

MIL-P-24377A
13 August 1982
~~SUPERSEDING~~
MIL-P-24377(SHIPS)
14 February 1969
(See 6.5)

MILITARY SPECIFICATION

PACKING MATERIAL, ASBESTOS, BRAIDED,

IMPREGNATED WITH PTFE (POLYTETRAFLUOROETHYLENE), SURFACE LUBRICATED

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

1. SCOPE

1.1 Scope. This specification covers a braided asbestos packing, impregnated with polytetrafluoroethylene (PTFE), and lubricated with a petroleum lubricant, for general service, when the service temperature does not exceed 500 degrees Fahrenheit ($^{\circ}$ F).

1.2 Definitive specification part number. The specification part number is a definitive part number which will be formulated by selecting from the requirement options available in the specification as follows:

Definitive Specification Part Number: M24377 - XX

MILITARY SPECIFICATION NUMBER _____

SIZE DESIGNATOR (SEE 3.4) _____

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-566 - Boxes, Folding, Paperboard.

PPP-B-636 - Boxes, Shipping, Fiberboard.

PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple Wall.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 5330

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- MIL-P-116 - Preservation, Methods of.
- MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible.
- MIL-F-22191 - Barrier Material, Transparent, Flexible, Heat Sealable.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipping and Storage.
- MIL-STD-147 - Palletized Unit Loads.

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting 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. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 299 - Asbestos Yarns, Specification for.
- D 1918 - Asbestos Content of Asbestos Textile Materials, Test for.
- D 2257 - Extractable Matter in Yarns, Test for. (DoD adopted).

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

UNIFORM CLASSIFICATION COMMITTEE AGENT

Uniform Freight Classification Ratings, Rules and Regulations

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article. When specified, the contractor shall furnish a sample unit for first article inspection and approval (see 4.3 and 6.2.1).

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3.2 Material. The packing material shall be made of plain white asbestos yarn containing suitable reinforcing fibers, impregnated with PTFE and lubricated with petrolatum or petroleum based oil.

3.2.1 Asbestos yarn. The yarn shall be without wire insertion and have a white crysotile asbestos fiber content of not less than 75 percent by weight, as defined by commercial grade of ASTM D 299 (see 4.8.5).

3.2.2 Impregnation. The impregnation shall be from a dispersion of virgin PTFE deposited uniformly throughout the packing (see 4.8.4.1). Based on the weight of the dry yarns after the lubricant has been extracted, the PTFE content shall be not less than 30 percent (see 4.8.4.2).

3.2.3 Lubricant. The lubricant shall be either a highly refined white petrolatum or petroleum based mineral oil, weighing 10 percent \pm 5 percent of the finished packing (see 4.8.3). The lubricant shall be applied to either the surface of individual strands before braiding or to the surface of the finished braided packing.

3.3 Construction. The packing shall be braided, for sizes 1/4-inch and over, to a diagonal interlocking through-body-to-surface construction (as opposed to braid-over-braid or square-braid construction). This construction shall use either 20 diagonal strands, and center-corner-stuffer strands, as necessary, or 36 diagonal strands, and center-corner-stuffer strands, as necessary, to produce a dense square packing with good dimensional stability. Sizes 1/8-inch and 3/16-inch only shall be square braided (see 4.8.2 and figure 1).

3.4 Sizes and weights. The packing shall be calendered square in cross section and furnished in sizes shown in table I (see 6.2.1). The weight per linear foot shall be not less than that shown in table I.

TABLE I. Sizes and weights of packing.

Part number	Nominal size, (Cross-section) inches	Minimum weight pounds/foot	Part number	Nominal size, (Cross-section) inches	Minimum weight pounds/foot
01	1/8	0.008	13	7/8	0.398
02	3/16	0.013	14	15/16	0.450
03	1/4	0.027	15	1	0.500
04	5/16	0.050	16	1-1/8	0.640
05	3/8	0.076	17	1-1/4	0.800
06	7/16	0.107	18	1-3/8	1.000
07	1/2	0.138	19	1-1/2	1.250
08	9/16	0.172	20	1-5/8	1.550
09	5/8	0.212	21	1-3/4	1.800
10	11/16	0.255	22	1-7/8	2.100
11	3/4	0.300	23	2	2.350
12	13/16	0.345		---	---

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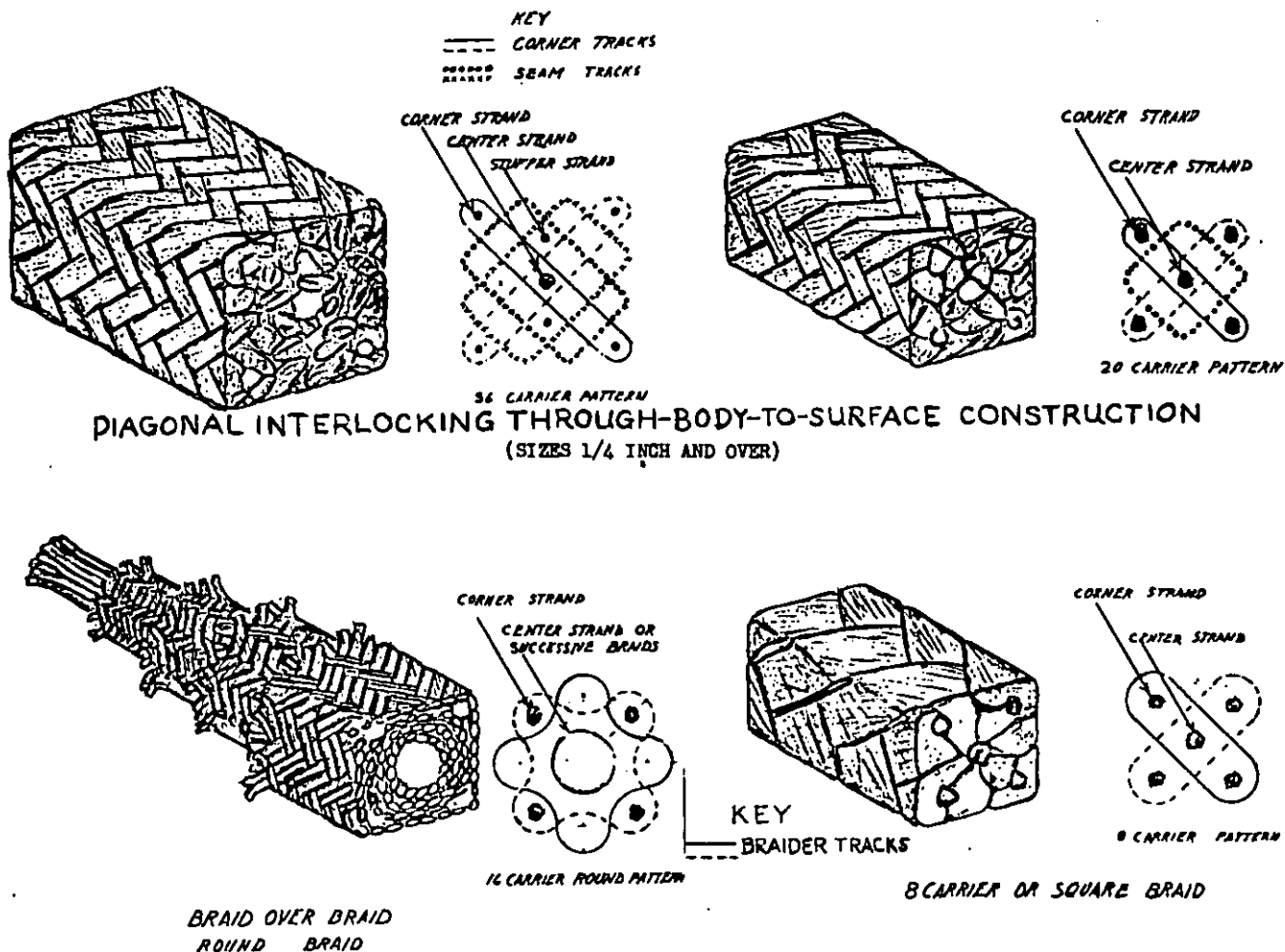


FIGURE 1. Interlocking versus braid-over-braid patterns.

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3.5 Spools or reels. Unless otherwise specified (see 6.2.1), the packing shall be uniformly coiled on spools or reels according to the following:

<u>Packing size (inch)</u>	<u>Package</u>
1/8 through 7/16	1 or 5 pounds (lb.) spools
3/8 through 3/4	5 or 10 lb. spools
3/4 through 1	25, 50, or 100 lb. reels
1-1/8 through 2	50 or 100 lb. reels

3.6 Workmanship. The workmanship shall be first class in all respects, and the packing shall be free from defects which may affect its serviceability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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 inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 First article inspection.

4.3.1 First article inspection. First article inspection shall consist of the examination of 4.4 and the tests specified in 4.8.

4.3.2 First article tests. Prior to production, first article tests shall be conducted on a sample, sufficient in size to determine the conformance with all the tests and requirements as specified herein, (see 6.3). The test material shall be certified to be identical in composition to the material to be supplied later for quality conformance inspection in accordance with the data ordering document specified in 6.2.2. The first article sample shall comply to the requirements specified herein. First article tests shall be monitored by a Government representative. The contractor shall not proceed with production under the contract or purchase order without submitting all approved test data results certified by the Government representative and without receiving final written approval from the contracting activity.

4.3.2.1 First article inspection report. The contractor shall furnish a first article inspection report in accordance with the data ordering document specified in 6.2.2.

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4.4 Quality conformance inspection.

4.4.1 Lot. For purposes of sampling, examination and tests, a lot shall consist of packing material of the same form and dimensions, produced in one plant under essentially the same conditions and offered for delivery at one time. At all times, the number of spools or reels shall be the lot size. The sampling unit shall be one spool or reel of packing.

4.4.2 Sampling.

4.4.2.1 Sampling for visual and dimensional examination. For visual and dimensional examination, a random sample shall be selected from each lot according to MIL-STD-105 at inspection level II, with an acceptable quality level (AQL) of 2.5 percent defective.

4.4.2.2 Sampling for quality conformance tests. For quality conformance inspection requiring tests, a random sample shall be selected from each lot according to MIL-STD-105, level S-2, with an AQL of 2.5 percent defective.

4.4.3 Examination.

4.4.3.1 Examination for visual and dimensional defects. Each unit selected according to 4.4.2 shall be surface examined and measured to determine conformance with the requirements which do not require tests. Any unit containing one or more visual or dimensional defects shall be rejected, and if the number of defective units in the sample exceeds the acceptance number for that sample, this shall be cause for rejection of the lot which this represents.

4.4.3.2 Examination of packaging. An examination shall be made to determine that the packaging, packing, and marking comply with the requirements of section 5. Examination of packaging shall be in accordance with the following. For examination of interior packaging, the sample unit shall be one shipping container fully prepared for delivery, selected at random just prior to the closing operations. Shipping containers fully prepared for delivery shall be examined for defects of closure listed in table II. The lot size shall be the number of shipping containers in the end item inspection lot. Sampling shall be in accordance with MIL-P-116. The AQL shall be 2.5 percent.

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TABLE II. Examination of packaging defects.

Examine	Defects
Packaging	Not level specified; not in accordance with contract requirements. Not packaged in unit containers as specified. Mixed class, type and size in same container, container containing less than indicated or specified quantity.
Packing	Not level specified; not in accordance with contract requirements. Packing material not as specified; closures not accomplished by specified or required methods or materials. Gross weight of shipping container exceeds specified limit.
Marking	Any nonconforming component, component missing, damaged, or otherwise defective affecting serviceability. Interior and exterior markings omitted, illegible, incorrect, incomplete, not in accordance with contract requirements.

4.5 Production check tests. Production check tests shall be conducted on samples from the first lot of material offered under a contract or purchase order and one check pest from every ten lots thereafter. All of the tests specified in 4.8 shall be conducted.

4.6 Quality conformance tests. Quality conformance tests shall be conducted on those lots which are not represented by 4.5. The tests specified in 4.8.1, 4.8.2, and 4.8.4.1 shall be conducted.

4.7 Rejection. If any of the samples tested in accordance with 4.5 or 4.6 is found not to be in conformance with the requirements specified herein, the lot which it represents shall be subjected to rejection. Furthermore, if the failure was a production check test, additional samples shall be taken from (or provided to represent) each subsequent lot and shall be subjected to the test or tests wherein the failure occurred. Each lot shall then be considered acceptable only after satisfactory results are obtained on the test or tests by all the samples taken to represent the lot. This additional testing shall be discontinued after four successive lots have passed the test or tests.

4.8 Test procedures.

4.8.1 Weight. The weight shall be determined after carefully weighing and measuring a specimen at least two feet long.

4.8.2 Construction. The diagonal interlocking through-body-to-surface, braid-over-braid, and square-braid patterns are shown in figure 1 for visual examination. In addition, a one to two inch length of coil being examined shall be unbraid and strands (not yarn plies or ends) counted and compared to the numbers as specified in 3.3.

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4.8.3 Lubricant. The lubricant content of the finished packing shall be determined as specified in ASTM D 2257 with the following exceptions:

- (a) Extraction time shall be 16 hours.
- (b) The halogenated hydrocarbon solvent only shall be used. Duplicate specimens shall be taken from different parts of the packing. Results are calculated as $P = 100 E/S$ where,
 P = Percent halogenated hydrocarbon solvent extract on the original sample,
 E = Weight of halogenated hydrocarbon solvent extract, and
 S = Specimen weight before extraction.

4.8.4 Impregnant.

4.8.4.1 Visual. A sample length of material shall be visually inspected to determine if the PTFE impregnant is distributed throughout the packing or is concentrated on the packing surface.

4.8.4.2 Analysis. Place a 5-gram specimen of extracted material (lubricant removed) in a crucible and heat at $220^{\circ} \pm 2^{\circ}\text{F}$ to constant weight (original dry weight) at room temperature. Heat at $600^{\circ} \pm 10^{\circ}\text{F}$ for 24 hours, cool, and weigh. Heat the same specimen at $900^{\circ} \pm 25^{\circ}\text{F}$ for three hours, cool, and weigh. Redetermine the crucible weight without the specimen after the 900°F heating, unless a platinum crucible was used. Use this new weight of the crucible to determine the weight of the residue after heating. Heating shall be done in a ventilated hood to avoid exposure to toxic vapors. The percentage of PTFE is calculated as follows, based on an average of three determinations:

W = Average original dry weight of specimens after extraction.
 F = Average weight of residue in crucibles after heating at 600°F .
 N = Average weight of residue in crucibles after heating at 900°F .

$$\text{Percent PTFE} = \frac{100 (F - N)}{W}$$

4.8.5 Asbestos content. The asbestos content of the yarn used to fabricate the packing shall be determined in accordance with the method specified in ASTM D 1918. The petroleum lubricant shall be extracted before the determination is made (see 4.8.3).

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.4.)

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5.1 Packaging. Packaging shall be level A or C, as specified (see 6.2.1).

5.1.1 Level A. Unless otherwise specified (see 6.2.1), each unit (see 3.5) shall be wrapped in a greaseproof barrier material conforming to grade A of MIL-B-121 or type II of MIL-F-22191 at the contractor's option, and individually packaged as follows:

<u>Unit</u>	<u>Specification</u>	<u>Box</u>
1 to 10 pound spools	PPP-B-566	Boxes, Folding, Paperboard
25 to 50 pound spools	PPP-B-636	Boxes, Shipping, Fiberboard
50 or 100 pound reels	PPP-B-640	Boxes, Fiberboard, Corrugated, Triple Wall

5.1.2 Level C. Packaging shall afford protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2.1).

5.2.1 Level A. One to ten pound units packaged as specified (see 6.2.1), shall be packed in containers conforming to the weather resistant class of PPP-B-636 or class 2 of PPP-B-640, at the option of the contractor. All corners and edge seams and manufacturer's joints shall be waterproofed in accordance with the appendix to PPP-B-636 or PPP-B-640, as applicable. Twenty-five to 100 pound units shall require no further packing.

5.2.2 Level B. One to ten pound units packaged as specified (see 6.2.1), shall be packed in containers conforming to class domestic of PPP-B-636 or class 1 of PPP-B-640, at the option of the contractor. Twenty-five to 100 pound units packaged as specified shall require no further packing.

5.2.3 Level C. Units shall be packed in containers in a manner which will ensure acceptance for shipment by common carrier at the lowest rates and will afford protection against physical damage during direct shipment from the supply source to the first receiving activity for immediate use. This level, in general, shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations, as applicable to the mode of transportation.

5.3 Unitized loads. Unitized loads should be used when practical and shall be commensurate with the level of packing stated in the contract or purchase order (see 6.2.1). Palletization, when required, shall be in accordance with MIL-STD-147.

5.4 Interior packages and exterior marking. In addition to any special marking required (see 6.2.1), shipping containers shall be marked in accordance with MIL-STD-129.

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6. NOTES

6.1 Intended use. This material is intended for service on stern tubes, rudder posts, rotary shafts, and reciprocating rods on pumps in general service, low and high pressure valve stems, and miscellaneous mechanical applications (see 6.2.1). It is not intended for use with superheated steam or other service resulting in packing temperature over 500°F, oxygen, alkaline molten metals, or fluorochemicals. Toxic fumes from overheated PTFE must be avoided. Pressure should not exceed 2,500 pounds per square inch, and rod or shaft speed should not exceed 5,000 feet per minute.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) First article sample, if required (see 3.1).
- (c) Size required (see 3.4). If necessary, also include size tolerance.
- (d) If other than spools or reels are desired (see 3.5).
- (e) Level of packaging and level of packing required; if other than 5.1 (see 5.2).
- (f) Palletization when required (see 5.3).
- (g) Special marking, if required (see 5.4).
- (h) Intended use and need for appropriate installation instructions (see 6.1).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n) (2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph no.	Data requirement title	Applicable DID no.	Option
4.3.2	Certificate of Compliance	DI-E-2121	----
4.3.2.1	Reports, Test	DI-T-2072	10.1.b

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and

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accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 First article inspection. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - AR
Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 5330-0561)

User activities:

Army - ME
Navy - AS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER (Number) AND TITLE

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1. ☐ **HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?** ☐ **IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.**

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B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY (Printed or typed name and address — Optional)

TELEPHONE NO.

DATE

DD FORM 1426
1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.