

MIL-B-11040E
15 October 1980
SUPERSEDING
MIL-B-11040D
24 September 1976

MILITARY SPECIFICATION

BELT, V: ENGINE ACCESSORY DRIVE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers endless, V-type engine-accessory drive belts.

1.2 Classification. Belts shall be of the following grades and nominal cross-section designation. Unless otherwise specified (see 6.2), grade A belts shall be supplied.

Grade A - Standard duty.

Grade B - Heavy duty.

0.380-inch nominal belt width x 5/16-inch nominal belt thickness
(MS51065).

0.500-inch nominal belt width x 13/32-inch nominal belt thickness
(MS51066).

11/16-inch nominal belt width x 13/32-inch nominal belt thickness
(MS51067).

3/4-inch nominal belt width x 7/16-inch nominal belt thickness
(MS51068).

7/8-inch nominal belt width x 1/2-inch nominal belt thickness
(MS51069).

1-inch nominal belt width x 9/16-inch nominal belt thickness
(MS51070).

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

FSC 3030

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Mobility Equipment Research and Development Command, ATTN: DRDME-DS, Fort Belvoir, VA 22060 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

FEDERAL

- | | |
|-----------|--|
| QQ-S-781 | - Strapping, Steel, and Seals. |
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood. |
| PPP-B-621 | - Boxes, Wood, Nailed and Lock-Corner. |
| PPP-B-636 | - Boxes, Shipping, Fiberboard. |

MILITARY

- | | |
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| MIL-F-116 | - Preservation Packaging, Methods of. |
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STANDARDS

- | | |
|------------------------|--|
| MIL-STD-105 | - Sampling Procedures and Tables of Inspection by Attributes. |
| MIL-STD-129 | - Marking for Shipment and Storage. |
| MIL-STD-130 | - Identification Marking of US Military Property. |
| MIL-STD-294 | - Visual Inspection Guide for Rubber V-Belts. |
| MIL-STD-1188 | - Commercial Packaging of Supplies and Equipment. |
| MS51065 | - Belts, V: Engine Accessory Drive (0.380 Inch Nominal Width). |
| MS51066 | - Belts, V: Engine Accessory Drive (0.500 Inch Nominal Width). |
| MS51067 | - Belts, V: Engine Accessory Drive (11/16 Inch Nominal Width). |
| MS51068 | - Belts, V: Engine Accessory Drive (3/4 Inch Nominal Width). |
| MS51069 | - Belts, V: Engine Accessory Drive (7/8 Inch Nominal Width). |
| MS51070 | - Belts, V: Engine Accessory Drive (1 Inch Nominal Width). |

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE Handbook

- | | |
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| SAE J636 | - V-Belt and Pulley. |
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(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

ANSI/ASTM D-471

**- Standard Test Method for Rubber
Property - Effect of Liquids.**

(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Descriptions. Each belt shall be an endless loop having a trapezoidal cross section.

3.2 Qualification. Belts furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List (see 4.3 and 6.3).

3.3 Material. Material shall be as specified herein. Materials not specified shall be selected by the contractor and shall be such as to enable the belts to meet all requirements of this specification (see 6.7).

3.3.1 Cords. Cords shall be as specified herein, shall be prestretched, and shall be impregnated with a rubber compound.

3.3.1.1 Grade A. Cords for Grade A belts shall be natural or synthetic.

3.3.1.2 Grade B. Cords for Grade B belts shall be polyester.

3.3.2 Fabric. Fabric shall be woven or knit of natural or synthetic fibers, and shall be impregnated with rubber.

3.3.3 Rubber. Rubber shall be either natural or synthetic.

3.4 Construction.

3.4.1 Tension members. Tension members shall be uniformly spaced in a direction parallel to the circumference of the belt, and shall be imbedded in the belt structure.

3.4.2 Compression members. Compression members shall form the narrower trapezoidal portion of the belt in the section below the tension members and shall support the belt in the pulleys. The base that forms the inner circumference of the belt shall be plain, notched, or cogged.

3.4.3 Cover. The cover, if used, shall consist of one or more plies of bias-cut fabric or cord, frictioned or impregnated with rubber.

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3.4.4 Splicing. Not more than two transverse splices shall be allowed in any ply or fabric within a length of 66 inches or less.

3.5 Sizes. Sizes of belts (nominal widths and effective lengths) shall be as shown on MS51065 through MS51070 or as specified (see 6.2).

3.5.1 Effective length tolerance.

3.5.1.1 Single belts. The effective length tolerance for grade A single belts, when tested as specified in 4.5.2.1, shall not exceed the center distance tolerance specified in table I. The effective length tolerance for grade B single belts, when tested as specified in 4.5.2.1, shall not exceed the center distance tolerance specified in table II.

TABLE I. Effective length tolerance, grade A.

Effective belt length (inches)	Tolerance on center distance	
	Plus (inch)	Minus (inch)
40 and less	1/8	5/32
over 40 and through 50	1/8	3/16
over 50 and through 60	5/32	7/32
over 60 and through 80	3/16	9/32
over 80	7/32	11/32

TABLE II. Effective length tolerance, grade B.

Effective belt length (inches)	Tolerance on center distance	
	Plus or Minus (inch)	
50 and less	1/8	
over 50 and through 60	5/32	
over 60 and through 80	3/16	
over 80	7/32	

3.5.1.2 Matched set. When specified (see 6.2), belts shall be furnished in matched sets of the size and numbers of belts required. Belts of matched sets shall conform to the effective-length tolerance specified in table I for grade A belts and table II for grade B belts, except that the difference in effective length, between test pulley centers of the longest and shortest belt in any one matched set, shall not exceed 1/16 inch for grade A belts, and those shown in table III for grade B belts, when tested as specified in 4.5.2.1.

TABLE III. Matching tolerance for sets of grade B belts.

Nominal belt width	Difference in length between test pulley centers (inch)
0.380	0.04
0.500	0.04
11/16	0.06
3/4	0.06
7/8	0.06
1	0.06

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3.6 Electrical resistivity. The electrical resistivity, as measured between any pair of opposite electrodes after the belt is subjected to tension, shall be not more than 300,000 ohms.

3.7 Oil-Resistance. When specified (see 6.2) the belt thickness shall increase no more than 20 percent after exposure to ASTM No. 3 oil, and shall decrease (Shrink) no more than 1 percent after exposure to ASTM No. 1 oil, when tested as specified in 4.5.2.4.

3.8 Resistance to temperature. The belts shall not crack, break, or require more torque to start or continue rotation than that specified in table IV when tested as specified in 4.5.2.5.

TABLE IV. Maximum torque requirements.

Nominal top width	Torque required to start (maximum)	Torque required to continue (maximum)
Less than 11/16	20 ft. lbs.	12.5 ft. lbs.
11/16 through 3/4	25 ft. lbs.	15.0 ft. lbs.
7/8 through 1	30 ft. lbs.	20.0 ft. lbs.

3.9 Rideout. When tested as specified in 4.5.2.2, the position of the top of the belt with respect to the top of the pulley groove (ride-out) shall be within the limits specified in table V.

TABLE V. Rideout.

Nominal belt width	Rideout, plus or minus 1/32 inch
0.380	1/16
0.500	1/16
11/16	3/32
3/4	3/32
7/8	3/32
1	3/32

3.10 Resistance to fatigue. The belts shall not crack, break, or slip in excess of 8 percent after two permissible adjustments to compensate for slippage when tested as specified in 4.5.2.6.

3.11 Age. When specified (see 6.2), the age of the belts shall be not more than 12 months (4 quarters) old from the time of manufacture to the date of acceptance by the Government.

3.12 Marking.

3.12.1 Single belts. Unless otherwise specified (see 6.2), the belts shall be marked on the outside circumference in accordance with MIL-STD-130, except that the design activities identification as specified in MIL-STD-130 will not be required. In addition, each belt shall be marked with the nominal top width, effective length, the contractor's name (or trademark, or identification code) and the date of manufacture. The date of manufacture shall be shown by quarter and year (example 1Q80), or month and year (example Jan 80) or week and year (example 1-80). Ink inprinting or permanent molded marking is acceptable.

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3.12.2 Matched sets. Each belt of a matched set shall be marked as specified in 3.12.1. In addition, all belts of a matched set shall be tied together. A tag or separate label shall include the following notice: "WARNING: THIS IS A MATCHED SET. DO NOT BREAK TIES EXCEPT AT INSTALLATION."

3.13 Workmanship. The belts shall contain no visible defects as specified in MIL-STD-294.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).
- (c) Inspection of packaging (see 4.6).

4.3 Qualification inspection.

4.3.1 Quantity of belts. For the purpose of qualification, no fewer than three belts of each grade and applicable belt width (see 6.3.3), manufactured by the same process, shall be subjected to the examination and tests specified herein.

4.3.2 Examination. Each belt shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection of all belts.

4.3.3 Tests. Each belt shall be tested as specified in 4.5.2.1 through 4.5.2.6. Failure of any test shall be cause for rejection of all belts.

4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination and tests shall be in accordance with MIL-STD-105, Inspection Level S-3.

4.4.2 Examination. Samples selected in accordance with 4.4.1 shall be examined as specified in 4.5.1. AQL shall be 1.5 percent defective for major defects and 2.5 percent defective for minor defects. Major and minor defects are defined in MIL-STD-294.

4.4.3 Tests. Samples selected in accordance with 4.4.1 shall be tested as specified in 4.5.2.1 and 4.5.2.2. AQL shall be 4.0 percent defective.

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TABLE VII. Dimensions of pulleys for temperature and fatigue tests.

Nominal belt width	Diameter of pulley where specified groove width (without width tolerance) occurs		Groove		Angle	
	Driver and driven pulleys ±0.010	Tension pulley ±0.010	Width ±0.010	Depth (Min)	Driver and driven pulleys ±30 min.	Tension pulley ±30 min.
inch	inches	inches	inches	inches	degrees	degrees
0.380	4.75	2.75	0.380	7/16	36	36
0.500	5.00	3.50	0.500	9/16	36	36
11/16	4.66	3.16	0.597	9/16	36	34
3/4	4.91	3.29	0.660	5.8	36	34
7/8	5.91	3.91	0.785	11/16	36	34
1	6.91	4.54	0.910	13/16	36	34

4.5.2.6 Fatigue.4.5.2.6.1 Apparatus. The apparatus shall consist of the following:

- (a) A torque-reaction-type dynamometer.
- (b) A constant-speed motor.
- (c) A means for setting the tension at the value specified in table VIII for the specific belt width.
- (d) A means of determining belt slip within an accuracy of plus or minus 1 percent. This can be determined by an electronic digital counting technique, or by calibrating the instrument being used for measuring belt slip and checking periodically by electronic digital counting.
- (e) A governor arranged to automatically stop the motor drive when the speed of the driven pulley (on dynamometer) drops 8 percent below that of the driver pulley (on motor).
- (f) Three pulleys arranged as shown in Figure 2. Pulleys for the belt widths designated shall have dimensions as shown in table VII.
- (g) Dial indicator.

4.5.2.6.2 Procedure. Install the belt on the pulleys. Apply the applicable tension specified in table VIII to the idler pulley. (NOTE: if tension is to be applied to the driven pulley, the tension values in table VIII shall be multiplied by 1.21.) Condition the belt by running with the tensile pulley unrestrained for 5 minutes, plus or minus 15 seconds, under the conditions specified in table VIII; do not apply the dynamometer load. Stop the machine and allow the belt to condition for 10 minutes. Turn the drive manually for 2 or 3 revolutions of the belt and, by means of a dial indicator mounted in contact with the tensioned-pulley support bracket, record the maximum limits of travel. Lock the tensioned-pulley support bracket in the position midway between the two limits of travel and remove the tensioning weights. Restart the

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machine, bring the drive up to test speed and apply the dynamometer load specified in table VIII. Continue to operate the machine for 100 hours, plus or minus 1/2 hour, in an ambient temperature of between 70° F to 90° F. If slippage exceeds 8 percent, stop the machine, let the belt stand for a minimum of 20 minutes, unlock the tensioning pulley, restore the initial tension, determine the center position, and relock the tensioning pulley. Restart the machine, bring up to speed, reapply the dynamometer load, and continue the 100-hour run. Evidence of cracks or breakage, or more than 2 retensionings, shall constitute failure of this test.

TABLE VIII. Condition of fatigue test.

Nominal belt width	Pulley diameters (inches)			Tension weight at no load (lbs.)	Horse- power load	Belt effective length (in.)
	Driver and driven	Idler	Driver rpm			
0.380	4.75	2.75	4900	60	6.0	under 40.0
				70	7.0	40.0-55.0
				80	8.0	55.0 & over
0.500	5.00	3.50	4700	80	8.0	under 40.0
				90	9.0	40.0-55.0
				100	10.0	55.0 & over
11/16	4.66	3.16	4900	50	5.0	under 40.0
				60	6.0	40.0-55.0
				70	7.0	55.0 & over
3/4	4.91	3.29	4700	55	5.5	under 40.0
				65	6.5	40.0-55.0
				75	7.5	55.0 & over
7/8	4.91	3.91	3900	70	7.0	under 40.0
				80	8.0	40.0-55.0
				90	9.0	55.0 & over
1	6.91	4.54	3350	80	8.0	under 40.0
				90	9.0	40.0-55.0
				100	10.0	55.0 & over

4.6 Inspection of packaging.

4.6.1 Quality conformance inspection of pack.

4.6.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

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4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following major defects. AQL shall be 2.5 percent defective.

101. Materials, methods, or containers not as specified for level A or level B. Each incorrect material, method, or container shall be considered one defect.
102. Belts or belt sets not preserved as specified or not in the quantities specified for level A.
103. Strapping not as specified for level A.
104. Gross weight or size exceeds the limitations of the applicable box specification for level A or level B.
105. Marking missing, illegible, incorrect, or incomplete.

5. PACKAGING

5.1 Preservation. Preservation shall be level A, or commercial, as specified (see 6.2).

5.1.1 Level A. Each belt set shall be combined as a single unit. Belts of like description or belt sets of like description shall be preserved in the quantity specified (see 6.2) in accordance with MIL-P-110 method III, using a close-fitting box conforming to PPP-B-636, W6c, style optional, as the container. Minimum permissible lengths to be coiled shall be as specified in table IX.

TABLE IX. Unitization.

Nominal belt width (inch)	Minimum permissible belt lengths to be coiled ^{1/} (inches)
0.380	30
0.500	34
11/16	38
3/4	40
7/8	46
1.00	52

^{1/} The coil diameter size shall be the contractor's standard.

5.1.2 Commercial. Each belt or belt set shall be preserved in accordance with MIL-STD-1188, except paragraph 2.2.5 does not apply.

5.2 Packing. Packing shall be level A, level B, or commercial, as specified (see 6.2).

5.2.1 Level A. The belts, preserved as specified in 5.1, shall be packed in a close-fitting box conforming to PPP-B-601, overseas type, grade B, style optional or PPP-B-621, class 2, style optional, in quantities not to exceed the weight limitation of the box. The boxes shall be closed and strapped in accordance with the appendix to the applicable box specification. Strapping shall conform to QQ-S-781, class 1, type I or IV, size as applicable unless

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otherwise specified (see 6.2), strapping shall be finish B. When specified (see 6.2), strapping shall be finish A.

5.2.2 Level B. The belts, preserved as specified in 5.1, shall be packed in a close-fitting box conforming to PPP-B-636, V3c or V3s. The gross weight or size shall not exceed the limitation of the box specification. Closure and strapping shall be in accordance with the appendix to the box specification.

5.2.3 Commercial. Belts and belt sets of like description shall be packed in accordance with MIL-STD-1188.

5.3 Marking. Marking for military levels of protection shall be in accordance with MIL-STD-129. Commercial marking shall be in accordance with MIL-STD-1188.

6. NOTES

6.1 Intended use. The belts covered by this specification are intended to be used on power-transmission applications that require high speed, small-pulley, short-center drives, such as drives on internal combustion engines that transmit power to generators, pumps, fans, and other accessory equipment. This specification does not apply to the light-duty or fractional-horsepower belts of the 2L through 5L cross-sectional designations, to industrial belts of the A through E cross-sectional designations, nor to the industrial narrow, 3V, 5V, and 8V cross-sectional designations. These belts are intended for use in ambient temperatures as low as minus 65° F. If minus 40° F is the minimum temperature requirement and electrical conductance is not a requirement, use specification Z-B-190 instead of this specification.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Military standard part number and dash number designation or nominal belt width, grade, and effective length required (see 1.2 and 3.5).
- (c) When matched sets are to be furnished and quantity of belts per set required (see 3.5.1.2).
- (d) When oil resistance is required (see 3.7).
- (e) When the age of belts is not to exceed 12 months (see 3.11).
- (f) Degree of preservation and packing required (see 5.1).
- (g) Quantity of belts per container (see 5.1.1).
- (h) When strapping shall be other than as specified (see 5.2.1).

6.3 Qualification.

6.3.1 Belts procured as end items. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List, whether or not such products have actually been so listed by that date. The attention of contractors is called to this requirement, and manufacturers

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are urged to arrange to have the products that they propose to offer to the Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Commanding Officer, U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, VA 22060, ATTN: DRDME-HKP, and information pertaining to qualification of product may be obtained from that activity.

6.3.2 Belts procured as components of end items. When belts covered by this specification are components of end items being procured by the Government, the requirements of ASPR 1-1107.2(b) will apply and the contracting officer shall include the requirements of ASPR 1-1107.2(b) in the solicitation.

6.3.3 Samples for qualification. Qualification of belts of 0.380-inch nominal top width will be considered as qualifying all belts of nominal top width of 0.500 inch or less. Qualification of belts of 11/16-inch nominal top width will be considered as qualifying all belts of nominal top width greater than 0.500 inch.

6.4 International Standardization Agreement. Certain provisions of this specification are the subject of International Standardization Agreement ABCS 63. When amendment, revision, or cancellation of this specification is proposed which will effect or violate the international agreement concerned, the preparing activity will inform GSA so that appropriate reconciliation action may be taken through international standardization channels.

6.5 Effective length. The length for belts should always be expressed as "effective length" in procurement documents (see 3.5 and table 1).

6.6 Belt limitations. The low temperature requirement of MIL-B-11040 belts necessitates the use of special compounds in belt fabrication. Although these compounds enhance belt performance at low temperature, the belts do not perform as well as a good-quality, standard belt at normal temperatures. Under these circumstances, a belt drive designed for minus 25° F or minus 40° F should be analyzed by the belt manufacturer prior to substituting a minus 65° F belt.

6.7 Recycled material. It is encouraged that recycled material be used when practical as long as it meets the requirements of the specification (see 3.3).

Custodians:

Army - ME
Air Force - 99

Preparing activity:

Army - ME

Project 3030-U142

Review activities:

Army - AT, SM
DSA - CS

User activities:

Army - AR, MI
Navy - MC

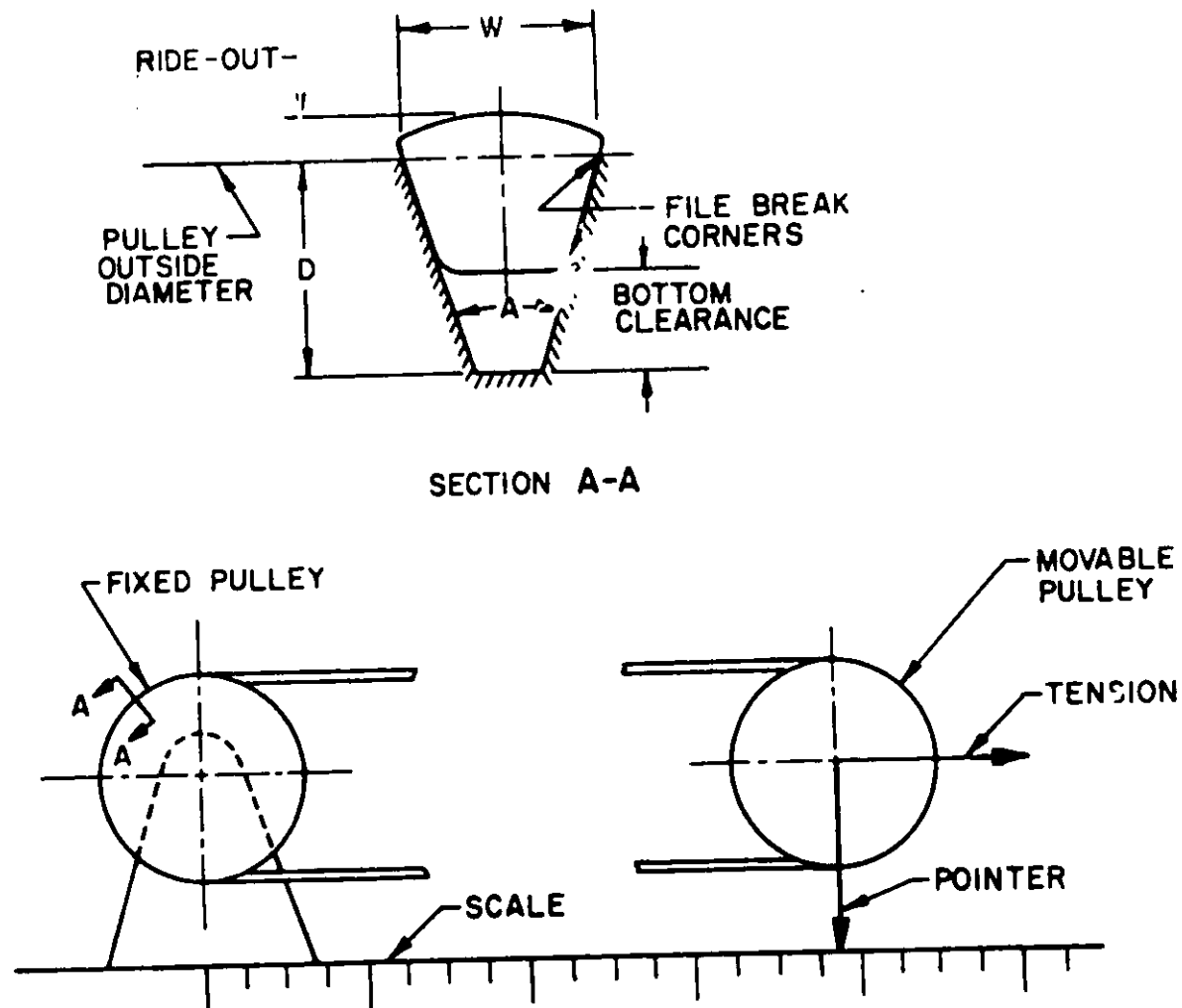
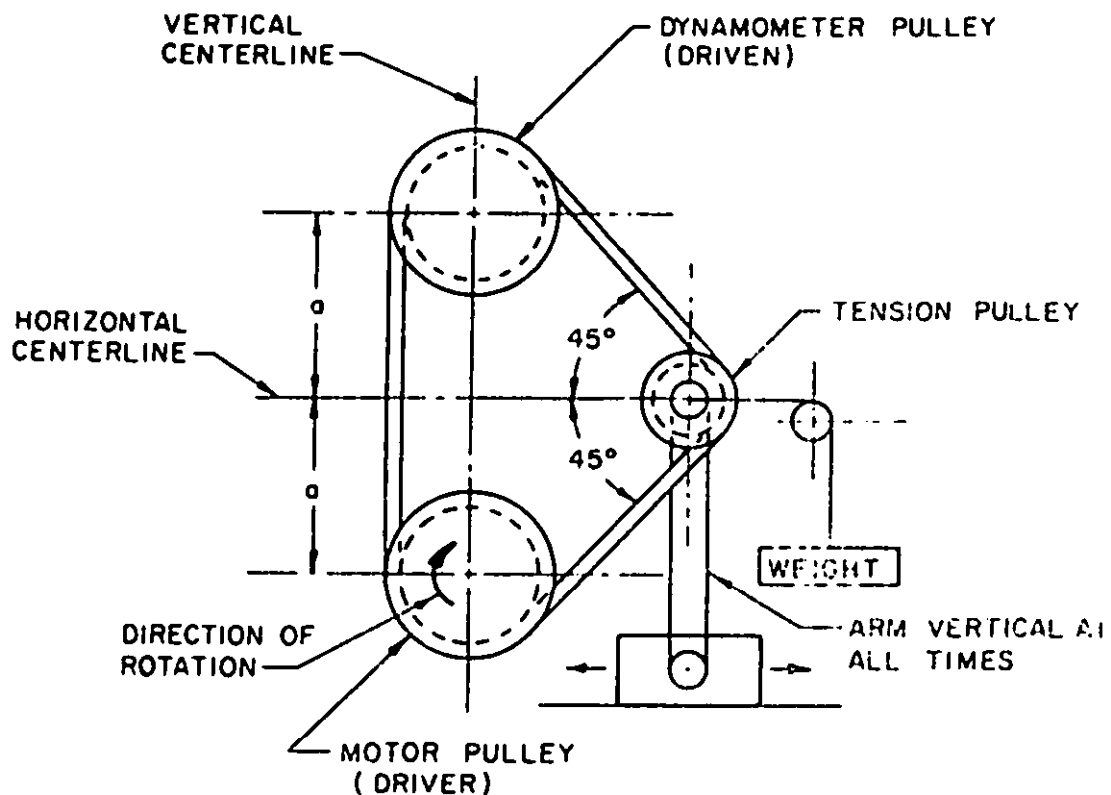


FIGURE 1. Test fixture and pulleys for determining belt effective length, rideout and bottom clearance.

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**NOTE:**

DIMENSION "a" IS ADJUSTED FOR VARIOUS LENGTH BELTS TO MAINTAIN TENSION PULLEY MIDWAY VERTICALLY BETWEEN DRIVER AND DRIVEN PULLEYS.

FIGURE 2. General pulley arrangement for low temperature and fatigue tests.

X-152A

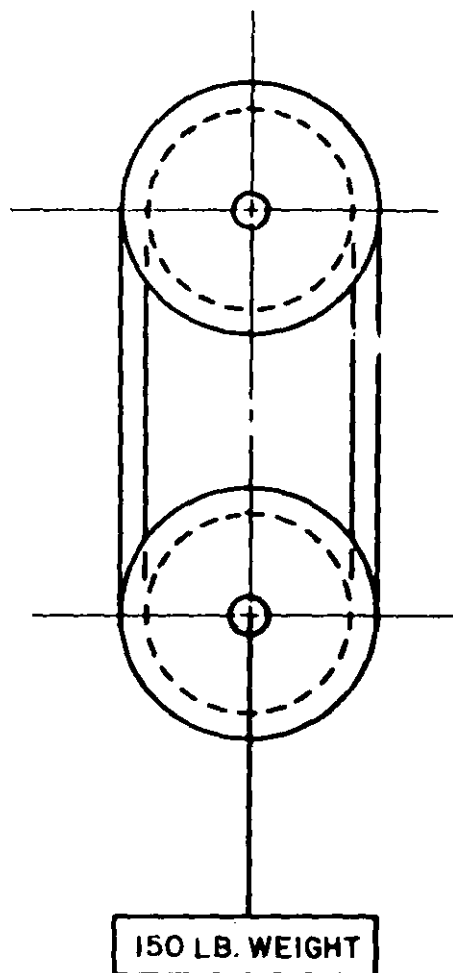


FIGURE 3. Tensioning of belt for electrical conductance test.

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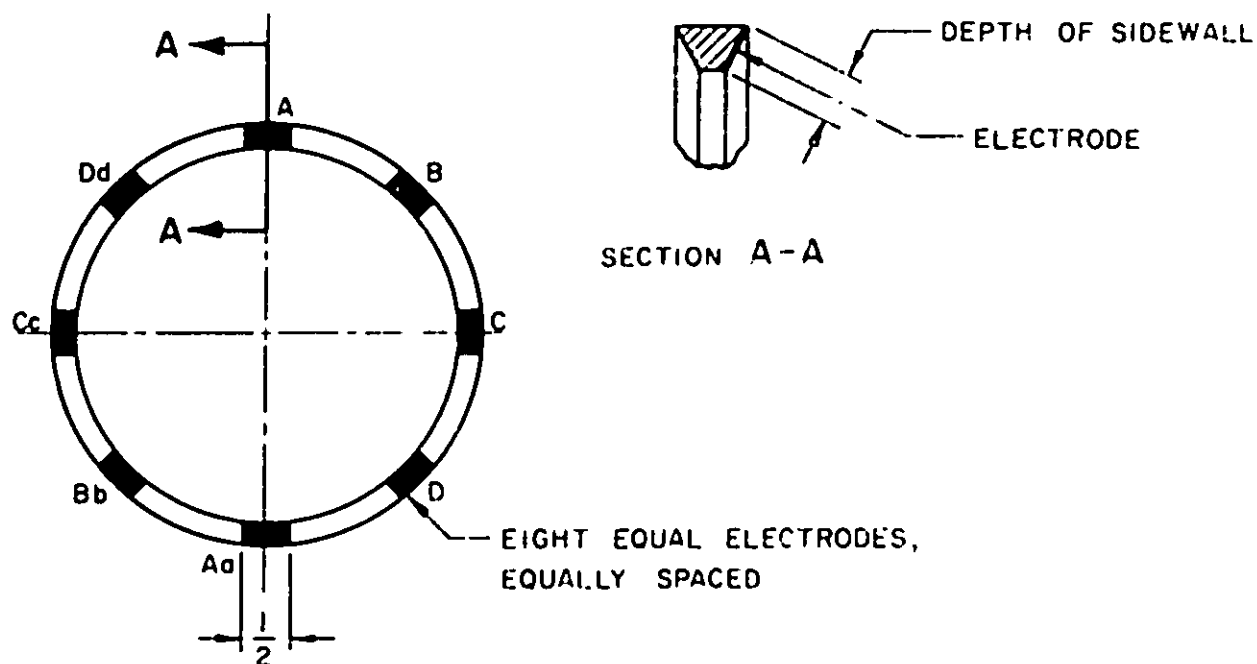


FIGURE 4. Dimensions, spacing, and marking of electrodes for electrical conductance test.

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