

O-M-232G  
 March 14, 1986  
 SUPERSEDING  
 O-M-232F  
 February 23, 1984

FEDERAL SPECIFICATION  
 METHANOL (METHYL ALCOHOL)

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

1. SCOPE

1.1 Scope. This specification covers two synthetic grades and one denaturing grade of methanol.

1.2 Classification. Methanol shall be of the following grades as specified (see 6.2):

- Grade A - Synthetic, 99.85 percent by weight (solvent use)
- Grade AA - Synthetic, 99.85 percent by weight (hydrogen-carbon dioxide generation use)
- Grade C - Wood alcohol (denaturing grade)

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:

Federal Specifications:

- L-S-300 - Sheeting and Tape, Reflective: Nonexposed Lens
- TT-C-1060 - Coating Compound, Reflective
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter
- PPP-D-729 - Drums, Shipping and Storage, Steel, 55-Gallon (208 Liters)
- PPP-P-704 - Pails, Metal: (Shipping, Steel, 1 Through 12 Gallons)

Federal Standards:

- Fed. Std. No. 123 - Marking for Shipment (Civil Agencies)
- Fed. Std. No. 313 - Material Safety Data Sheets Preparation and the Submission Of
- FED-STD-595 - Colors

FSC 6810

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Commercial Item Description:

A-A-1558 - Paint, Stencil

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly 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, other Federal specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Washington, DC; Philadelphia, PA; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in 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-147 - Palletized Unit Loads

(Copies of military 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.)

Code of Federal Regulations (CFR):

27 CFR 21 - Formulas for Denatured Alcohol and Rum  
 49 CFR 171 to 179 - Hazardous Materials Regulations

(The Code of Federal Regulations and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

ASTM Standards:

- D 1193 - Reagent Water (DOD Adopted)
- D 1296 - Odor of Volatile Solvents and Diluents (DOD Adopted)
- D 1353 - Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products (DOD Adopted)
- E 346 - Analysis of Methanol (DOD Adopted)

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Grades A and AA. Grades A and AA methanol shall conform to the chemical and physical characteristics of table I when tested as specified therein.

3.2 Grade C. Grade C methanol shall comply with the requirements for methyl alcohol used as a denaturant in 27 CFR 21.

3.3 Material Safety Data Sheets. Material Safety Data Sheets for methanol shall be prepared and submitted by the contractor as specified in Fed. Std. No. 313 (see 6.3).

### 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.

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TABLE I. Chemical and physical characteristics of grades A and AA methanol

Characteristic	Requirement		Test paragraph
	Grade A	Grade AA	
Acetone, percent by weight, maximum	0.003	0.002	4.2.4.1
Acidity (as acetic acid), percent by weight, maximum	0.003	0.003	4.2.4.2
Appearance	Free of opalescence, suspended matter, and sediment	Free of opalescence, suspended matter, and sediment	4.2.4.3
Carbonizable impurities, color, Pt-Co, maximum	No. 30	No. 30	4.2.4.4
Color, Pt-Co, maximum	No. 5	No. 5	4.2.4.5
Distillation range at 760 mm, maximum	1.0°C (and shall include 64.6° + 0.1°C)	1.0°C (and shall include 64.6° + 0.1°C)	4.2.4.6
Ethanol, percent by weight, maximum	---	0.001	4.2.4.7
Nonvolatile matter, mg per 100 mL, maximum	10	10	4.2.4.8
Odor	Characteristic, nonresidual	Characteristic, nonresidual	4.2.4.9
Permanganate time	No discharge of color in 30 minutes	No discharge of color in 30 minutes	4.2.4.10
Specific gravity at 20°/20°C, maximum	0.7928	0.7928	4.2.4.11
Water, percent by weight, maximum	0.15	0.10	4.2.4.12

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not

relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

#### 4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the methanol produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions provided the operation is continuous. In the event the process is a batch operation, each batch shall constitute a lot (see 6.4).

#### 4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with MIL-STD-105, inspection level S-4.

4.2.2.2 For methanol test. See 6.5 for sampling and testing precautions. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 0.9 liter shall be removed from each sample container and placed in a suitable clean, dry, glass container labeled to identify the lot and container from which it was taken.

TABLE II. Sampling for methanol test

Number of containers in batch or lot : Number of sample containers	
2 to 25	2
26 to 150	3
151 to 1,200	5
1,201 to 7,000	8
7,001 to 20,000	10
Over 20,000	20

#### 4.2.3 Inspection procedure.

4.2.3.1 For examination of packaging. The sample unit shall be one filled unit or shipping container, as applicable, ready for shipment. Sample unit and shipping containers shall be examined for the following defects using an AQL of 2.5 percent defective:

- (a) Contents per container not as specified
- (b) Container not as specified
- (c) Container closure not as specified
- (d) Container damaged or leaking
- (e) Marking incorrect, missing, or illegible
- (f) Palletization not as specified (when required)

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4.2.3.2 For methanol test. Each sample specimen taken in 4.2.2.2 shall be tested as specified in 4.2.4. Failure of any test by any specimen shall be cause for rejection of the lot represented.

4.2.4 Methanol tests. See 6.5 for sampling and testing precautions. Water in accordance with ASTM D 1193 and reagent grade chemicals shall be used throughout the tests. Tests shall be conducted as follows:

4.2.4.1 Acetone. Determine the percent by weight acetone in the specimen in accordance with the procedure for acetone in ASTM E 346; for grade AA methanol, use 1.5 milliliters (mL) of sample and 3.5 mL of water instead of the 1 mL of sample and 4 mL of water in the procedure and report acetone content as less than or greater than 0.002 percent by weight.

4.2.4.2 Acidity. Determine the percent by weight acidity as acetic acid in the specimen in accordance with the procedure for acidity in ASTM E 346.

4.2.4.3 Appearance. Dilute 15 mL of the specimen to 45 mL with water in a Nessler tube. Visually examine the solution for opalescence, suspended matter, and sediment during 30 minutes of standing.

4.2.4.4 Carbonizable impurities. Determine the carbonizable impurities in accordance with the procedure for carbonizables in ASTM E 346.

4.2.4.5 Color. Determine the color of the specimen in accordance with the procedure for color in ASTM E 346.

4.2.4.6 Distillation range. Determine the distillation range of the specimen in accordance with the procedure for distillation range in ASTM E 346.

4.2.4.7 Ethanol (grade AA only). Determine the parts per million ethanol in the specimen in accordance with the procedure for ethanol in ASTM E 346 and convert to percent by weight ethanol.

4.2.4.8 Nonvolatile matter. Determine nonvolatile matter in the specimen in accordance with ASTM D 1353.

4.2.4.9 Odor. Determine the odor of the specimen in accordance with ASTM D 1296.

4.2.4.10 Permanganate time. Determine the permanganate time of the specimen in accordance with the procedure for permanganate time in ASTM E 346.

4.2.4.11 Specific gravity. Determine the specific gravity of the specimen in accordance with the procedure for specific gravity in ASTM E 346.

4.2.4.12 Water. Determine the percent by weight of water in the specimen in accordance with the procedure for water in ASTM E 346.

## 5. PACKAGING

5.1 Preservation. Methanol shall be preserved level A or C as specified (see 6.2). Quantity tolerance shall be +1 or -0 percent of the specified volume.

5.1.1 Level A. Methanol shall be unit packed level A in 1-quart, 1-gallon (gal), 5-gal, or 55-gal unit quantities as specified (see 6.2).

5.1.1.1 One-quart quantity. Methanol shall be unit packed in a round-shaped 1-quart can conforming to type V, class 4, with plan B coating with side seam striping of PPP-C-96. The cap shall have a phenolic-faced pulpboard liner. The closure shall be torqued to 20 (+0 or -5) inch-pounds.

5.1.1.2 One-gal quantity. Methanol shall be unit packed in a round, square, or oblong 1-gal can conforming to the requirements specified in 5.1.1.1. In addition, the can shall have a leakproof, tinned-plate, pressed-fit inner seal. The closure shall be torqued to 35 (+0 or -5) inch-pounds.

5.1.1.3 Five-gal quantity. Methanol shall be unit packed in a 5-gal tight head pail conforming to type I, class 7 of PPP-P-704 or to Department of Transportation (DOT) Specification 5. The closure shall be in accordance with DOT Specification 5 and shall have an inner seal. The closure shall be torqued to 40 (+0 or -5) inch-pounds.

5.1.1.4 Fifty-five-gal quantity. Methanol shall be unit packed in a 55-gal closed head drum conforming to type I, class A of PPP-D-729 and also conforming to DOT Specification 5A. Removable head containers shall not be used. The 3/4-inch plug closure shall be torqued to 15 + 2 foot-pounds, and the 2-inch plug closure shall be torqued to 30 + 2 foot-pounds.

5.1.2 Level C. Methanol shall be unit packed level C in 1-quart, 1-gal, 5-gal, or 55-gal unit quantities as specified (see 6.2).

5.1.2.1 One-quart and 1-gal quantities. Methanol shall be unit packed in a capped metal can conforming to DOT regulations.

5.1.2.2 Five-gal quantity. Methanol shall be unit packed as specified in 5.1.1.3 except that the container shall conform to type I, class 4 of PPP-P-704 or to DOT Specification 17C.

5.1.2.3 Fifty-five-gal quantity. Methanol shall be unit packed in a tight head drum conforming to DOT Specification 17C.

5.2 Packing. Methanol shall be packed level A or C as specified (see 6.2).

5.2.1 Level A.

5.2.1.1 One-quart and 1-gal quantities. Methanol unit packed as specified in 5.1.1.1 or 5.1.1.2 shall be packed as specified for unpackaged cans in the appendix to PPP-C-96.

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5.2.1.2 Five-gal and 55-gal quantities. The unit packs shall serve as the shipping container.

5.2.2 Level C.

5.2.2.1 One-quart and 1-gal quantities. Methanol unit packed as specified in 5.1.2.1 shall be packed in accordance with DOT regulations.

5.2.2.2 Five-gal and 55-gal quantities. The unit pack shall serve as the shipping container.

5.3 Unitization. When specified (see 6.2), 5-gal pails, 55-gal drums, and shipping containers of 1-quart and 1-gal cans shall be palletized in accordance with MIL-STD-147.

5.4 Marking. Unit packs, shipping containers, and palletized loads for civil agency shipments shall be marked in accordance with Fed. Std. No. 123, DOT regulations, and other regulatory requirements. Unit packs, shipping containers, and palletized loads for military activity shipments shall be marked in accordance with MIL-STD-129, DOT regulations, and other regulatory requirements. The precautionary marking specified in 5.4.2 shall be applied to all shipments. The special identification marking specified in 5.4.1 shall be applied to all Department of Defense shipments and, when specified (see 6.2), to civil agency shipments.

5.4.1 Special identification marking for pails and drums. Special identification marking shall consist of NATO Code No., nomenclature, specification number, grade, and National Stock Number. Letters and numerals shall be in blue conforming to color No. 35109 of FED-STD-595 over a yellow reflective background. The marking system shall be as specified in 5.4.1.1 or 5.4.1.2.

5.4.1.1 Preprinted marking on yellow reflective preprinted sheeting. The numerals and letters shall be preprinted on yellow reflective sheeting conforming to type I, class 4, reflectivity No. 1, color yellow of L-S-300. The reflective sheeting shall have a precoated adhesive backing as specified for class 4 of L-S-300, protected by a removable liner.

5.4.1.2 Marking on yellow reflective coating. The yellow reflective coating shall conform to TT-C-1060, color No. 33538 of FED-STD-595. The marking shall be applied with stencil paint conforming to class 1 of A-A-1558. The stencil paint shall not be overcoated.

5.4.1.3 Five-gal pails. A 3-inch wide band of yellow reflective preprinted sheeting or yellow reflective coating shall be applied completely around the top area of the pail sides. The identification marking shall be applied on one side of the pail. The letters and numerals for the NATO Code No. shall be 3/4 inch in height. The remaining letters and numerals shall be 1/2 inch in height.



5.4.1.4 Fifty-five-gal drums. An 8-inch wide band of yellow reflective preprinted sheeting or yellow reflective coating shall be applied completely across the diameter of the drum head, and a 6-inch wide band of yellow reflective preprinted sheeting or yellow reflective coating shall be applied completely around the top area of the drum sides. The identification marking shall be applied in 1-inch high letters and numerals, once on the drum head, and three times on the drum sides, equally spaced around the circumference of the drum. When preprinted sheeting is used, the 6-inch wide sheeting may be in three pieces of equal length with the required identification markings centrally preprinted on each piece. The three pieces shall be of sufficient length to completely encircle the drum when applied.

5.4.2 Precautionary marking. Each container and palletized load, when applicable, shall be marked to show the following precautionary information and the skull and crossbones poison symbol.

HAZARD:

Highly toxic by ingestion.  
Toxic by inhalation.  
Toxic when spilled on the skin.

DANGER! FLAMMABLE  
POISONOUS IF SWALLOWED

Keep away from heat, sparks, and open flame.  
Keep container closed.  
Avoid prolonged or repeated breathing of vapor.  
Use only with adequate ventilation.  
Avoid contact with eyes, skin, and clothing.

POISON

Call a physician

First Aid: Remove contaminated clothing and shoes. Flush affected area with plenty of water. If swallowed and victim is conscious, have victim drink water or milk and have victim induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm. If in eyes, hold eyelids open and flush with plenty of water. If inhaled, move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.

6. NOTES

6.1 Intended use. Grade A methanol is intended for use as an industrial solvent. Grade AA methanol is intended for use in the generation of hydroger. and carbon dioxide. Grade C methanol (wood alcohol) is a product of the destructive distillation of wood and is intended for use as a denaturant.

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6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Grade of methanol required (see 1.2)
- (c) Unit quantity required (see 5.1.1 and 5.1.2)
- (d) Level of preservation and packing required (see 5.1 and 5.2)
- (e) If palletization is required (see 5.3)
- (f) If special identification marking is required for civil agency shipments (see 5.4)

6.3 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with Fed. Std. No. 313. The pertinent mailing addresses for submission of data are listed in appendix B of Fed. Std. No. 313.

6.4 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process or subjected to some physical mixing operation intended to make the final product substantially uniform.

6.5 Sampling and testing precautions. This specification requires inspection of chemical material which is potentially hazardous to personnel (see 5.4.2). All applicable safety rules, regulations, and procedures must be followed in the handling and processing of this material.

MILITARY INTERESTS:

Custodians:

Army - EA  
Navy - OS  
Air Force - 68

Review activities:

Army - AR, GL, MD, MI  
DLA - GS  
Misc - DS

User activity:

Navy - AS

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - 7FCE

Preparing activity:

Army - EA

Project No. 6810-B519

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Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain copies and other documents referenced herein.

**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

**NOTE:** This form may not be used to request copies of documents, nor to request 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.

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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

*(See Instructions – Reverse Side)*

1. DOCUMENT NUMBER O-M-232G		2. DOCUMENT TITLE METHANOL (METHYL ALCOHOL)	
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			
c. 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>	