

ZZ-B-225B
January 29, 1980
SUPERSEDING
Fed. Spec. ZZ-B-225A
June 26, 1967

FEDERAL SPECIFICATION

BELTS, V: INDUSTRIAL (MULTIPLE DRIVE)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers endless V-type, multiple drive belts used primarily for power transmission in industrial applications of integral-horsepower class, requiring one or more V-belts.

1.1.1 Federal specification coverage. Federal specifications do not include all varieties of the commodity as indicated by the title of the specification, or which are commercially available, but are intended to cover only those generally used by the Federal Government.

1.2 Classification. The belts shall be of the following nominal cross-sectional designation as specified (see 6.2):

Designation A - 1/2-inch top width by 5/16-inch thick.
Designation B - 21/32-inch top width by 13/32-inch thick.
Designation C - 7/8-inch top width by 17/32-inch thick.
Designation D - 1-1/4-inch top width by 3/4-inch thick.
Designation E - 1-1/2-inch top width by 29/32-inch thick.

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2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

QQ-S-781	- Strapping, Steel and Seals.
PPP-B-601	- Boxes, Wood, Cleated-Plywood.
PPP-B-636	- Box, Shipping, Fiberboard.

Federal Standard:

FED. STD. No. 123	- Marking for Domestic Shipment (Civilian Agencies).
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(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points of their agencies.)

Military Standards:

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-130	- Identification Marking of U.S. Military Property.
MIL-STD-294	- Visual Inspection Guide for Rubber V-Belts.

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MIL-STD-1188	- Commercial Packaging of Supplies and Equipment.
MS39255	- Belt, V; Industrial (Multiple Drive) "A" Cross Section.
MS39256	- Belt, V; Industrial (Multiple Drive) "B" Cross Section.
MS39257	- Belt, V; Industrial (Multiple Drive) "C" Cross Section.
MS39258	- Belt, V; Industrial (Multiple Drive) "D" Cross Section.
MS39259	- Belt, V; Industrial (Multiple Drive) "E" Cross Section.
MS39260	- Pulley, Industrial (Multiple Drive) Regular, Deep and Narrow Groove.

(Copies of Military 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.

Mechanical Power Transmission
 Rubber Manufacturers Association
 Engineering Standard Specifications for Drives Using Multiple V-Belts
 A, B, C, D, and E Cross Sections.

(Application for copies should be addressed to the Rubber Manufacturers Association, 444 Madison Avenue, New York, NY 10022, or to the Mechanical Power Transmission Association, 3525 Peterson Road, Chicago, IL 60645).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS:

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.)

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3. REQUIREMENTS

3.1 Description. The belts shall be endless loops having a trapezoidal cross-section.

3.2 Qualification. The belts furnished under this specification shall be products which are qualified for listing on the applicable qualified products list (QPL) at the time set for opening of bids (see 4.3, 6.3 and 6.4).

3.3 Material. Materials not specified herein shall be selected by the contractor and shall be such as to enable the V-belt to meet the performance requirements of this specification (see 6.8).

3.3.1 Cords. Cords shall be treated for low growth and adhesion to the supporting polymer.

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

3.3.3 Rubber. Rubber shall be either natural rubber or synthetic rubber compounds.

3.4 Construction. The belt shall consist of tension members (inserts) and a compression member. Covers may be used (see 3.4.4). The members shall be tightly bonded with rubber.

3.4.1 Tension members. Tension members shall be either natural or synthetic cord or fabric reinforcement, and shall be arranged in a symmetrical pattern parallel to the circumference of the belt.

3.4.2 Splicing. Not more than two transverse splices shall be allowed in any ply of fabric in any belt having a length of 65 inches or less. Belts over 65 inches shall have not more than three transverse splices in any ply of fabric.

3.4.3 Compression member. Compression members shall form the narrow trapezoidal portion of the belt in the section below the tension members and shall support the belt in the pulleys. The inner circumference of the belt may be plain, notched, or cogged. The compression members may include natural or synthetic fiber cords or fabric.

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

3.5 Dimensions. The nominal cross-sectional dimensions, pitch lengths, pitch length tolerances, and matching tolerances for belt sets shall conform to the dimensions, as specified in MS39255 through MS39259.

3.6 Matched sets. When specified (see 6.2), belts shall be furnished in matched sets according to the nominal cross-sectional designation, pitch lengths, and quantity of belts per set. The maximum length difference between the shortest and longest belt in one set shall not exceed the matching tolerances shown in the applicable military standard. The individual belts of a matched set shall conform to the dimensional requirements for single belts.

3.7 Electrical resistivity. Electrical resistance shall not be greater than 6 megohms when tested, as specified in 4.5.2.4.

3.8 Resistance to temperatures. The belts shall not crack or require a greater torque to start or continue rotation than as shown in table I, when tested as specified in 4.5.2.3.

TABLE I. Maximum torque requirements

Cross-sectional designation	Torque required to start maximum (foot pounds)	Torque required to continue maximum (foot pounds)
A	26	13
B	30	15
C	45	30

3.9 Elongation. Belts shall not exceed an elongation of 8 percent when tested, as specified in 4.5.2.2.

3.10 Oil-Resistance. When specified (see 6.2), the belt thickness shall increase no more than 15 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 4.5.2.5.

3.11 Age. When specified (see 6.2 and 6.6) the age of the belts shall be not more than ~~12~~ months (four quarters) old from the time of manufacturer to the date of acceptance.

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3.12 Marking. The belts shall be marked on the outside circumference in accordance with MIL-STD-130. In addition, each belt shall be marked with the dash number in accordance with the applicable MS39255 through MS39259 and the manufacturer's name or trademark. When age is specified (see 6.2), the marking shall include the quarter and year (such as 1079) of manufacture. Ink imprinting or moulded markings are acceptable.

3.12.1 Matched sets. Each belt of a matched set shall be marked as specified in 3.12. In addition, belts of a matched set shall be tied together and include a tag or label printed with the following notice; "WARNING, THIS IS A MATCHED SET, DO NOT BREAK TIES, EXCEPT AT INSTALLATION."

3.13 Workmanship. The belts shall be free from any of the visible defects listed 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, the contractor may utilize 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 inspections. The inspection requirements are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance (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, not less than three belts, manufactured by the same process, shall be subjected to the examinations and tests specified herein, in the order listed.

4.3.2 Examination. The belts submitted for qualification shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.3 Tests. The belts submitted for qualification shall be tested, as specified in 4.5.2.1 through 4.5.2.5, except that D and E cross-sections shall not be required to be tested for elongation or temperature tests (see 6.3). Failure of the belt to pass any test shall be cause for rejection.

4.4 Quality conformance inspection.

4.4.1 Sampling.

4.4.1.1 For examination and tests. 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 4.4.1.1 shall be examined as specified in 4.5.1. AQL shall be 1.5 percent for major defects and 2.5 percent for minor defects. Major and minor defects are defined in MIL-STD-294.

4.4.3 Tests. Belts selected in accordance with 4.4.1.1 shall be tested as specified in 4.5.2.1. AQL shall be 1.5 percent defective. A belt shall be determined defective upon failure to pass any test.

4.5 Inspection procedure.

4.5.1 Examination. The belts shall be examined for visible defects as specified in MIL-STD-294.

4.5.2 Tests.

4.5.2.1 Pitch length. The belts shall be tested for pitch length as specified in Mechanical Power Transmission Association and the Rubber Manufacturer's Association Engineering Standard, for Drives Using Multiple V-Belts A, B, C, D and E Cross Sections. A pitch length exceeding the limits specified on the applicable military standard shall constitute failure of this test.

4.5.2.2 Elongation. The belt shall be firmly clamped in the jaws of a vertical tensile test machine. The jaws shall be at least 12 inches apart from 3/4-inch to 2 inches per minute. Gage marks shall be placed 8-inches apart on the belt segment between the machine jaws. The machine shall be operated until the minimum tension in pounds for the size of the belt being tested is reached (see table II). The distance between the gage marks shall be measured. An increase in distance between gage marks of more than 8 percent shall constitute failure of this test.

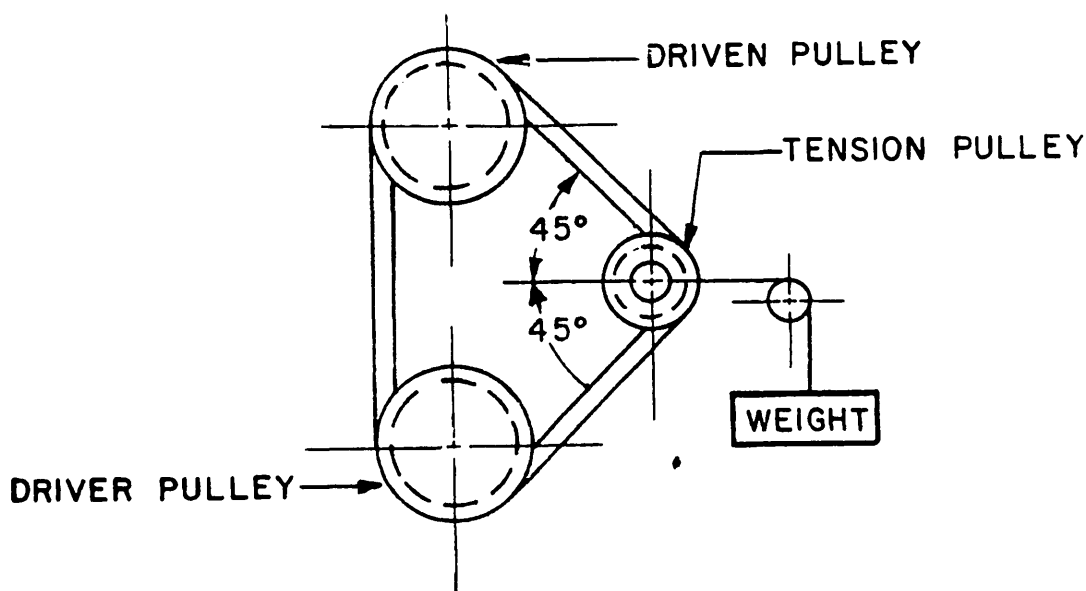
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TABLE II. Tension requirements for elongation test

Cross-sectional designation	Tension (pounds) minimum (per strand)
A	250
B	400
C	700

4.5.2.3 Temperature test.

4.5.2.3.1 Apparatus. The apparatus shall consist of an air oven, a cold chamber, and three pulleys having regular groove dimensions conforming to MS39260 and pitch diameters, as specified in table III. Both oven and cold chamber shall be of a size to accommodate a belt 70 inches in length without contacting the oven or chamber walls. The pulleys shall be mounted on a panel with center position as shown in figure 1. The pulleys shall be free rotating at minus 40° F.

FIGURE 1. Pulley arrangement for temperature tests.

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TABLE III. Pulleys and tension weights, for temperature tests

Belt cross-section	Pulleys, driver & driven (inches)	Tension pulleys (inches)	Tension weights (pounds)
A	5	3.5	35
B	6	5	45
C	9	7	115

4.5.2.3.2 Procedure. The belts shall be placed in the air oven in an unrestrained, horizontal position and the temperature of the oven shall be maintained at $180^{\circ} \pm 5^{\circ}$ F for 12 hours. At the end of the 12 hours, the belt shall be removed from the oven and allowed to cool for 30 minutes at $75^{\circ} \pm 10^{\circ}$ F. Then the belt shall be installed on the pulley and panel assembly and the belt tensioned by applying the applicable tension weight specified in table III. The tension weight may be applied as shown in figure 1, or the panel may be turned 90° F with the tension pulley at the bottom and the weight suspended from the tension pulley. The tension pulley location shall be locked and the weight removed. The assembly of belt and pulleys shall be placed in the cold chamber and the chamber maintained at a temperature of $\text{minus } 40^{\circ} \pm 5^{\circ}$ F for 12 hours. At the end of 12 hours and while still in the cold chamber, the pulleys shall be rotated with a torque wrench applied to the driver pulley until the belt has been rotated not less than two complete revolutions. The torque required to start and the torque required to continue rotation shall be recorded. The belt shall then be examined for visible evidence of cracking. Any evidence of cracks or torque in excess of that specified in table I shall constitute failure of this test.

4.5.2.4 Electrical resistivity. Place two 5/8-inch diameter brass contacts on the belt specimen 8-1/2 inches on centers. Each contact shall be moistened with water and pressed against the belt specified with force of 12-1/2 pounds. Resistance between contacts shall be measured with an ohmmeter operating at a potential of 500 volts. The ohmmeter shall have a range from zero to 10 megohms with an accuracy of plus or minus 2 percent. A resistivity greater than 6 megohms between contacts shall constitute failure of this test.

4.5.2.5 Oil-resistance test. Three belt sections each, 3 inches long, shall be immersed in ASTM Oil No. 1 and ASTM Oil No. 3, as cited in ASTM D-471, at a temperature of 158° F for 22 hours. The thickness of each belt section shall be measured at the center and 1/2-inch from each end, before and after the immersion. The percent increase or decrease in thickness of any specimen shall be recorded as the average of the three readings for that specimen. Failure of any specimen to meet the requirements of 3.10 shall be cause for rejection.

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4.6 Inspection of packaging.

4.6.1 Quality conformance inspection.

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.

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

101. Materials or containers not as specified for Level A or B. Each incorrect material or container shall be considered one defect.
102. Belt sets not combined and secured together as a single unit.
103. Belts not preserved in the quantities specified.
104. Gross weight exceeds 200 pounds for level A.
105. Gross weight exceeds the weight limitations of the fiberboard box for level B.
106. Strapping not as specified.
107. Marking missing, illegible, incorrect, or incomplete.

5. PREPARATION FOR DELIVERY

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 and secured together as a single unit (see 3.12.1). Belts of like description or belt sets of like description shall be preserved together in quantities specified (see 6.2), in a close-fitting, weather-resistance class box conforming to PPP-B-636, style optional. Box closure shall be in accordance with the appendix to the box specification method V.

5.1.2 Commercial. Each belt set shall be combined and secured together as a single unit. Belts of like description or belt sets of like description shall be preserved in accordance with MIL-STD-1188.

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

5.2.1 Level A. The belts or belt sets of like description shall be packed in a close-fitting box conforming to PPP-B-601, overseas type, style optional. Strapping shall conform to QQ-S-781, class 1, type I or IV,

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size as applicable. Unless 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.

5.2.2.1 Military agencies. The belts or belt sets of like description preserved as specified in 5.1 shall be packed as specified for level A except domestic boxes may be used or the belts shall be packed in a close-fitting box conforming to PPP-B-636, V3c or V3s. The gross weight shall not exceed the weight limitation of the box specification; closure and strapping shall be in accordance with the appendix to the box specification.

5.2.2.2 Civil agencies. The belts or belt sets of like description shall be packed in a close-fitting box conforming to PPP-B-636, class domestic. The gross weight shall not exceed the weight limitation of the box specification; closure and strapping shall be in accordance with the appendix to the box specification.

5.2.3 Commercial. The belts or belt sets of like description shall be packed in accordance with MIL-STD-1188.

5.3 Marking.

5.3.1 Civil agencies. Shipments shall be marked in accordance with FED. STD. No. 123.

5.3.2 Military packaging. Shipments shall be marked in accordance with MIL-STD-129.

5.3.3 Commercial packaging. Shipments shall be marked in accordance with MIL-STD-1188.

6. NOTES

6.1 Intended use. The belts are intended for use in transmitting power usually on drives that require belts in multiple. Belts specified in this specification do not include engine accessory drive, fractional horsepower, or the industrial 3V, 5V, or 8V cross-sectional designations.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents;

- (a) Title, number, and date of this specification.
- (b) The cross-section designation and length (see 1.2 and 3.5).
- (c) When matched sets are required, and number of belts in a set (see 3.6).

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- (d) When oil-resistance is required (see 3.10).
- (e) When age of belts shall be not more than 12 months (four quarters) old (see 3.11).
- (f) Degree of preservation and packing required (see 5.1 and 5.2).
- (g) Quantity of belts per package (see 5.1.1 and 5.1.2).

6.3 Qualification of D and E cross-sections. The belts in A, B, and C cross-sections shall be representative of D and E cross-sections for elongation and temperature tests, providing the D and E cross-sections are manufactured with the same basic compounds and tensile members.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable qualified products lists, whether or not such products have been actually so listed by that date. The attention of the contractor is called to this requirement and manufacturers are urged to arrange to have the products they propose to offer to the Federal 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 U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, VA 22060, ATTN: DRDME-H.

6.5 V-Belts. The industrial V-Belts specified herein conform to Engineering Standards of Rubber Manufacturers Association and the Mechanical Power Transmission Association except for elongation requirements.

6.6 Age. Age of belts as specified in 3.11 should be imposed only on large quantity procurements of belts that are intended for replacement purposes over a several year period.

6.7 International standardization agreement. Certain provisions of this specification are the subject of International Standardization Agreement ABC 63. When amendment, revision, or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the international agreement concerned.

6.8 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).

MILITARY INTEREST:**Custodians:**

Army - ME
Navy - YD
Air Force - 99

Review Activities:

Army - ME
DSA - CS

User Activities:

Army - AV, AR

CIVIL AGENCY COORDINATING ACTIVITIES;

GSA - FSS
DOT - ACO
NASA - JFK

Preparing Activity: Army - ME

Project 3030-0119

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