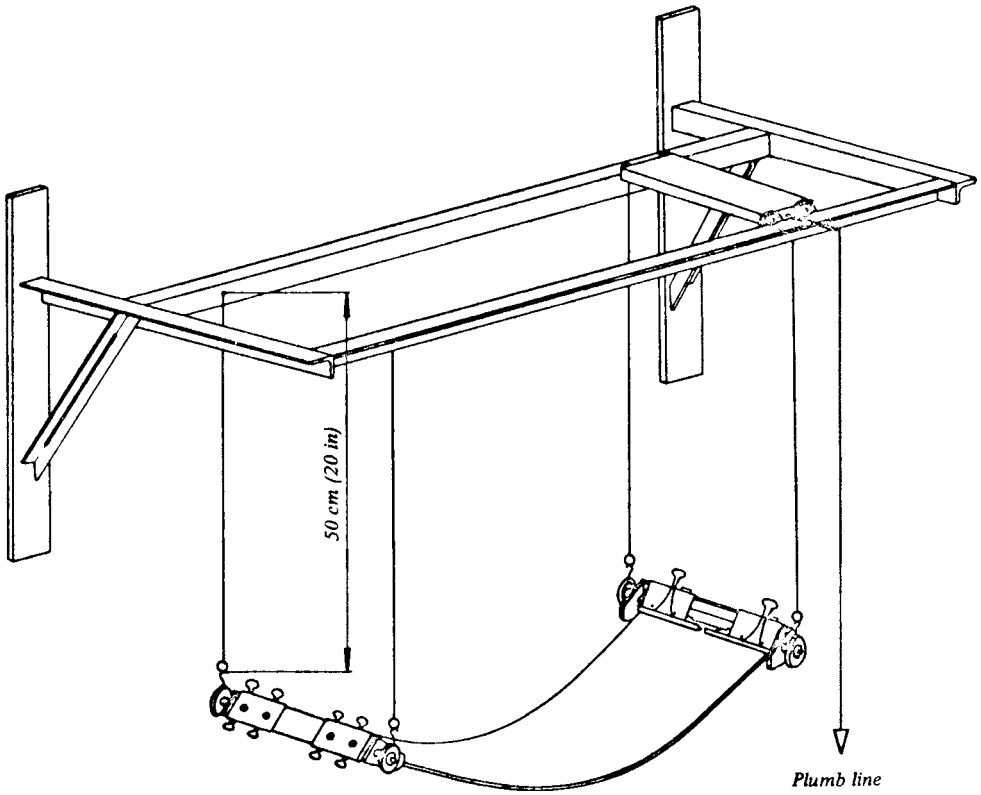


FIG. 7 Apparatus for Measuring Deflection of Test Piece (Details given only as an indication)

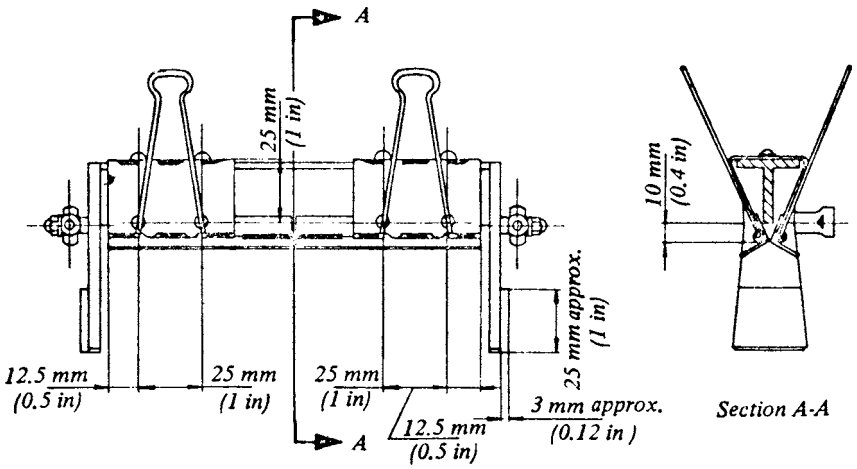


FIG. 8 Clamps (Given only as an example)

where:

A_1 = distance from test frame to suspension point, mm (in.),
A_2 = distance from the lowest point of the belt surface to the test frame, mm (in.),
B_1 = distance from the lower horizontal reference plane to suspension point, mm (in.),
B_2 = distance from the lowest point on the belt surface to the lower horizontal reference plane, mm (in.),
e = thickness, mm (in.),
F = deflection, mm (in.) (see Fig. 9), and
L = the transverse length of the sample belt, mm (in.).

15.5 *Report*—The troughability is expressed as the ratio *F/L*. Report the test conditions and note if they are different from the standard (Section 7).

16. Breaking Strength of Mechanical Fastenings (Static Test Method)

16.1 *Apparatus*—Refer to 12.1.

16.1.1 *Steel Adapter Plate,* for joints that can be disconnected (see Fig. 10).

16.2 *Test Specimens:*

16.2.1 *Shape, Dimensions, and Preparation:*

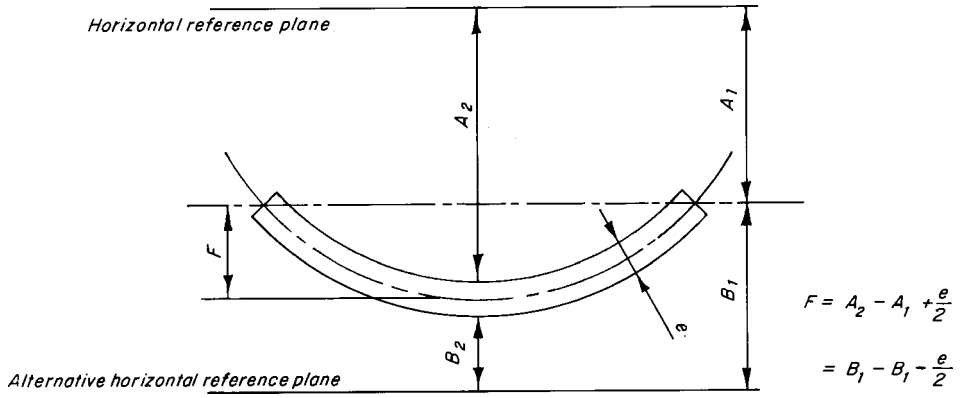


FIG. 9 Determination of Deflection *F*

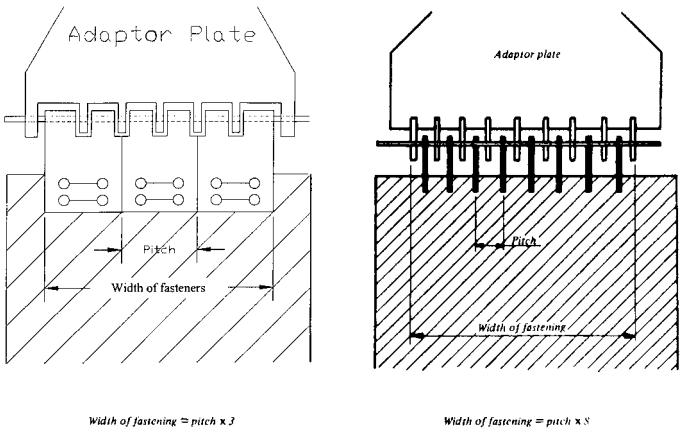


FIG. 10 Fastenings

16.2.1.1 *Joints that Can be Disconnected*—The test piece should consist of a full thickness piece of belting cut in the longitudinal direction, with a minimum length of 100 mm (4 in.) plus the gripped length, and should be 150 mm (6 in.) wide. It should be connected to the connecting plate by the mechanical fastening to be used. The fastened width should be at least 100 mm (4 in.). In place of using the adaptor plate, the test piece shall consist of two lengths of belting, each having a minimum length of 100 mm (4 in.) plus the gripped length and a width of 150 mm (6 in.), fastened together with the test fasteners. When the overall width of the fastening elements in service is equal to the width of the belt, the width of the test piece may be equal to the overall width of the fastening elements under the test and may be taken to be the fastened width, but should not be less than 100 mm (4 in.).

16.2.1.2 *Joints that Cannot be Disconnected*—The test piece should consist of two lengths of belting each having a minimum length of 100 mm (4 in.) plus the gripped length and a width of 150 mm (6 in.) assembled by means of the mechanical fastening to be used. When the overall width of the fastening elements in service is equal to the width of the belt, the width of the test piece may be made equal to the overall width of the fastening elements under test and may be taken to be the fastened width, but should not be less than 100 mm (4 in.).

16.2.2 *Number of Test Specimens*—Three test specimens shall be used.

16.2.3 *Conditioning*—Specimens shall be conditioned for three days per standard conditions.

16.3 *Procedure:*

16.3.1 *Joints that Can be Disconnected*—Fasten the test specimen in one of the clamps of the machine described in 12.1 and attach the connecting plate to the belt at the distance between the clamps as shown in Fig. 11. For test specimens without a connecting plate, fasten both ends of the test specimen in the clamps of the machine described in 12.1. Apply uniform stress (tensile force) to preclude a premature rupture at either end of the joint, with a separation rate of 1.67 ±0.17 mm/s (4 ±0.4 in./min). The maximum force to break the mechanical fastening or belt is recorded.

16.3.2 *Joints that Cannot be Disconnected*—Fasten the ends of the test specimens in the clamps of the machine described in 12.1. Uniform stress is applied with a separation rate of 1.67 ±0.17 mm/s (4 ±0.4 in./min). The maximum force before the mechanical fastening breaks is recorded.

16.4 *Calculation*—Determine the mean value of the results obtained and calculate the average breaking strength of the fastening in kN/m (lb/in.) (see Figs. 10 and 11).

16.5 *Test Report:*

16.5.1 Test results shall include the following information:

16.5.1.1 Width of fastening and the number and type of fasteners in the test specimen(s);

16.5.1.2 Brand of fasteners and whether they can be disconnected or not;

16.5.1.3 Brand and type of the belt and the rated working tension with fasteners; and,

16.5.1.4 Type of failure of the fastening, whether tearing of the belt or breaking or opening of the fasteners.

17. Elevator Belt Bolt Holding Strength Test

17.1 *Scope*—This test is used to determine the ability of belting to retain bolts (and buckets) for elevator systems, simulating the forces on the belt as the bucket is filled during system operation.

17.2 *Apparatus*—Tensile testing machine or dyna-mometer and fixture(s) made in accordance with Fig. 12. For testing several different bolt sizes, different fixtures (different hole sizes) will be required.

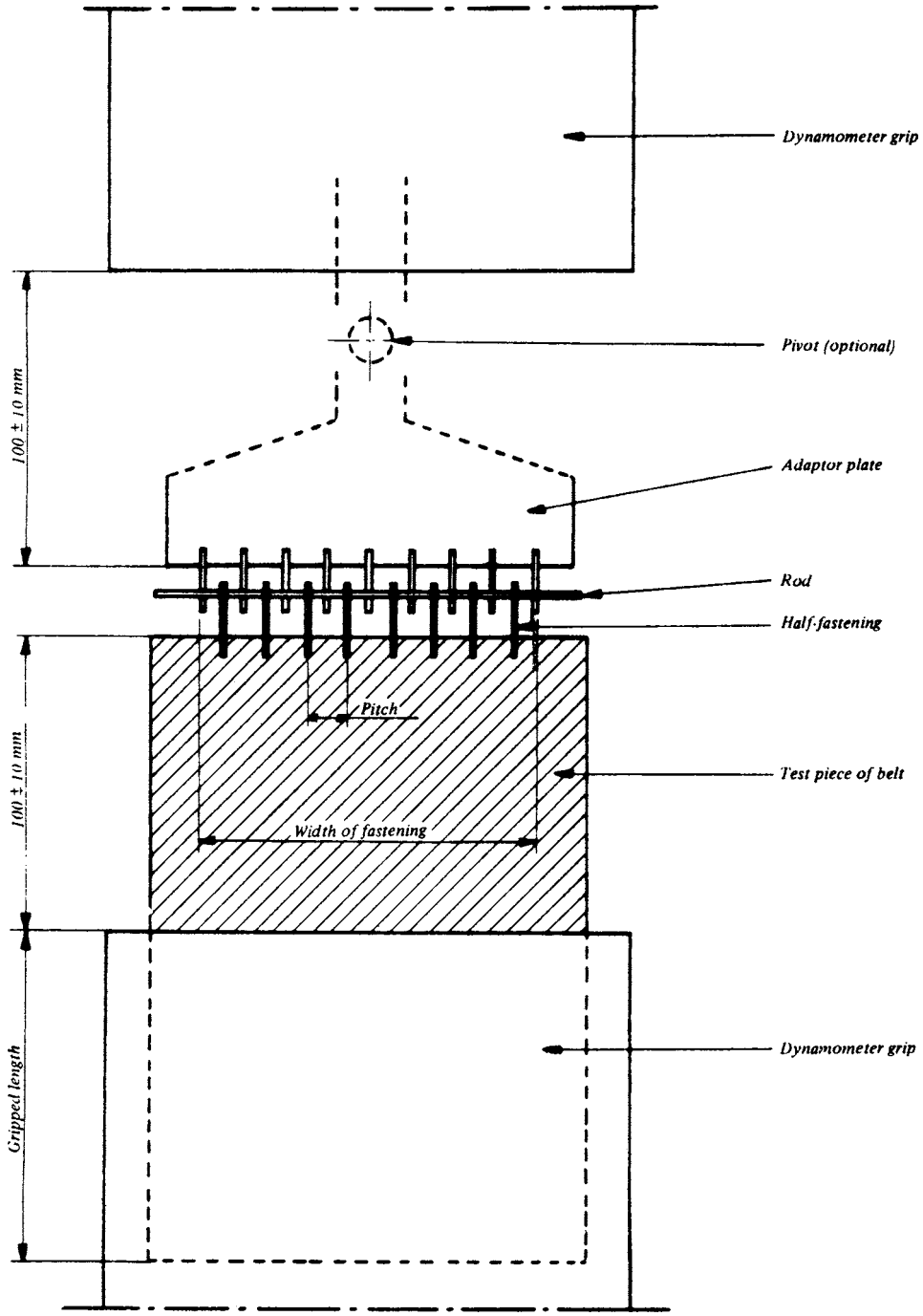


FIG. 11 Fastened Joint in Test Machine

17.3 *Test Specimens*—A76 mm (3 in.) wide belt specimen is cut longitudinally (warp direction) with sufficient length to be secured in the test fixture and the clamp of the test machine (450 mm (18 in.) minimum). Four specimens are prepared for each test belt and for each type and size bolt being evaluated.

17.4 *Sample Preparation*—Belt covers are retained on all samples. A hole of appropriate (same) size as the retaining bolt is drilled in the specimen at the midpoint (widthwise) and 205 mm (8 in.) from one end of the specimen.

17.5 *Mounting*—The test sample is attached to the fixture with heavier conveyor cover up and the bolt head against this cover. The bolt passes through the belt sample and fixture with the nut against the fixture. The nut is torqued until the bolt head is flush with the top cover. The sample and fixture is mounted to the test machine with the belt end in one clamp and the fixture attached to the other.

17.6 *Procedure*—Displacement speed of the test machine is 100 mm/min (4 in./min). The test proceeds until the bolt is

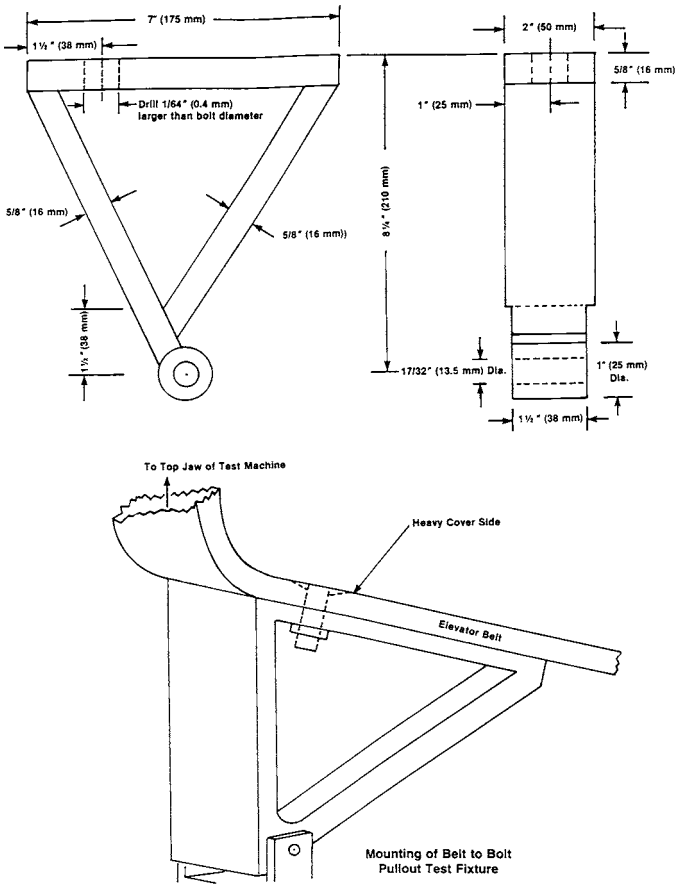


FIG. 12 Fixture for Making Elevator Belt Bolt Pullout Test

pulled through the belt sample. The maximum force is recorded as the bolt holding strength. The average (mean) of the maximum forces is taken as the test value.

17.7 *Report*—The report shall include the following information:

17.7.1 *Belt Information*—Belt and carcass type (strength rating), and cover thickness;

17.7.2 Size of bolt and torque used in mounting; and

17.7.3 Individual maximum force for each test and average of the four tests. Type of failure of the fastening; whether tearing of the belt or breaking or opening of the fasteners.

18. Steel Cord/Cable Belt Testing

18.1 For steel cable belt testing the following standards apply: ISO 7590, ISO 7622-1, ISO 7622-2, ISO 7623, and ISO 8094.

19. Report

19.1 The report shall include the following information:

19.1.1 A description of the belt product tested, including manufacturer, manufacturer's product name, grade or designation, or both; commercial designation, if applicable (for example, RMA Grade 2, 3 ply 330 PIW); belt-size including number of plies and cover thickness; and accessories, if included.

19.1.2 Test identification and method,

19.1.3 Shape, size, and dimensions of the test specimen(s),

19.1.4 Conditioning of the test specimen(s) and the test conditions, where applicable, and

19.1.5 Test results and other pertinent information as specified in the respective test descriptions.

20. Precision and Bias

20.1 Precision statements for test methods cited in 2.1 are found in those referenced ASTM standards.

20.2 No test method precision is given for the tests described in Sections 12–18. There is an insufficient number of laboratory participants available or willing to carry out the interlaboratory testing in accordance with Practice D4483.

21. Keywords

21.1 belting; elastomeric; RMA; rubber