

MIL-P-16404B

20 September 1973

SUPERSEDING

MIL-P-16404A

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## MILITARY SPECIFICATION

## PACKING, ASBESTOS

This specification is mandatory for use by all departments and agencies of the Department of Defense.

## 1. SCOPE

\* 1.1 Scope. This specification covers five types of asbestos packing material for use in hydraulic and mechanical components.

1.2 Classification. Packing shall be of the following types, grades, and classes, as specified (see 6.2).

Type I	Soft-twisted, single strand
Type II	Spiral-twisted single ply yarn, 12 to 15 strands
Type III	Twisted yarn, several strands
Type IV	Braided, lubricated, and graphite coated
Type V	Molded
*Grade AA	Yarn asbestos Content 90% wt. up to but excluding 95% wt.
*Grade Under-	Yarn asbestos Content 80% wt. up to but excluding 85% wt.
writers	
Class 1	Free of lubricant, rubber, and graphite
Class 2	Rubber frictioned, without lubricant, and coated with graphite on the outside only
Class 3	Single ply yarn, 18 to 22 strands, lubricated, and each strand coated with graphite
Class 4	Double ply yarn, 5 strands, lubricated, and outside surface coated with graphite
Class 5	Molded from braided asbestos tubing, lead-reinforced, lubricated, and outside surface coated with graphite

MIL-P-16404B

## 2. APPLICABLE DOCUMENTS

2.1 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.

### SPECIFICATIONS

#### Federal

*QQ-L-201	Lead Sheet
*SS-G-659	Graphite, Dry (Lubricating)
*PPP-B-566	Box, Folding, Paperboard
*PPP-B-636	Box, Fiberboard
*PPP-B-676	Box, Setup

#### Military

*MIL-B-121	Barrier Material, Greaseproofed, Waterproofed, Flexible
*MIL-L-10547	Liners, Case, and Sheet, Overwrap, Water-Vaporproof or Waterproof, Flexible
*MIL-L-25681	Lubricating Oil, Molybdenum Disulfide, Silicone Base, High Temperature

### STANDARDS

#### Military

*MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
*MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-417	Rubber Composition, Vulcanized General Purpose, Solid

(Copies of specifications, standards, drawings, and publications required by suppliers 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 document to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

\*American Society for Testing and Materials

ASTM D 297	Standard Method of Chemical Analysis of Rubber Products
ASTM D 299	Standard Specification for Asbestos Yarns
ASTM D 1918	Method of Test for Asbestos Content of Asbestos Textile Materials

(Application for copies of ASTM standards should be addressed to the 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.)

\*Consolidated Classification Committee

Uniform Freight Classification Rules

National Motor Freight Classification

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago, Ill. 60606.)

### 3. REQUIREMENTS

\*3.1 End-item. Packing furnished under this specification shall be a product which has been inspected and passed the quality conformance inspection specified in section 4.

\*3.2 Materials. Materials shall be as specified herein and shall conform to the applicable requirements of this specification. All materials which are not specifically described herein shall be of the best quality

MIL-P-16404B

and suitable for the purpose intended. Packing covered by this specification shall be made of asbestos yarn, with or without lubricant, rubber frictioning, graphite, and lead reinforcement, as specified for the various types and classes.

\*3.2.1 Asbestos. The asbestos used shall be the mineral chrysotile, containing not less than 12 percent by weight of water of hydration, in the form of textile materials composed of organic fibers and asbestos (see 1.2).

\*3.2.2 Lubricants. The lubricant used in this packing shall be a noncorrosive oil conforming to MIL-L-25681. Lubricant for Classes 3 and 4 shall not exceed 20 percent by weight of the finished packing. For Class 5 packing, the lubricant shall not exceed 23 percent by weight of the finished packing.

\*3.2.3 Frictioning compound. The compound used in class 2 packing shall be made of type S class SB; grade 515 synthetic oil-resistant rubber in accordance with MIL-STD-417. The rubber content of type II, class 2 packing shall be not more than 10.0 percent by weight of the finished packing.

\*3.2.4 Graphite. Graphite coatings for classes 2, 3, 4, and 5 packings shall be smoothly applied, and shall be 0.5 to 2.0 percent by weight of the finished packing. Graphite used for coating either the separate strands or the outer surface of packings shall conform to the requirements of SS-G-659, type "small particle size."

\*3.2.5 Lead. The lead used in class 5 packings shall be in accordance with QQ-L-201, grade B.

### 3.2.6 Yarn.

\*3.2.6.1 Weight of yarn. Single ply yarn shall weigh  $1.00 \pm 0.10$  pound per 1,000 yards.

\*3.2.6.2 Grades of yarn. Grade AA yarn shall contain 90.0 to 94.99 percent by weight of asbestos fiber. Grade Underwriters yarn shall contain 80.0 to 84.99 percent by weight of asbestos fiber.

\*3.2.7 Sizing, organic fibers, and binder. The amount of sizing, organic fibers, and binder shall not exceed 10.0 percent by weight of the finished packing for Grade AA yarn and 20.0 percent by weight of the finished packing for Grade Underwriters yarn.

3.3 Construction and design. Unless otherwise specified, the various types and classes of packing shall be constructed as indicated in 1.2, and shall have the following properties.

\*3.3.1 Characteristics of types and classes.

Type I, class 1	Single strand, soft-twisted, free of lubricants, rubber and graphite, $0.047 \pm .007$ inch in diameter
Type II, class 2	Spiral twisted from parallel strands to a cord $0.125 \pm .018$ inch in diameter. This construction shall permit the ready adjustment of the diameter by unwinding the spiral, removing or adding parallel strands, and rewinding to a different diameter
Type III, class 3	$0.188 \pm .028$ inches in diameter
Type III, class 4	$0.094 \pm .014$ inches in diameter
Type IV	Braided to size specified, and graphite coated
Type V, class 5	Molded from braided asbestos tubing, reinforced with a strip of sheet lead approximately $0.010$ inch thick by two-thirds the width of the finished part

\*3.3.2 Asbestos breaking strength. Asbestos breaking strength shall be as specified in contract or order.

\*3.4 Reaction with metals. The packing shall not cause corrosion or pitting of brass, copper, monel, or steel (see 4.4.2.1).

\*3.5 Adherence to metals. The packing shall not adhere or stick to brass, copper, monel, or steel, either through operation of the metallic

MIL-P-16404B

parts within the packing or upon removal of the packing from the assembly (see 4.4.2.1).

\*3.6 Performance. The finished asbestos packing shall be flexible and shall not leave hard or gummy deposits or cause corrosion to glands or valve stems, show hardening, loss of lubricant, or other deterioration.

\*3.7 Workmanship. The packing shall be uniform in quality and free from any irregularities which would adversely affect performance. The packing shall be consistent with the highest commercial practice of the industry.

#### 4. QUALITY ASSURANCE PROVISIONS

\*4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 this specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

\*4.2 Quality conformance inspection. Quality conformance inspection shall consist of the following inspections performed upon each 3 ounce sample (see 4.3.3).

<u>Inspection</u>	<u>Paragraph</u>	<u>Samples required</u>
Visual and dimensional	4.3.5	All
Asbestos content	4.4.1.1	3 ounces <sup>1</sup>
Sizing, organic fibers, and binder	4.4.1.2	3 ounces <sup>1</sup>
Lubricant content	4.4.1.3	3 ounces <sup>2</sup>
Graphite content	4.4.1.4	3 ounces <sup>2</sup>
Rubber content	4.4.1.5	3 ounces <sup>2</sup>
Corrosion and Adhesion	4.4.2.1	3 ounces <sup>2</sup>
Strength	4.4.2.2	3 ounces <sup>1</sup>

<sup>1</sup>Sample of asbestos yarn used

<sup>2</sup>Sample of finished packing

### 4.3 Sampling

\*4.3.1 Inspection lot. A lot shall consist of finished asbestos packing of the same material, type, grade, and class produced under essentially like conditions and submitted for acceptance at one time.

\*4.3.2 Sample size. When specified, the contractor shall furnish samples for inspection to determine conformance with this specification. Samples shall consist of 3 ounces of the asbestos yarn used in the manufacture of each lot of packing, and 5 feet of the finished packing, or six finished molded packings of each item on contract or order. The samples shall be identified with the manufacturer's part number and contract number and shall be inspected as specified herein and in accordance with the contract or order (see 6.2). The samples shall be forwarded as directed by the contracting officer or agency.

\*4.3.3 Sampling for quality conformance inspection. A random sample of asbestos packing shall be taken from each lot in accordance with MIL-STD-105, inspection level S-1. The acceptable quality level (AQL) shall be as specified in table I. The quality assurance terms and definitions shall be in accordance with MIL-STD-109.

\*Table I

CLASSIFICATION OF DEFECTS FOR VISUAL AND  
DIMENSIONAL EXAMINATION OF THE END ITEM

Categories	Defects	Method of inspection
Critical	None defined	
	<u>AQL 1.0 percent</u>	
Major		
101	Size or tolerance incorrect	Visual and SIE <sup>1</sup>
102	Packing stiff (lubricant missing)	Visual
103	Graphite missing	Visual
104	Configuration incorrect	Visual
105	Lead reinforcement missing	Visual
106	Weight of yarn incorrect	SIE
	<u>AQL 4.0 percent</u>	
Minor		
201	Loose strands	Visual

<sup>1</sup>Standard inspection equipment.

MIL-P-16404B

\*4.3.4 Examination of preparation for delivery. An examination shall be made to determine that packaging and packing requirements comply with section 5 of this specification. The inspection shall be inspection level S-2 and the AQL shall be 2.5 percent defects per hundred units in accordance with MIL-STD-105.

\*4.3.5 Examination for visual and dimensional defects. Each packing taken at random, as specified in 4.3.3, shall be examined to verify conformance to requirements of this specification. Examination shall be conducted in accordance with table I. Packings having one or more major defects shall be rejected.

#### 4.4 Test methods.

##### 4.4.1 Physical properties tests.

\*4.4.1.1 Asbestos content. Tests shall be in accordance with ASTM D1918. Binder shall be removed prior to testing to determine asbestos content. Treated asbestos textile materials may be tested providing the treatment can be completely removed prior to analysis.

\*4.4.1.2 Sizing, organic fibers, and binder content. The percentage of sizing, organic fibers, and binder in the yarn shall be determined by subtracting the percent asbestos content from 100 percent.

4.4.1.3 Lubricant content. Weigh a 2-gram sample of the finished packing into an extraction thimble. Extract with acetone for about 4 hours in an Underwriters' apparatus, taking care to lose as little graphite as possible in handling the sample. Dry the sample at 212° Fahrenheit (F) and reweigh. The loss of weight, in percent, is taken as the oil or lubricant content.

4.4.1.4 Graphite content. Remove manually as much of the graphite as possible from the extracted sample of 4.4.1.3. Weigh directly as graphite.

\*4.4.1.5 Rubber content. Tests for rubber and rubber content specified in 3.2.3 shall be made in accordance with ASTM D 297.

##### \*4.4.2 Corrosion, adhesion, and strength tests.

MIL-P-16404B

\*4.4.2.1 Corrosion and adhesion tests. The packing shall be tested for corrosion and adhesion to brass, copper, monel metal, and steel to determine compliance with the requirements of 3.4 and 3.5. A compression device shall be used for conducting these tests. This compression device shall consist of a base plate provided with two studbolts on which polished plates of brass, copper, monel metal, and mild steel are successively placed. These plates used in this device shall measure 3 by 1 by 1/8 inch. Two compression springs, which together are capable of imposing a load of 25 pounds per square inch, are placed over the studs and secured by a nut on top of each stud. The nuts also serve to adjust the spring loads so as to obtain the specified load on the packing specimen. The total surface area of the packing specimen shall be 1 square inch. One or more strips of packing may be used to make up this area. Before running the test, the test strips of brass, copper, monel metal, and steel shall be cleaned with reagent grade benzene. A strip of one of the above metals and a packing specimen are placed in the device and the stud nuts are adjusted so that the springs impose a load of 25 pounds per square inch on the packing. The device assembly shall then be placed in an oven at  $158^{\circ} \text{F} \pm 2^{\circ}$  for a period of 168 hours (1 week). At the end of this period the test assembly shall be removed from the oven and disassembled. The packing contact surface of the metal test plate shall be carefully examined for corrosion and pitting. A slight discoloration of the metal shall not be considered as corrosion. The packing specimens shall be considered as adhering if particles or pieces of the packing remain in contact with the metal surface. This test shall be conducted for each kind of metal noted above.

\*4.4.2.2 Strength test. Tests for asbestos strength shall be made in accordance with ASTM D 299.

#### \*5. PREPARATION FOR DELIVERY

\*5.1 Packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

\*5.1.1 Level A. Unless otherwise specified, types I, II, III, and IV packings shall be wrapped in greaseproof barrier material conforming to grade A of MIL-B-121 and packaged in 1/4-pound quantities in containers conforming to PPP-B-566, PPP-B-676, or PPP-B-636. Type V molded packings shall be wrapped 12 to a roll either in waxed paper or in greaseproof barrier material conforming to grade A of MIL-B-121, and package one roll in either paperboard or fiberboard cylindrical containers or in containers conforming to specifications mentioned herein.

MIL-P-16404B.

\*5.1.2 Level C. Preservation and packaging shall be sufficient to afford physical protection against damage during shipment from the supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice when such meets the requirement of this level.

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

\*5.2.1 Level A. Unless otherwise specified by the procuring activity, packings packaged as specified in 5.1 shall be packed in fiberboard shipping containers conforming to PPP-B-636, class weather resistant, style RSC-L. Insofar as practicable, shipping containers shall be similar in shape and size and shall contain identical quantities. Container closure, sealing and strapping shall be in accordance with the appendix to PPP-B-636.

\*5.2.1.1 Shipping box. Boxes shall be closed, strapped, or banded in accordance with the applicable box specification or appendix thereto. Gross weight of PPP-B-636 boxes shall not exceed the weight limitation of the box specification. When specified, containers subject to level A shipments shall be lined with a case liner conforming to MIL-L-10547 and sealed according to the appendix thereto.

\*5.2.2 Level B. Level B shall be the same as level A except shipping containers shall conform to class domestic.

\*5.2.3 Level C. Packings packaged as specified in 5.1 shall be packed in a manner which affords adequate protection against damage during shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations as indicated in 2.2 and may be the supplier's commercial practice when such meets the requirements of this level.

\*5.3 Marking. In addition to any special marking required by the contract or order (see 6.2), interior unit containers and exterior shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

\*6.1 Intended use. Packing covered by this specification is intended for use in hydraulic and mechanical components of torpedoes, missiles, rockets, etc.

\*6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Type, grade, and class required (see 6.2.1)
- (c) Dimensions (see 3.3.1)
- (d) Quantity required
- (e) Breaking strength (see 3.3.2)
- (f) Applicable levels of packaging and packing (see 5.1 and 5.2)
- (g) Markings as required (see 5.3).
- (h) Whether case liners are required (see 5.2.1.1)
- (i) Whether inspection samples are required (see 4.3.2)

\*6.2.1 Grades clarification. Grades A and B, specified in MIL-P-16404A, have been redesignated as Grades AA and Underwriters, respectively.

\*6.3 The margins of this specification are marked with an asterisk where changes (additions, modifications, corrections, deletions, etc.) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:  
 Army--WC  
 Navy--OS  
 Air Force--82

Preparing activity:  
 Navy--OS  
 (Project No. 5330-0377)

Review activities:  
 Army--MR  
 Navy--SH  
 Air Force--82  
 DSA--IS

User activities:  
 Navy--AS

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
<p><b>INSTRUCTIONS:</b> This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p>		
<p>SPECIFICATION MIL-P-16404B, Packing, Asbestos</p>		
<p>ORGANIZATION</p>		
<p>CITY AND STATE</p>		<p>CONTRACT NUMBER</p>
<p>MATERIAL PROCURED UNDER A  <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT      <input type="checkbox"/> SUBCONTRACT</p>		
<p>1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?  A. GIVE PARAGRAPH NUMBER AND WORDING.</p>		
<p>B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES</p>		
<p>2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID</p>		
<p>3. IS THE SPECIFICATION RESTRICTIVE?  <input type="checkbox"/> YES      <input type="checkbox"/> NO (If "yes", in what way?)</p>		
<p>4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)</p>		
<p>SUBMITTED BY (Printed or typed name and activity - Optional)</p>		<p>DATE</p>

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