

MIL-P-87938
November 16 1984

MILITARY SPECIFICATION

PEROXIDE, METHYL ETHYL KETONE, TECHNICAL

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

1. SCOPE.

1.1 Scope. This specification covers three grades of methyl ethyl ketone peroxide (see 6.1 and 6.1.1).

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1 Specifications, Standards, and Handbooks. Unless otherwise specified, the following specifications, standards, 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.

SPECIFICATIONS

Federal

PPP-B-591	Box, Fiberboard, Wood-cleated
PPP-B-601	Box, Wood, Cleated Plywood
PPP-B-621	Box, Wood, Nailed and Locked Corners
PPP-B-636	Box, Shipping, Fiberboard
PPP-C-2020	Chemicals, Liquid, Dry, and Paste, Packaging of

Military

MIL-B-10377	Box, Wood, Cleated, Veneer, Paper Overlaid
MIL-V-23776	Vermiculite, Expanded
MIL-B-26701	Bottle, Screw Cap and Carboys, Polyethylene Plastic

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing
FED-STD-313	Material Safety Data Sheets, Preparation and the Submission of

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: SA-ALC/SFRM, Kelly AFB TX 78241, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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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

(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. 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 Standards

ASTM D 92 Test for Flash and Fire Points by Cleveland Open Cup
 ASTM D 891 Test for Specific Gravity of Liquid Industrial Chemicals
 ASTM D 1016 Purity of Hydrocarbons from Freezing Points
 ASTM D 2196 Test for Viscosity Measurements and Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer
 ASTM E 300 Recommended Practice for Sampling of Industrial Chemicals

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

CODE OF FEDERAL REGULATIONS

49 CFR 100-177 Department of Transportation Rules and Regulations for the
 49 CFR 178-199 Transportation of Explosives and Other Dangerous Articles

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington D.C. 20402.)

UNIFORM FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the Uniform Classification Committee, 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 Materials. The different grades of methyl ketone peroxide shall be a 47 - 49% solution of methyl ethyl ketone peroxide in dimethyl phthalate and shall meet all other requirements of this specification.

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3.2 Chemical and Physical Properties. The grade of methyl ethyl ketone peroxide shall conform to the chemical and physical properties listed in Table I.

TABLE I
CHEMICAL AND PHYSICAL PROPERTIES

REQUIREMENTS	GRADE A	GRADE B	GRADE C
Active Oxygen, % (by weight)	8.8 ± 0.1	8.9 ± 0.1	8.9 ± 0.1
Specific Gravity 25/25°C, min	1.0815	1.157	1.150
Refractive Index (21°C)	1.4615	1.4748	1.4714
Viscosity, cps @:			
25°C, max	14.8	11.1	11.0
30°C, max	11.5	8.8	8.6
35°C, max	9.4	7.2	6.9
Freezing Point, °C, max	-30	-35	-35
Flash Point (SETA) °F/°C, min	137/58	140/60	140/60

3.3 Workmanship. The end product shall be manufactured from materials entirely suitable for the purpose intended and shall be processed in a manner that will produce a homogeneous and uniform product that is free from all foreign material, clear, colorless and meets the requirements herein specified.

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 when such inspections are deemed necessary to assure supplies and services conform to prescribed requirement.

4.2 Quality Conformance Inspection. Quality conformance inspection for acceptance of the material shall consist of all the tests of this specification. The inspection terms used herein are as defined in MIL-STD-109.

4.3 Sampling. Unless otherwise specified, not less than three one-pound samples shall be selected at random from each batch and subjected individually to the tests specified in 4.2. Failure to meet any test requirements constitutes rejection of the entire batch.

4.4 Batch. A batch shall consist of that quantity of material which has been manufactured by some unit chemical process and subjected to some physical mixing operation intended to make the final product substantially uniform.

4.5 Sampling of Product. Sampling for filled containers shall be in accordance with ASTM E 300. The filled containers shall be subjected to the inspections specified in 4.6.

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4.6 Inspection of the End Item. Examination of the end item shall be made in accordance with the following classification of defects, inspection levels, and acceptable quality levels (AQL). The lot size, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of filled primary containers for the examinations specified in 4.6.1, 4.6.2, and 4.6.3, and in units of shipping containers for the examinations specified in 4.6.4.

4.6.1 Quantity. Examination of the end item containers for defects in appearance, closure, construction, workmanship, and markings. The sample unit for this examination shall be one filled primary contractor.

<u>EXAMINATION</u>	<u>DEFECT</u>
-Appearance, construction	Not in container specified, cracked, crushed, or any defect affecting serviceability. Not clean; any evidence of dirt, rust, or foreign matter.
-Closure	Any leakage or seepage of contents in either an upright or horizontal position. Closure not as specified.
-Markings	Omitted, illegible, incorrect or not in accordance with contract requirements.

4.6.2 Sample size for examination for defects. The sample unit for this examination shall be one filled primary container. (See 4.6.1).

4.6.3 Examination for net contents. The quality of the lot shall be unacceptable if the average net content is less than specified or indicated quantity. The sample unit for this examination shall be one filled primary container.

4.6.4 Examination of preparation for delivery. An examination shall be made to determine that packing, palletization, and markings comply with Section 5.

<u>EXAMINATION</u>	<u>DEFECT</u>
-Packing	Container not as specified. Arrangements or number of unit containers per pallet (as applicable) not in accordance with contract requirements. Loose or inadequate strappings, bulged or distorted containers.
-Palletization	Palletization not in accordance with contract requirements.
-Markings	Data, including directions for use omitted, illegible, incorrect, incomplete or not in accordance with contract requirements.

4.6.5 Inspection levels and AQLs for examinations. The inspection levels for determining the sample size and the AQLs expressed in defects per 100 units, shall be as specified in Table II.

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TABLE II

Examination, Inspection Level, and AQL

Examination	Para	Inspection Level	AQL
Defects in appearance of closure, construction, workmanship and markings. . . .	4.6.1	1	2.5
Net contents	4.6.3	S-2	2.5
Defects in preparation for delivery.	4.6.4	S-2	2.5

4.7 Test Methods.

4.7.1 Active Oxygen. The active oxygen content shall be determined using the following method: Prepare glass stoppered 125 ml Erlenmeyer flasks by adding 20 mls of glacial acetic acid and then passing carbon dioxide into the acid in each flask for two minutes. Weigh to the third decimal point approximately 0.2 gram samples into these flasks. Add 10 mls of KI solution (one part KI solution to 2 parts H₂O) and let stand in the dark for 15 minutes. Add 10 mls of H₂O and titrate with 0.1N Sodium thiosulfate solution to a colorless end point. A blank shall also be run and subtracted from the sample titration before calculation.

$$\% \text{ Active Oxygen} = \frac{(\text{mls thio} - \text{mls blank}) \times N \times 0.008 \times 100}{\text{sample weight}}$$

N = Normality of sodium thiosulfate solution

4.7.2 Specific Gravity. Specific gravity shall be determined in accordance with ASTM D 891.

4.7.3 Refractive Index. Refractive index shall be determined in accordance with Method 4371 of Federal Test Method Std No 141.

4.7.4 Viscosity. Viscosity shall be determined in accordance with ASTM D 2196 except a Brookfield LV Viscosimeter with a UL adapter shall be used. Report the average of the 6, 12, and 30 RPM readings. If material is limited, readings may be accomplished using 25 ml of sample in the special Brookfield accessory for small samples.

4.7.5 Flash Point. Flashpoint shall be determined in accordance with ASTM D 92.

4.7.6 Freezing Point. The freezing point shall be determined in accordance with ASTM D 1016.

4.7.7 Workmanship. Conformance shall be by visual inspection.

4.7.8 Materials. Manufacturer shall certify that all product procured is a 47-49% solution of methyl ethyl ketone peroxide in dimethyl phthalate.

5. PACKAGING

5.1 Packaging. Packaging shall be Level A, as specified.

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5.1.1 Level A - Unit Packaging. Methyl ethyl ketone peroxide solution furnished under this specification shall be packaged as specified in PPP-C-2020 in clean, dry, new polyethylene bottles with screw top closures as specified by MIL-B-26701. Closure lining, where used, shall not react with contents. Closures shall be sealed to the bottle by shrink film sealers or equivalent. Net capacity of bottles shall be either 1, 8, or 45 pounds as specified by the procuring activity (see 6.2). The wall thickness of the 45-pound bottles shall be not less than 0.015 inches as per Department of Transportation Specification 2U of 49 CFR 178.24.

5.1.2 Level A - Intermediate Packaging. Methyl ethyl ketone peroxide solution packaged as specified in 5.1.1 shall be packed in snug fitting corrugated or solid fiberboard boxes conforming to level A, B, or C as indicated by contractor or procuring activity (see 6.2). Quantity of unit packages per shipping container shall be as specified by the following.

<u>Unit Container Capacity (lbs)</u>	<u>Unit Quantity Per shipping Container</u>
1	1 or 25
8	1, 2, or 4
45	1

Section 178.205-34 of the Department of Transportation Regulations shall apply for the shipment of the 45 pound bottle.

5.2 Packing. Packing shall be Levels A, B, or Industrial as specified (see 6.2).

5.2.1 Level A. Unless otherwise specified, intermediate packages, or unit packages where intermediate packaging is not required of methyl ethyl ketone peroxide solution in containers of uniform type and size shall be packed with closures on top in quantities not to exceed 70 pounds gross weight. Shipping containers shall conform to PPP-B-601, overseas type; or PPP-B-621, class 1. Fiberboard fillers shall be placed intermediate packages and between unit packages where there is no intermediate packing, and between the packages and the sides, ends, tops, and bottoms of shipping containers to make a tight pack. Closures or handles extending above the containers shall be protected by fiberboard pads so that bearing on the closure or handles will be prevented. Fiberboard fillers and pads shall conform to PPP-B-636, class 2, W5c. The shipping containers shall be closed and strapped in accordance with the applicable box specification and appendix thereto.

5.2.2 Level B. Methyl ethyl ketone peroxide solution shall be packed in accordance with 5.2.1, except that shipping containers shall conform to PPP-B-636, type I or II, class 2, W5c or W5s; PPP-B-621, class 1; PPP-B-601, domestic type; PPP-B-591, domestic type; or MIL-B-10377, domestic type.

5.2.3 Industrial. Unless otherwise specified, methyl ethyl ketone peroxide solution shall be packed in snug fitting corrugated or solid fiberboard boxes conforming to Department of Transportation Specification 49 CFR.

5.2.4 Packing separators, liners and cushioning. Fiberboard boxes shall have full-height partition and liners and full-size tops and bottom pads. The cells formed by the partitions shall snugly fit the unit packages. Partitions are not required when the fiberboard boxes are used for consolidating paper-board set-up boxes. Separators shall be placed between all layers of unit

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packages. Paperboard set-up boxes shall have snug-fitting slotted partitions and noncombustible cushioning material conforming to MIL-V-23776, or equivalent, in sufficient quantity to completely absorb liquid contents in the event of breakage. Indexed fiberboard pads shall be used over can closures and handles. Pads, liners, partitions, and separators shall be of corrugated fiberboard conforming to PPP-B-636, class 2, W5c. Fiberboard intermediate packages shall be closed and strapped in accordance with the appendix of the box specification.

5.3 Markings. In addition to any special markings specified herein, shipment shall be marked in accordance with MIL-STD-129, and per Department of Transportation 49 CFR.

5.3.1 Special Markings. Each unit and shipping container shall have the following special markings.

CAUTION: OXIDIZING MATERIAL, STRONG IRRITANT, HARMFUL IF SWALLOWED

Maximum shelf-life is 12 months. Dispose of through Defense Property Disposal Office (DPDO) channels after 12 months from date of manufacture.

Store in original closed container below 100°F (38°C).

Protect from all sources of heat, including direct sunlight.

Keep away from sparks and open flames.

Do not add hot materials; vigorous decomposition may result.

Do not add accelerator to contents; may cause vigorous reaction.

Avoid contact with skin and eyes. In case of contact, flush immediately with water.

In case of ingestion and for eye contact, call a physician immediately.

5.3.2 Shipping Container. In addition to the special markings specified in 5.3 and 5.3.1, each shipping container shall have a Department of Transportation label in accordance with 49 CFR and MIL-STD-129 Appendix D.

5.4 Material Safety Data Sheets. Material Safety Data Sheets shall be prepared in accordance with FED-STD-313.

6. NOTES AND CONCLUDING MATERIAL

6.1 Intended Use. Methyl ethyl ketone peroxide grades covered by this specification are used as a catalyst hardening agent for plastics. Grades A, B, and C are intended for use as a cure agent for Laminac (Army Drawing 10523979). Laminac is used in cartridges M456A1, M456A2, M490, and M490A1.

6.2 Material Suppliers. Material supplied by Pennwalt or Reichhold under the manufacturing designations listed below have been found satisfactory for cartridges identified in 6.1. Users, considering accepting material from sources of supply other than those listed below, should first consult with their appropriate DoD Technical/Quality Assurance Office for FSC 6810 and service document custodian.

GRADE A:	LUPERSOL	DDM-9 (Pennwalt)
GRADE B:	SUPEROX	702 (Reichhold)
GRADE C:	SUPEROX	709 (Reichhold)

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6.3 Ordering Data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Quantity in pounds (Avoirdupois).
- (c) Size and type of container desired (see 5.1 and 5.1.1).

6.4 Shelf-life. When stored between 25⁰C and 30⁰C, the methyl ethyl ketone peroxide would have a maximum useful shelf-life of 12 months. Ordering activities should consider this shelf life under test storage conditions in computing requirements.

6.5 Packaging Criteria. Criteria for use of the proper level of packing shall be as follows:

6.5.1 Level A. This level shall be designed to protect items subjected to multiple domestic shipments from direct exposure to all extremes of climatic, terrain, operational, and transportation environments without protection other than that provided by the package and pack.

6.5.2 Level B. This level shall be designed to protect items which will be subjected to multiple domestic shipments, from physical and environmental damage during shipment, handling, and storage for conditions other than those identified for Level A or industrial protection.

6.4.3 Industrial. This level shall be designed to protect items which will be used at the first receiving activity against physical and environmental damage during known favorable conditions of shipment, handling and storage.

CUSTODIANS:

ARMY - AR
NAVY - OS
AIR FORCE - 68

PREPARING ACTIVITY:

AIR FORCE - 68

REVIEW ACTIVITIES:

ARMY - GL
NAVY - AS
DLA - GS

PROJECT NO. 6810-B427

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions - Reverse Side)*

1. DOCUMENT NUMBER MIL-P-87938		2. DOCUMENT TITLE Peroxide, Methyl Ethyl Ketone, Technical	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	