

**INCH-POUND**

**O-A-51H**

April 23, 1992

**SUPERSEDING**

**O-A-51G**

July 3, 1984

## **FEDERAL SPECIFICATION**

### **ACETONE, TECHNICAL**

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

#### **1. SCOPE**

**1.1 Scope.** This specification covers one technical grade of acetone.

#### **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:**

- PPP-B-585 - Boxes, Wood, Wirebound
- PPP-B-636 - Boxes, Shipping, Fiberboard
- PPP-C-96 - Cans, Metal, 28 Gauge and Lighter
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes

Comments or suggestions pertaining to this specification should be addressed to:  
Commander, U.S. Army Chemical Research, Development and Engineering Center,  
ATTN: SMCCR-PET-S, Aberdeen Proving Ground, MD 21010-5423.

AMSC N/A

FSC 6810

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

O-A-51H

**Federal Standards:**

- Fed. Std. No. 123 – Marking for Shipment (Civil Agencies)
- FED-STD-313 – Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

(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 Auburn, 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-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):**

- 29 CFR 1900.1200 – Hazard Communication
- 49 CFR 171 to 199 – Hazardous Materials Regulations

(The Code of Federal Regulations and 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 891 – Specific Gravity, Apparent, of Liquid Industrial Chemicals
- D 1078 – Distillation Range of Volatile Organic Liquids
- D 1193 – Reagent Water
- D 1209 – Color of Clear Liquids (Platinum–Cobalt Scale)
- D 1296 – Odor of Volatile Solvents and Diluents
- D 1353 – Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
- D 1363 – Permanganate Time of Acetone and Methanol
- D 1364 – Water in Volatile Solvents (Fischer Reagent Titration Method)
- D 1613 – Acidity in Volatile Solvents and Chemicals Intermediates Used in Paint, Varnish, Lacquer, and Related Products
- D 1614 – Alkalinity in Acetone
- D 1722 – Water Miscibility of Water–Soluble Solvents

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

**International Civil Aviation Organization**

“Technical Instructions for the Safe Transport of Dangerous Goods by Air”

(Application for copies should be addressed to the International Civil Aviation Organization, 1000 Sherbrooke Street West, Suite 400, Montreal, Quebec, Canada H3A 2R2.)

**International Maritime Organization**

“International Maritime Dangerous Goods Code”

(Application for copies should be addressed to the International Maritime Organization, 101–104 Piccadilly, London, W1V 0AE, England.)

(Non–Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein, the text of this document takes precedence. Nothing in this

O-A-51H

document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

**3.1 Specific gravity.** Acetone shall have a specific gravity at 20°/20° C of no less than 0.7910 and no greater than 0.7930 when tested as specified in the applicable portion of 4.2.4.1.

**3.2 Distillation range.** Acetone shall distill entirely within a 1.0° C range which shall include the temperature of 56.1° C when tested as specified in the applicable portion of 4.2.4.1.

**3.3 Color.** Acetone shall have a color no darker than No. 5 on the platinum-cobalt scale when tested as specified in the applicable portion of 4.2.4.1.

**3.4 Odor.** Acetone shall have a characteristic, nonresidual odor when tested as specified in the applicable portion of 4.2.4.1.

**3.5 Permanganate reduction.** The color of potassium permanganate added to the acetone shall be retained for no less than 30 minutes at 25° C in the dark when tested as specified in the applicable portion of 4.2.4.1.

**3.6 Water miscibility.** Acetone shall be miscible with distilled water in all proportions when tested as specified in the applicable portion of 4.2.4.1.

**3.7 Impurities.** Acetone shall conform to the impurity limitations of table I when tested as specified therein.

TABLE I. Impurities

Impurity	Maximum limit	Test paragraph
Nonvolatile matter, grams per 100 milliliters	0.005	4.2.4.1
Water, percent by weight	0.50	4.2.4.1
Acidity (as CH <sub>3</sub> COOH), percent by weight	0.002	4.2.4.1
Alkalinity (as NH <sub>3</sub> ), percent by weight	0.001	4.2.4.1
Aldehydes (as HCHO), percent by weight	0.002	4.2.4.2

**3.8 Material Safety Data Sheets.** Material Safety Data Sheets for acetone shall be prepared and submitted by the contractor in accordance with FED-STD-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 (examinations and tests) 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

**4.1.1 Responsibility for compliance.** All items shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

**4.1.2 Contractor assurance of compliance.** The contractor's quality program or detailed inspection system shall provide assurance of compliance of all characteristics with the applicable specification requirements using, as a minimum, the conformance criteria specified herein.

**4.1.3 Alternative inspection provisions.** Alternative inspection procedures, methods, or equipment, such as statistical process control, tool control, and other types of sampling procedures may be used by the contractor when they provide, as a minimum, the level of quality assurance required by the inspection provisions specified herein. Prior to applying such alternative procedures, methods, or equipment, the contractor shall describe them in a written proposal submitted to the Government for evaluation and approval. (See 6.4.) When required, the contractor shall demonstrate that the effectiveness of each proposed alternative is equal to or better than the quality assurance provisions specified herein. In cases of dispute as to whether the contractor's proposed alternative provides equal quality assurance, the provisions of this specification shall apply. All approved alternative inspection provisions shall be specifically incorporated into the contractor's quality program or detailed inspection system, as applicable.

### 4.2 Quality conformance inspection.

**4.2.1 Lotting.** A lot shall consist of the acetone produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions

O-A-51H

provided the operation is continuous. In the event the process is a batch operation, each batch shall constitute a lot (see 6.5).

#### 4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with table II. The sample unit shall be one filled unit pack or packing container, as applicable, ready for shipment.

TABLE II. Sampling for packaging examination

Number of containers in batch or lot	Number of sample containers
1 or 2	all
3 to 25	3
26 to 50	5
51 to 90	6
91 to 150	7
151 to 280	10
281 to 500	11
501 to 1,200	15
1,201 to 3,200	18
3,201 to 10,000	22
over 10,000	29

4.2.2.2 For acetone test. See 6.6 for sampling and testing precautions. Sampling shall be conducted in accordance with table III. A representative specimen of at least 450 milliliters (mL) shall be removed from each sample container and placed in a suitable clean, dry container labeled to identify the lot and container from which it was taken.

TABLE III. Sampling acetone 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.** Sample unit packs and packing containers shall be examined for the characteristics listed below. Failure of any sample unit pack or packing container to conform to all characteristics shall be cause for rejection of the lot represented.

- (a) Contents per container
- (b) Container
- (c) Container closure
- (d) Container free of damage and leaks
- (e) Fiberboard pads or partitions evident and correct (when required)
- (f) Marking evident, correct, and legible
- (g) Unitization

**4.2.3.2 For acetone test.** See 6.6 for sampling and testing precautions. 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 Acetone tests.** Water in accordance with ASTM D 1193 and reagent grade chemicals shall be used throughout the tests. Where applicable, blank determinations shall be run and corrections applied where significant. Tests shall be conducted as follows:

**4.2.4.1 ASTM test methods.** Determine the requirements listed in table IV in accordance with the applicable ASTM method specified therein.

O-A-51H

Table IV. ASTM test methods

Requirement	Requirement paragraph	ASTM test method
Specific gravity	3.1	D 891*
Distillation range	3.2	D 1078**
Color	3.3	D 1209
Odor	3.4	D 1296
Permanganate reduction	3.5	D 1363
Water miscibility	3.6	D 1722
Nonvolatile matter	3.7	D 1353
Water	3.7	D 1364
Acidity	3.7	D 1613
Alkalinity	3.7	D 1614

\*The method used shall be accurate to the fourth decimal place.

\*\*Using an ASTM No. 39C thermometer.

**4.2.4.2 Aldehydes.** Dilute 2.5 mL of the specimen with water to 10 mL. Prepare a control containing 0.04 milligrams of formaldehyde in 10 mL of water. To both the specimen solution and the control, add 0.15 mL of a 5 percent solution of 5,5-dimethyl-1,3-cyclohexanedione in alcohol. Evaporate each on a steam bath until the acetone is volatilized (no odor of acetone remains). Dilute each to 10 mL and cool quickly in an ice bath with vigorous stirring. Any turbidity produced in the specimen solution shall be no greater than that produced in the control.

## 5. PACKAGING

Note: The metric equivalents given for inch-pound quantities are nominal values provided for informational purposes and should not be considered as quantity requirements.

**5.1 Packaging.** Packaging shall be in accordance with the applicable requirements of 49 CFR 171 to 199 and the International Civil Aviation Organization – Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO-TDGA) or the International Maritime Organization – International Maritime Dangerous Goods Code (IMO-IMDGC), as applicable to the mode of transportation. The packaging shall meet the applicable packaging performance tests specified in ICAO-TDGA or IMO-IMDGC, as applicable.

### 5.2 Unit packing.

**5.2.1 One-pint (0.5-liter) quantity.** A quantity of 1 pint (+1/8 or –0 fluid ounces) (0.5 liters) of acetone shall be unit packed in a nominal 1-pint (0.5-liter) tin-plate metal can



conforming to an IP.3 container of ICAO-TDGA or IMO-IMDGC, as applicable. The IP.3 container shall conform to type V, class 8 of PPP-C-96. The can shall be formed from minimum number 100 electrolytic tin-plate and shall have exterior nonmetallic protective coating plan B with side seam striped. The flexible spout shall be protected by metal tamper-proof (evident) seal. The can shall be closed as specified in the appendix to PPP-C-96.

**5.3 Packing.** Packing shall be level A or B as specified (see 6.2).

**5.3.1 Level A.**

**5.3.1.1 One-gallon (4.0-liter) quantity.** A quantity of 1 gallon (+1 or -0 fluid ounces) (4.0 liters) of acetone shall be packed in a nominal 1-gallon (4.0-liter) tighthhead steel pail conforming to the requirements of a 1A1 container of ICAO-TDGA or IMO-IMDGC, as applicable. The pail shall also be furnished with a flexible, self-venting spout, and metal outer closure seal. In addition, the container shall be fabricated from minimum 24 gauge steel.

**5.3.1.2 Five-gallon (20.0-liter) quantity.** A quantity of 5 gallons (+5 or -0 fluid ounces) (20.0 liters) of acetone shall be packed as specified in 5.3.1.1, except the nominal capacity of the drum shall be 5 gallons.

**5.3.1.3 Fifty-five-gallon (210.0-liter) quantity.** A quantity of 55 gallons (+1/2 or -0 gallons) (210.0 liters) of acetone shall be packed in a nominal 55-gallon (210.0-liter) steel drum conforming to the requirements of a 1A1 container of ICAO-TDGA or IMO-IMDGC, as applicable. Top and bottom heads and body shall be constructed of minimum 14 gauge steel sheet.

**5.3.2 Level B.**

**5.3.2.1 One-pint (0.5-liter) quantity.** Twelve 1-pint (0.5-liter) cans, unit packed as specified in 5.2.1, shall be packed in three rows of four cans in a close-fitting weather-resistant fiberboard box conforming to the requirements of a 4G container of ICAO-TDGA or IMO-IMDGC, as applicable. Motion of contents in the box shall be prevented by inserting fiberboard pads where needed. Each box shall be closed and reinforced as specified in accordance with the general packing requirements of ICAO-TDGA or IMO-IMDGC, as applicable.

**5.4 Overpacking.** Overpacking shall be level A or B as specified (see 6.2).

**5.4.1 Level A.**

**5.4.1.1 One-pint (0.5-liter) quantity.** Four packs of 1-pint (0.5-liter) cans shall be overpacked with closure ends uppermost in a close-fitting box conforming to class 3, style optional of PPP-B-585. Motion of contents in the box shall be prevented by inserting fiberboard pads, where needed, formed from material conforming to grade V3c of PPP-F-320. The box shall be closed as specified in the appendix to PPP-B-585.

O-A-51H

**5.4.1.2 One-gallon (4.0-liter) quantity.** Six 1-gallon (4.0-liter) drums of acetone, packed as specified in 5.3.1.1, shall be overpacked in a box as specified in 5.4.1.1, except that all inside faces of the box shall be lined with the fiberboard pads.

**5.4.2 Level B.**

**5.4.2.1 One-pint (0.5-liter) quantity.** Four packs of 1-pint (0.5-liter) cans of acetone shall be overpacked level B in the same manner as specified for level A, except that the box shall conform to class weather-resistant, grade V3c of PPP-B-636. The fiberboard box shall be closed as specified in the appendix to PPP-B-636 for closure of boxes used as exterior containers.

**5.4.2.2 One-gallon (4.0-liter) quantity.** Six 1-gallon (4.0-liter) drums of acetone shall be overpacked in a box as specified in 5.4.2.1, except that all inside faces of the box shall be lined with fiberboard pads formed from material conforming to class weather-resistant, grade V3c of PPP-F-320.

**5.5 Marking.** Shipments for civil agencies shall be marked in accordance with Fed. Std. No. 123. Shipments for military activities shall be marked in accordance with MIL-STD-129.

**5.5.1 Container compliance markings.** Each shipping container shall be marked in accordance with 49 CFR 171 to 179 and either ICAO-TDGA or IMO-IMDGC, as applicable.

**5.5.2 Hazard class label.** Each shipping container and pallet load shall be labeled in accordance with 49 CFR 171 to 179 and either ICAO-TDGA or IMO-IMDGC, as applicable.

**5.5.3 Proper shipping name.** Each shipping container and pallet load shall be marked with the proper shipping name in accordance with 49 CFR 171 to 179 and either ICAO-TDGA or IMO-IMDGC, as applicable.

**5.5.4 Precautionary markings.** Each unit pack, pack, and shipping container shall be marked or labeled, as applicable, in accordance with 29 CFR, Hazards Communication, 1900.1200(f) to show the required precautionary information. Each outer container shall be marked to show the top of the container by use of an arrow and the word "UP".

**5.5.5 Overpack markings.** Each overpack shall be marked "Inner packages comply with prescribed specification \_\_\_\_\_." (Enter either 1A1 or 4G, as applicable.)

**5.6 Palletization.** Uniform quantities of level A and level B packs and overpacks of acetone shall be palletized in accordance with MIL-STD-147, using the requirements for load type I for boxes, and the requirements for load type III for drums, but prohibiting the shrink wrap option for both types.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

**6.1 Intended use.** Acetone is intended for use as a solvent for various substances and for use in the manufacture of explosives and propellants.

**6.2 Acquisition requirements.** Acquisition documents must specify the following:

- (a) Title, number, and date of this specification
- (b) Unit quantity required
- (c) Level of packing required (see 5.3)
- (d) Level of overpacking required (see 5.4)
- (e) If palletization is required for shipment (see 5.6).

**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-313. The pertinent mailing addresses for submissions of data are listed in FED-STD-313.

**6.4 Submission of alternative inspection provisions.** Proposed alternative inspection provisions should be submitted by the contractor to the procuring contracting officer for evaluation and approval by the technical activity responsible for preparation of this specification.

**6.5 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.

**6.6 Sampling and testing precautions.** This specification requires inspection of chemical material which is potentially hazardous to personnel. This specification does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this specification to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**6.7 Significant places.** For the purpose of determining conformance with this specification, an observed or calculated value shall be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of ASTM E 29.

**6.8 Changes from previous issues.** Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

O-A-51H

**6.9 Subject term (key word) listing.**

explosive  
propellant  
solvent

**MILITARY INTERESTS:**

**Custodians:**

Army - EA  
Navy - OS  
Air Force - 68

**Review activities:**

Army - MD, MI, SM  
DLA - GS  
Other - DS

**User activities:**

Navy - AS

**CIVIL AGENCY COORDINATING ACTIVITIES:**

COM-NIST  
DOT-ACO  
GSA-FSS (9FTE-10)  
NASA-NA  
TVA

**Preparing activity:**

Army - EA  
Project No. 6810-1270

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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

### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
0-A-51H

2. DOCUMENT DATE (YYMMDD)  
920423

3. DOCUMENT TITLE  
ACETONE, TECHNICAL

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(If applicable)

7. DATE SUBMITTED  
(YYMMDD)

### 8. PREPARING ACTIVITY

a. NAME  
U.S. Army Chemical Research, Development  
and Engineering Center

b. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(410) 671-3259

(2) AUTOVON  
DSN 584-3259

c. ADDRESS (Include Zip Code)

Cdr, U.S. Army CRDEC  
ATTN: SMCCR-PET-S  
Aberdeen Proving Ground, MD 21010-5423

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:  
Defense Quality and Standardization Office  
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466  
Telephone (703) 756-2340 AUTOVON 289-2340