

O-T-634C  
April 25, 1984  
SUPERSEDING  
Fed. Spec. O-T-634b  
October 9, 1968

## FEDERAL SPECIFICATION

### TRICHLOROETHYLENE, TECHNICAL

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

#### 1. SCOPE

1.1 Scope. This specification covers two types of technical grade trichloroethylene for use as a solvent.

1.2 Classification. Trichloroethylene shall be furnished in the following types as specified (see 6.2):

Type I - Regular  
Type II - Vapor degreasing

#### 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-636 - Boxes, Shipping, Fiberboard  
PPP-C-186 - Containers, Packaging and Packing for Drugs, Chemicals, and  
Pharmaceuticals  
PPP-C-2020 - Chemicals, Liquid, Dry, and Paste; Packaging Of  
PPP-D-729 - Drums, Shipping and Storage, Steel, 55-Gallon (208 Liters)  
PPP-P-704 - Pails, Metal: (Shipping, Steel, 1 Through 12 Gallons)

##### Federal Standard:

Fed. Std. No. 123 - Marking for Shipment (Civil Agencies)

(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, US Government Printing Office, Washington, DC 20402.

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(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; Houston, 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
- MIL-STD-1168 - Ammunition Lot Numbering

(Copies of specifications, standards, handbooks, drawings, and publication required by manufacturers 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)**

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, US 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.

**Uniform Classification Committee, Agent:**

Uniform Freight Classification

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

**National Motor Freight Traffic Association, Inc., Agent:**

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, NW, Washington, DC 20036.)

## ASTM Standards:

- D 1078 - Distillation Range of Volatile organic Liquids
- D 1193 - Reagent Water
- D 2108 - Color of Halogenated Organic Solvents and Their Admixtures  
(Platinum Cobalt Scale)
- D 2109 - Nonvolatile Matter in Halogenated Organic Solvents and Their  
Admixtures
- D 2111 - Specific Gravity of Halogenated Organic Solvents and Their  
Admixtures
- D 2942 - Total Acid Acceptance of Halogenated Organic Solvents  
(Nonreflux Method)
- D 3401 - Water in Halogenated Organic Solvents and Their Admixtures

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

## 3. REQUIREMENTS

3.1 Physical and chemical characteristics. Trichloroethylene shall conform to the physical and chemical characteristics of table I when tested as specified therein.

3.1.1 Stabilizer. A stabilizer shall be added to type II material, within the limits of table I, to inhibit acid formation. The inhibitor shall not lower the flammability or increase toxicity or noxious characteristics of the solvent (see 4.2.4.11).

## 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.

TABLE I. Physical and chemical characteristics

Characteristic	Type I	Type II	Test paragraph
Specific gravity at 25 deg./25 deg. C	1.450 to 1.460	1.450 to 1.460	4.2.4.1
Distillation range:			4.2.4.2
Initial boiling point, minimum	86.0 deg. C	86.0 deg. C	
Minimum 95 percent distilled, maximum	87.5 deg. C	87.5 deg. C	
Dry point, maximum	90.0 deg. C	90.0 deg. C	
Acidity (as HCl), weight percent, maximum	0.01	0.001	4.2.4.3
Alkalinity (as NaOH), weight percent, maximum	0.015	0.015	4.2.4.4

Water, parts per million, maximum	100	100	4.2.4.5
Residual stain	None	-	4.2.4.6
Appearance	Clear and free of suspended matter	Clear and free of suspended matter	4.2.4.7
Color, APHA scale	15	15	4.2.4.8
Nonvolatile residue, weight percent, maximum	0.002	0.010	4.2.4.9
Acid acceptance (as NaOH), weight percent, minimum	0.160	0.160	4.2.4.10

## 4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the trichloroethylene 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 6.3). When specified (see 6.2) each lot shall be identified and controlled in accordance with MIL-STD-1168.

## 4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with MIL-STD-105.

4.2.2.2 For trichloroethylene test. See 6.5 for sampling and testing precautions. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 750 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.

4.2.2.3 For container leakage test. Sampling shall be conducted in accordance with MIL-STD-1051 inspection level S-2.

TABLE II. Sampling for trichloroethylene 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 1.5 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) Unitization not as specified

4.2.3.2 For trichloroethylene 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.

4.2.3.3 For container leakage test. See 6.5 for sampling and testing precautions. The sample unit shall be one container. The sample containers selected in 4.2.2.3 shall be tested as specified in 4.2.5 using an AQL of 1.5 percent defective.

4.2.4 Trichloroethylene tests. See 6.5 for sampling and testing precautions. 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 Specific gravity. Determine the specific gravity of the specimen in accordance with ASTM D 2111.

4.2.4.2 Distillation range. Determine the distillation range of the specimen in accordance with ASTM D 1078 using ASTM thermometer No. 39C and a k factor of 0.043 ( deg. C per millimeter change in pressure).

4.2.4.3 Acidity. Measure 25 mL of water into a 250-mL glass-stoppered Erlenmeyer flask. Add 3 drops of phenolphthalein indicator (1 percent by weight in ethanol), and neutralize to a very faint pink color with 0.01N sodium hydroxide solution. Pipet 25 mL of specimen into neutralized water, stopper the flask, and shake for 30 seconds. Titrate with 0.01N sodium hydroxide solution to a very faint pink color, stopper, and shake flask. If pink color disappears, continue titration dropwise to 8 very faint pink color. Calculate the percent by weight acidity as follows:

$$\text{Percent acidity as hydrochloric acid} = \frac{3.646VN}{MS}$$

where: V = Milliliters of sodium hydroxide solution,  
 N = Normality of sodium hydroxide solution,  
 M = Milliliters of specimen, and  
 S = Specific gravity of specimen (determined in 4.2.4.1).

4.2.4.4 Alkalinity. Measure 25 mL of water into a 250-mL glass-stoppered Erlenmeyer flask. Add 3 drops of phenolphthalein indicator, and add 0.01N sodium hydroxide dropwise to a very faint pink color. Add 0.01N hydrochloric acid until 1 drop causes the pink color to just disappear. Pipet 25 mL of specimen into the neutralized water, stopper the flask and shake for 30 seconds. If the water layer is colorless, report alkalinity as 0.00 percent; if the water layer is pink, titrate with 0.01N hydrochloric acid solution until 1 drop causes the pink color to just disappear. Stopper the flask and shake. If the pink color reappears, continue the titration dropwise until pink color just disappears. Calculate the percent by weight alkalinity as follows:

$$\text{Percent alkalinity, as sodium hydroxide} = \frac{4VN}{MS}$$

where: V = Milliliters of hydrochloric acid solution,  
 N = Normality of hydrochloric acid solution,  
 M = Milliliters of specimen, and  
 S = Specific gravity of specimen (determined in 4.2.4.1).

4.2.4.5 Moisture. Determine moisture content as parts per million water in accordance with ASTM D 3401.

4.2.4.6 Residual stain (type I only). In a laboratory hood with outside exhaust, place five drops of trichloroethylene in the center of a double-acid washed medium texture filter paper. The center portion of the under surface of the filter paper shall not be in contact with any object. Allow the material to evaporate away from direct sunlight at room temperature (20 deg. to 30 deg. C). There shall be no stain nor spot after a 2 hour drying period.

4.2.4.7 Appearance. Transfer 15 mL of thoroughly mixed specimen into a test tube, allow to stand for at least 10 minutes at room temperature (20 deg. to 30 deg. C) and inspect by transmitted light for clarity, suspended matter, and sediment.

4.2.4.8 Color. Determine the color of the specimen in accordance with ASTM D 2108.

4.2.4.9 Nonvolatile residue. Determine the nonvolatile residue of the specimen in accordance with ASTM D 2109, method B.

4.2.4.10 Acid acceptance. Determine acid acceptance in accordance with ASTM D 2942.

4.2.4.11 Stabilizer. The contractor shall certify that the stabilizer (or stabilizers) added will not reduce the flammability or increase the toxicity or noxious characteristics of the trichloroethylene.

4.2.5 Container leakage test. Place the container in each of the following positions, and leave it in each for a period of 15 minutes.

- (a) Upright
- (b) Upside down
- (c) On one side (or one quadrant)
- (d) On one end (or second quadrant)
- (e) On other side (or fourth quadrant)

Examine the container after each period for any evidence of leakage.

## 5. PACKAGING

5.1 Unit packing. Unit packing shall be level A, B or minimum protection as specified (see 6.2), and shall be in accordance with the general requirements of PPP-C-2020 and Department of Transportation (DOT) regulations.

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

5.1.1.1 One-gal quantity. A quantity of 1 gal [+2 or -0 fluid ounces (oz)] of trichloroethylene shall be unit packed in a nominal 1-gal capacity metal can or pail in accordance with PPP-C-186, group C, type a or PPP-C-186, group E, type 1. The screw-caps or plugs of the filled container shall be closed to a torque within the ranges specified by the container or closure manufacturer. There shall be no evidence of leakage from the container when tested as specified in 4.2.5.

5.1.1.2 Five-gal quantity. A quantity of 5 gal (+6 or -0 oz) of trichloroethylene shall be unit packed in a nominal 5-gal capacity metal pail in accordance with DOT Specification 5B or 17C; PPP-P-704 type I, class 4; and as specified in 5.1.1.1 above.

5.1.1.3 Fifty-five gal quantity. A quantity of 55 (+ 1/2 or -0) gal of trichloroethylene shall be unit packed in a nominal 55-gal steel drum in accordance with DOT Specification 5B; PPP-D-729, type I, class A; and as specified in 5.1.1.1 above.

5.1.2 Level B. Trichloroethylene shall be unit packed level B in a 1-, 5-, or 55-gal quantity as specified (see 6.2).

5.1.2.1 One-gal quantity. A 1-gal quantity of trichloroethylene shall be unit packed level B as specified for level A protection in 5.1.1.1, except that no exterior organic protective coating shall be required on the exterior of the container.

5.1.2.2 Five-gal quantity. A 5-gal quantity of trichloroethylene shall be unit packed level B as specified for level A protection in 5.1.1.2, except that the pail shall conform to DOT Specification 17C.

5.1.2.3 Fifty-five gal quantity. A 55-gal quantity of trichloroethylene shall be unit packed level B as specified for level A protection in 5.1.1.3, except that the drums shall conform to DOT Specification 5B and all interior surfaces shall neither affect nor be affected by the contents.

5.1.3 Level C. The quantity of trichloroethylene specified in the contract or order (see 6.2) shall be unit packed level C to provide adequate protection of its purity, and to guard against corrosion, deterioration, leakage, and damage from the supply source to the first receiving activity and for a duration of six months. Containers and the manner of unit packing shall be in accordance with DOT regulations and all other regulations applicable to the modes of transportation intended.

5.2 Packing. Trichloroethylene shall be packed for shipment level A, B or minimum protection as specified (see 6.2), in accordance with DOT regulations.

5.2.1 Level A. Trichloroethylene shall be packed level A as follows:

5.2.1.1 One-gal quantity. Six cans or pails, as applicable, of the 1-gal quantity of trichloroethylene of 5.1.1.1, shall be packed level A for shipment as specified in PPP-C-186, using procedure code 22 and reinforcing strapping on boxes.

5.2.1.2 Five-gal quantity. The 5-gal quantity of trichloroethylene, unit packed as specified in 5.1.1.2, shall require no further protection for shipment other than unitization.

5.2.1.3 Fifty-five gal quantity. The 55-gal quantity of trichloroethylene, unit packed as specified in 5.1.1.3, shall require no further protection for shipment other than unitization.

5.2.2 Level B. Trichloroethylene shall be packed level B as follows:

5.2.2.1 One-gal quantity. Six cans or pails of trichloroethylene shall be packed level B as specified for level A protection in 5.2.1.1, except that the box shall conform to PPP-B-636, grade V3c for a type 2 load.

5.2.2.2 Five-gal quantity. The 5-gal quantity of trichloroethylene, unit packed as specified in 5.1.2.2, shall require no further protection for shipment other than unitization.

5.2.3 Level C. Trichloroethylene shall be packed for shipment in accordance with DOT regulations in a manner to assure carrier acceptance and safe delivery to destination. Containers shall be in accordance with Uniform Freight Classification Rules and National Motor Freight Classification Rules, and the rules of any other applicable intended mode of transportation.

5.2.4 Unitization. Uniform quantities of level A, B or C packs of the 1 and 5-gal quantities shall be palletized in accordance with MIL-STD-147. Individual pallet loads shall consist of one size quantity.

5.3 Marking.

5.3.1 Civil agencies. Marking shall be in accordance with the precautionary marking of 5.3.3, DOT and other applicable regulatory marking, and Fed. Std. No. 123.



5.3.2 Military activities. Level A, B and C packs, unit packs, and pallet loads shall be marked in accordance with MIL-STD-129. Each container and pallet load shall be marked to show the lot or batch numbers and date of manufacture of contents.

5.3.3 Precautionary marking. Each container and pallet load shall be marked as follows:

HAZARDS:

Suspected carcinogen.  
Toxic by Inhalation.  
Toxic by Ingestion.

WARNING! HARMFUL IF INHALED OR SWALLOWED.

Avoid breathing vapor.  
Keep container closed.  
Use with adequate ventilation.  
Wash thoroughly after handling.  
Avoid contact with eyes, skin and clothing.  
Poisonous gases are produced in fire.  
Vapors in high concentrations are anesthetic and dangerous to life.

FIRST AID: If inhaled, remove to fresh air.  
If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen.  
Call a physician. If swallowed and victim is conscious, give large quantities of water. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.  
If victim is unconscious or having convulsions, do nothing except keep victim warm. Call a physician.

SUPPLY/USE: Appropriate personal protective equipment as designated by local industrial hygiene, medical and safety personnel.

5.3.3.1 Special restriction. The 55-gal quantity of trichloroethylene shall be marked "Cargo aircraft only."

6. NOTES

6.1 Intended use. Type I trichloroethylene is intended for use in dry-cleaning and for general solvent purposes. Type II trichloroethylene is intended for vapor degreasing of metals.

6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification,
- (b) Type of material required (see 1.2),
- (c) If lot numbering in accordance with MIL-STD-1168 is required (see 4.2.1).
- (d) Level of unit packing and packing required (see 5.1 and 5.2), and
- (e) Quantity to be unit packed level A, level B, or level C for civil agencies, or level C for military activities (see 5.1.1, 5.1.2, 5.1.3.1, or 5.1.3.2).

6.3 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.

6.4 Significant places. For the purpose of determining conformance with this specification, an observed or calculated value should 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.

6.5 Sampling and testing precautions. This specification covers inspection of chemical material which is potentially hazardous to personnel. (Trichloroethylene is toxic by inhalation, toxic by ingestion, and is a suspected carcinogen.) All applicable safety rules, regulations and procedures must be followed in the handling and processing of this material.

MILITARY INTERESTS:

Custodians:

Army - EA  
Navy - SH  
Air Force - 68

Review activities:

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

User activities:

Army - GL  
Navy - AS, MC

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS  
HHS-HSM

Preparing activity:

Army - EA

Project No. 6810-B028

O-T-634C  
AMENDMENT 1  
October 24, 1985

FEDERAL SPECIFICATION

TRICHLOROETHYLENE, TECHNICAL

This amendment which forms a part of Federal Specification O-T-634C, dated April 25, 1984, is approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

PAGE 9

5.3.3, line 4: Delete "Suspected carcinogen." and substitute "Has been shown to cause cancer in some animals."

PAGE 11

6.5, lines 3 and 4: Delete "is a suspected carcinogen.)" and substitute "has been shown to cause cancer in some animals.)"

MILITARY INTERESTS:

Custodians:

Army - EA  
Navy - SH  
Air Force - 68

Review activities:

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

User activities:

Army - GL  
Navy - AS, MC

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-7FCE  
HHS-HSM

Preparing activity:

Army - EA

Project No. 6810-B518

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