

MIL-R-3065E
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SUPERSEDING
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MILITARY SPECIFICATION

RUBBER, FABRICATED PRODUCTS

This specification is approved for use by the Army Materials and Mechanics Research Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1. Scope. This specification establishes the requirements for fabricated products of vulcanized rubber, synthetic rubber or rubberlike compositions alone or in combination, together with procedures for the inspection of such products (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications, standard and handbooks 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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, US Army Materials and Mechanics Research Center, ATTN: DRXMR-SMS, Watertown, MA 02172 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

/FSC 9320/

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SPECIFICATIONS

FEDERAL

- NN-P-530 - Plywood, Flat Panel
- UU-P-268 - Paper, Kraft, Wrapping
- PPP-L-601 - Boxes, Wood, Cleated Plywood
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner
- PPP-B-636 - Boxes, Shipping, Fiberboard
- PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall
- PPP-T-45 - Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing.

MILITARY

- MIL-P-116 - Preservation, Packaging, Methods of

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-177 - Rubber Products, Terms for Visible Defects of
- MIL-STD-190 - Identification Marking of Rubber Products
- MIL-STD-289 - Visual Inspection Guide for Rubber Sheet Material
- MIL-STD-298 - Visual Inspection Guide for Rubber Extruded Goods
- MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items
- MIL-STD-417 - Classification System and Tests for Solid Elastomeric Materials
- MIL-STD-1523 - Age Controls of Elastomeric Materials

HANDBOOKS

MILITARY

- MIL-HDBK-695-Rubber Products Recommended Shelf Life

(Copies of specifications, standards, drawings, and publications 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.

American Society for Testing and Materials (ASTM) Standards:

- ASTM D 2000 - Elastomeric Materials for Automotive Applications
- ASTM D 3133 - Rubber-Preparation of Pieces for Test from other than Standard Vulcanized Sheets.
- ASTM D 3951 - Standard Practice for Commercial Packaging

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

Rubber Manufacturer's Association

Rubber Handbook, Specifications for Rubber Products
Rubber Sheet Packing Handbook
Vendors Identification Guide for Molded and Extruded Goods

(Application for copies should be addressed to the Rubber Manufacturer's Association, 1901 Pennsylvania Avenue, N.W., Washington, DC 20006).

(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 Material. Rubber products furnished under this specification shall be made from rubber compositions in accordance with one of the grades, types, classes and suffixes designated in ASTM D 2000 (see 6.2 and 6.4).

3.2 Physical properties. The physical properties of the rubber products covered by this specification shall be determined from specimens cut from the product or from specimens prepared from samples furnished by the contractor (see 4.3.3). The properties shall be determined in accordance with procedures and applicable documents established in ASTM D 2000 and shall conform to the values for the applicable grade, type and class listed in ASTM D 2000 (see 6.1 and 6.1.1).

3.3 Dimensions and tolerances. Dimensions and tolerances shall be in accordance with the applicable part drawing or as indicated in the contract or purchase order (see 6.2). If no tolerances are specified, A-3 commercial tolerances of the Rubber Manufacturer's Association (RMA) Rubber Handbook as shown in table I, shall apply for molded solid rubber products and the commercial tolerances of the RMA Rubber Sheet Packing Handbook, as shown in table II, shall apply for sheet packing. Commercial tolerances as shown in tables III, IV and V shall apply for extruded shapes, extruded tubing and calendered sheet, respectively.

3.4 Identification marking. When specified (see 6.2) identification marking shall be in accordance with MIL-STD-190 and the RMA Vendors Identification Guide for Molded and Extruded Goods. Unless otherwise specified, sheet material shall have the applicable NSN legibly marked on one side of each sheet in at least one place within 304.8 mm (12 in.) of a narrow edge and in numbers of not less than 12.7 mm (0.5 in) in height. The marking material used shall not be deleterious to the rubber material, nor shall the markings be obliterated by normal handling.

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3.4.1 Cure date. For all rubber (or synthetic elastomers) furnished to ASTM D 2000, a cure date shall be marked and the marking shall be in accordance with MIL-STD-129 and applied using the calendar quarter and year (see 6.5).

3.5 Age Control.

3.5.1 Hose and seals ("o"-rings, gasket and packing materials). Age control of hose and seals ("o"-rings, gasket and packing materials) shall be in accordance with MIL-STD-1523.

3.5.2 Molded parts and sheet. Age control of molded parts and sheet shall be in accordance with the applicable service age control document. When a specific document is not specified, MIL-HDBK-695 shall be used as a guidance (see 6.2).

3.6 Color. Unless otherwise specified (see 6.2) the color of the rubber products (except those fabricated from classes FC, FE, FK, and GE compounds of ASTM D 2000) shall be black. Products fabricated from compounds from class FC, FE, FK and GE of ASTM D 2000 may be black or any one of several colors in which these compounds are normally supplied, such as clear, amber, white, gray or red, etc.

3.7 Recoverable Materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and shall be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recoverable materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified (see 6.2)

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Table I. RMA A3 dimensional tolerances for molded solid rubber products 1/

Size (Millimeters)	Fixed dimension tolerances <u>2/</u> (millimeters)	Closure dimension tolerances <u>3/</u> (millimeters)	Size (Inches-approx.)	Fixed dimension tolerances <u>2/</u> (inches)	Closure dimension tolerances <u>3/</u> (inches)
Above 0	Incl. 9.99	± 0.20	Above 0	Incl. 0.399	± 0.013
10	15.99	0.25	0.40	0.629	0.016
16	24.99	0.32	0.63	0.999	0.020
25	39.99	0.40	1.00	1.599	0.025
40	62.99	0.50	1.60	2.499	0.032
63	99.99	0.63	2.50	3.999	0.040
100	159.99	0.80	4.00	6.299	0.050
160 & over	To find fixed dimensional tolerances multiply by 0.5%.		6.30 & over	To find fixed dimensional tolerances multiply by 0.5%.	

1/ This table should be used only with common shaped, all-rubber parts.

2/ Fixed dimension tolerances apply individually to each fixed dimension by its own size.

3/ Closure dimension tolerances are determined by the largest closure dimension and this single tolerance is used for all other closure dimensions. (Closure dimension refers to any dimension in a plane parallel to the plane traced when the mold closes).

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Table II. RMA Commercial Tolerances for Rubber Sheet Packing

Thickness		Tolerances	
Millimeters	Inches (approx.)	Millimeters	Inches
Under 0.80	Under 0.031	± 0.25	± 0.010
0.80 to 1.59	0.031 to 0.059	0.30	0.012
1.60 to 3.19	0.060 to 0.124	0.40	0.016
3.20 to 4.79	0.125 to 0.186	0.50	0.020
4.80 to 9.49	0.187 to 0.374	0.80	0.031
9.50 to 14.29	0.375 to 0.561	1.20	0.047
14.30 to 19.19	0.562 to 0.749	1.60	0.063
19.20 to 25.39	0.750 to 0.999	2.40	0.093
25.40 and over	1.00 and over	10%	10%

Table III. Commercial tolerances for special extruded shapes, except tubing

Dimensions		Tolerance	
Millimeters	Inches (approx.)	Millimeters	Inches
0 - 2.49	0 - 3/32	± 0.41	± 0.016
2.50 - 3.99	3/32 - 5/32	0.51	0.020
4.00 - 6.29	5/32 - 1/4	0.64	0.025
6.30 - 9.99	1/4 - 13/32	0.76	0.030
10.00 - 15.99	13/32 - 5/8	1.02	0.040
16.00 - 24.99	5/8 - 1	1.60	0.063
25.00 - 39.99	1 - 1-5/8	2.03	0.080
40.00 - 63.00	1-5/8 - 2-1/2	2.03	0.080

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Table IV. Commercial tolerances for extruded tubing

Millimeters	Sizes		Tolerances of mandrel cured items		Tolerances of other cured items	
	Millimeters	Inches (approx.)	I.D.		I.D.	O.D.
			mm	(in.)	\pm mm (in.)	\pm mm (in.)
0- 9.99		0.0 - 0.393	+0,	-0.25 (0.016)	0.51 (0.020)	0.78 (1/32)
10 - 15.99		0.40 - 0.629	+0,	-0.31 (0.020)	0.78 (1/32)	1.19 (3/64)
16 - 24.99		0.63 - 0.984	+0,	-0.40 (0.025)	0.78 (1/32)	1.19 (3/64)
25 - 39.99		0.99 - 1.574	+0,	-0.50 (0.032)	1.19 (3/64)	1.69 (1/16)
40 - 62.99		1.60 - 2.479	+0,	-0.63 (0.040)	1.19 (3/64)	1.69 (1/16)
63 -100.00		2.48 - 3.937	+0,	-0.80 (0.050)		

Table V. Commercial tolerances for calendered sheet

Dimensions		Tolerances	
Millimeters	Inches (approx.)	Millimeters	Inches
0 to 0.99	0 to 0.039	\pm 0.18	\pm 0.007
1.00 to 1.75	0.04 to 0.069	0.30	0.012
1.75 to 3.40	0.07 to 0.134	0.43	0.017
3.41 and over	0.135 and over	0.56	0.022

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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 Quality conformance inspection. Quality conformance inspection shall be performed on the sample units selected in accordance with 4.3.2 and 4.3.3. The inspection shall include the examination of 4.4 and the tests of 4.5

4.3 Sampling.

4.3.1 Lot. For the purpose of sampling, a lot of fabricated rubber products shall consist of all like units of product of the same dimensions and of the same composition (same grade, type, class and suffix per ASTM D 2000, as applicable) in a single shipment offered for delivery at one time.

4.3.1.1 Unit of product. The unit of product shall be defined as shown in table VI.

Table VI. Definitions for unit of product

Type of product	Unit of product
Molded end item	One complete item
Sheet packing	One standard sheet or roll
Calendered sheet	One standard sheet or roll
Special extruded shapes	One cut length
Extruded tubing	One cut length
Others	As specified in contract or purchase order (see 6.2)

4.3.2 Sampling for examination. Unless otherwise specified (see 6.2), a random sample of units of product shall be taken from each lot offered to the Government in accordance with MIL-STD-105 at inspection level II.

4.3.3 Sampling for test.

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4.3.3.1 Molded products. Whenever the size and shape of the product permit, samples for laboratory acceptance tests shall be cut from the product. Contractors shall indicate where specimens are to be cut if not indicated on the drawing. Samples per a and b below shall either be cut from end item in accordance with ASTM D 3183, or if shape and size do not permit, be prepared from same rubber and cured with the product.

a. Six test slabs, each approximately 152.4 mm (6 in.) by 152.4 mm (6 in.) by 2 mm to 3.2 mm (0.078 in. to 0.125 in.) of the same rubber as used in the molded product and of the equivalent cure.

b. Six test buttons, cut from approximately 13 mm (0.51 in.) thick slab of the same rubber as used in the molded product and of equivalent cure. The circular die used for cutting the specimens shall have an inside diameter of 28.7 ± 0.025 mm (1.129 ± 0.001 in.). An optional method of preparing the standard test buttons may be the direct molding of a circular disk nominally 12.7 mm (0.50 in.) in thickness and 28.7 mm (1.129 in.) in diameter.

c. Additional test samples. The number and dimensions of additional test samples, if required for determining conformance of suffix letter requirements, shall be as specified in ASTM D 2000 as applicable.

4.3.3.2 Extruded products. For extruded products, the sample shall be approximately 2 metre (6.6 ft.) strip prepared from a 25.4 mm (1 in.) nominal outside diameter by 1.91 mm (0.075 in.) (nominal) wall tubing which shall be split and flattened into a strip while being extruded. The strip shall be cured in the same manner as the production materials.

4.3.3.3 Calendered sheets. For calendered sheet, the sample shall be approximately 1.5 metre (4.92 ft.) run by product width of approximately 2 mm (0.079 in.) thickness and cured in the same manner as the production materials.

4.3.3.4. Other products. Samples of other forms of products shall be specified by the procuring activity (see 6.2).

4.4 Examination. Each fabricated unit of product selected in accordance with 4.3.2 shall be examined in accordance with the classification of defects and acceptable quality level shown in table VII. The visual defects shown in MIL-STD-289, MIL-STD-298 and MIL-STD-407 are defined in MIL-STD-177. Any product in the sample containing one or more defects shall be rejected, and if the number of defects in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

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Table VII. Classification of defects in accordance with MIL-STL-105

<u>Categories</u>	<u>Defects per 100 units</u>	<u>Inspection method</u>
<u>Critical</u>	<u>None defined</u>	
<u>Major</u>	<u>AQL = 1.5 percent</u>	
101	Any defect classified as major in MIL-STL-289	Visual
102	Any defect classified as major in MIL-STD-298	Visual
103	Any defect classified as major in MIL-STD-407	Visual
104	Color not as specified	Visual
<u>Minor</u>	<u>AQL = 10 percent</u>	
201	Any defect classified as minor in MIL-STD-289	Visual
202	Any defect classified as minor in MIL-STD-298	Visual
203	Any defect classified as minor in MIL-STD-407	Visual
204	Dimensions and Tolerances not as specified	Gage
205	Marking not as specified	Visual
206	Improper use of preservatives	Visual

4.4.1 Examination of preparation for packaging. Examination of packaging, packing and marking shall be in accordance with the applicable requirements of section 5 of this specification.

4.5 Test procedures. Testing for conformance with the applicable basic and suffix requirements shall be accomplished in conformance with the testing procedures specified in ASTM D 2000 as applicable.

4.6 Acceptance tests. Acceptance tests are those tests accomplished on rubber products submitted for acceptance under contract. Acceptance tests shall consist of those tests contained in ASTM D 2000 that are applicable to the composition specified.

4.7 Rejection and retest. The requirements for rejection and retesting on the basis of the results of the acceptance tests shall be established by the procuring activity.

4.7.1 Non-determinable cure date. Elastomeric materials produced to this specification shall be rejected when the cure date can not be determined.

5. PACKAGING

5.1 Preservation.

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5.1.1 Rubber products without metal fittings. Items manufactured from compositions conforming to the requirements of this specification and ASTM D 2000 shall not be treated with preservative oils or compounds. Unless otherwise specified, items which are unit packaged in multiple quantities shall be dusted with technical talcum (soapstone), conforming to commercial standard, or shall be separated by kraft or polyethylene film separators.

5.1.2 Rubber products with bare steel fitting. Exposed steel surfaces shall be coated with preservative P-1 of MIL-P-116. Care shall be exercised to avoid coating any rubber surface.

5.2 Packaging. Packaging shall be level A or commercial as specified (see 6.2).

5.2.1 Level A.

5.2.1.1 Molded products. Molded rubber products shall be packaged in containers conforming to PPP-B-636, weather-resistant class. The unit quantity shall be 25, or as specified by the procuring activity. Containers shall be closed in accordance with the box specification.

5.2.1.2 Rubber sheet packing. Rubber sheet packing shall be interleaved with any suitable paper which shall extend over the full area of contact between the sheets. As an alternative to the interleaved paper, a fine film of talc or mica shall be applied to cover the sheets uniformly to prevent the sheets from adhering to each other. Unit quantities shall be stacked not to exceed ten inches in height and shall be wrapped in kraft paper of UU-P-268. The package shall be sealed with tape as specified in PPP-T-45.

5.2.1.3 Extruded shapes and tubing. Extruded rubber shapes and tubing shall be wrapped in kraft paper conforming to UU-P-268 and sealed with tape conforming to PPP-T-45.

5.2.1.4 Calendered sheets. Calendered sheet products shall be packaged as specified in 5.2.1.2.

5.2.2 Commercial. Rubber fabricated products shall be packaged in accordance with the requirements of ASTM D3951.

5.3 Levels of packing.

5.3.1 Level A. Shipping containers shall contain identical rubber products of the same shape, size, grade, type and class and shall enclose the contents in a snug, tight-fitting manner. The inside height of containers for rubber sheet and calendered sheet shall not exceed 254 mm (10 in.). Unless otherwise specified, containers for extruded shapes and tubing shall have a maximum length of 3 metres (approx. 10 ft.) and, if the items are not coiled, a maximum cross sectional area of 232 cm² (approx. 36 in.²). Coiling shall be allowed provided that adequate measures are taken to prevent deformation. Rubber fabricated products shall be packed in weather-resistant boxes of PPP-B-636, class 2 triple wall boxes of PPP-B-640, or class 2 wood boxes of PPP-B-621 or overseas type "F" of PPP-B-601. Plywood, if used, shall conform to group B of NN-P-530. The gross weight of the fiberboard container shall not exceed the requirements in PPP-B-636. The gross weight of the triple-wall shall not exceed 91 kg (200 pounds).

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5.3.2 Commercial. Packing shall be in accordance with the requirements of ASTM D 3951.

5.4 Marking. In addition to any special marking required by the contract or order (see 3.4 and 6.2), interior packages and exterior shipping containers shall be marked for shipment in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

6. NOTES

6.1 Intended use. The rubber products covered in this specification are intended for use in mechanical and general purpose applications. To secure products for specific applications, other properties or values may be required in addition to or in lieu of those shown in ASTM D 2000. In that event, such properties or values should be called for as a requirement for the finished product, on the part drawing or in other documents issued by the procuring activity.

6.1.1 MIL-STD-417 call-out numbers should not be used for procurement of rubber products except to replenish spare parts as necessary to maintain equipment in the field until items become obsolete or wear out. New design should use material specified in ASTM D 2000.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. The call-out number of the rubber composition specified in ASTM D 2000. This should include type, class, grade and suffix, where applicable (see 3.2 and 6.4).
- c. Dimensions and tolerances (see 3.3).
- d. Identification marking, where applicable (see 3.4).
- e. Color, if other than black (see 3.6).
- f. Use of recoverable materials (see 3.7).
- g. Definition for unit of product, if required (see 4.3.1.1).
- h. Number of test samples required (see 4.3.2 and 4.3.3.1).
- i. Number and dimensions for samples from non-standard forms of products (see 4.3.3.4).
- j. Levels of preservation, packaging and packing required (see section 5).
- k. Age control requirement (see 3.5).

6.3 Cross reference. Cross reference table VIII is intended as a guide to assist in converting from the call-out numbers (class, grade, plus suffixes) specified in MIL-STD-417 to the call-out numbers in ASTM D 2000. Because many new materials are available in ASTM D 2000, as well as materials presently covered by MIL-STD-417, MIL-STD-417 is inactive for new design.

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Table VIII. Cross reference data

<u>MIL-STD-417</u>	<u>ASTM D 2000</u>	<u>Type of polymers normally used</u>
RN	AA	Natural, synthetic or reclaimed rubbers
RS	AA,BA	Natural, synthetic or reclaimed rubbers
SA	AK,BK	Polysulfides
SB	BG	NBR polymers, urethane
SC	BC	Chloroprene polymers
TA	FC,FS,FE,GE	Silicones (high strength)
TB	DH	Polyacrylic polymers

6.4 Because it is not practical to list all the possible call-out numbers with the various suffixes, only typical examples of converting from MIL-STD-417 to ASTM D 2000 are shown in table IX.

Table IX. Examples of call-out number conversions

<u>MIL-STD-417</u>	<u>ASTM D 2000 (prior to 1981)</u>	<u>ASTM D 2000 (1981 to present)</u>
RN420AB	4AA420A13B13	M4AA414A13B13
RS420A	4AA420A13	M4AA414A13
RS420A ₁	3BA420A14	M3BA414A14
SA620	4BK620	M4BK614
SA620A ₁ E ₃	4BK620A14E034	M4BK614A24E034
SB615A ₁	5BG615A14	M5BG610A14
SB615E ₃	2BG615E034	M2BG610E034
SC305A ₁	2BC305A14	M2BC303A14
SC305A ₁ BE ₃	2BC305A14BZ1E034	M2BC303A14Z14E034
TA507E ₁ L	4GE507E016Z1	M4GE505E016Z1
TB610E ₃ E ₄	2DH610Z1Z2	M2DH608Z1Z2

6.5 Cure date marking. In accordance with MIL-STD-129, the cure date shall be marked by the quarter and year. The year shall be divided into quarters as follows

- 1st. Quarter - January, February, March
- 2nd Quarter - April, May, June
- 3rd Quarter - July, August, September
- 4th Quarter - October, November, December

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Custodians:

Army - MR

Air Force - 99

Review activities:

Army - AR, ER, GL, MI

Air Force - 82

DLA - GS, CS

User activities:

Army - AV

Navy - AS, MC, OS, SH, YD

Preparing activity:

Army - MR

Project No. 9320-0431

(WP# ID-5120A/DISC-0213A, FOR AMTRC USE ONLY)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION <i>(Mark one)</i> <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER <i>(Specify)</i> _____
b. ADDRESS <i>(Street, City, State, ZIP Code)</i>	
5. PROBLEM AREAS	
a. Paragraph Number and Wording	
b. Recommended Wording	
c. Reason/Rationale for Recommendation	
6. REMARKS	
7a. NAME OF SUBMITTER <i>(Last, First, MI) - Optional</i>	b. WORK TELEPHONE NUMBER <i>(Include Area Code) - Optional</i>
c. MAILING ADDRESS <i>(Street, City, State, ZIP Code) - Optional</i>	8. DATE OF SUBMISSION <i>(YYMMDD)</i>

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