

MIL-C-81302D  
16 April 1985  
SUPERSEDING  
MIL-C-81302C  
7 April 1981

## MILITARY SPECIFICATION

### CLEANING COMPOUND, SOLVENT, TRICHLOROTRIFLUOROETHANE

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

#### 1. SCOPE

1.1 Scope. This specification establishes the requirements for a 1, 1, 2-trichloro 1, 2, 2-trifluoroethane solvent (see 6.1).

1.2 Classification. The solvent shall be of the following types, as specified (see 6.2).

Type I - Ultra-clean  
Type II - Standard  
Type IIA - Type II packaged in a pressurized container.

#### 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-601	-	Boxes, Wood, Cleated Plywood
PPP-B-621	-	Box, Wood, Nailed and Lock Corner
PPP-B-636	-	Box, Shipping, Fiberboard

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of the document or by letter.

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## SPECIFICATIONS (cont.)

## FEDERAL (cont.)

- PPP-C-96 - Can, Metal, 28 Gage and Lighter
- PPP-D-729 - Drums, Shipping and Storage, Steel, 55 gallons (208 liters)
- PPP-P-704 - Pail, Metal (Shipping, Steel 1 through 12 gallon)

## STANDARDS

## FEDERAL

- FED-STD-313 - Material Safety Data Sheets, Preparation and Submission of
- FED-STD-791 - Lubricants, Liquid Fuels, and Related Products; Methods of Testing

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

## CODE OF FEDERAL REGULATIONS

- CFR, Title 49 - Transportation
- CFR, Title 29 1910.1200 - Hazard Communication Standard

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

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 CHEMICAL SOCIETY

Reagent Chemicals, A.C.S. Grade

(Application for A.C.S. publication should be addressed to the American Chemical Society, 1155 Sixteenth Street, N.W., Washington, DC 20036).

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 270	-	Sampling Petroleum and Petroleum Products
ASTM D 3951	-	Packaging, Commercial
ANSI/ASTM D 3443	-	Chloride in Trichlorotrifluoroethane
ANSI/ASTM D 3444	-	Total Acid Number of Trichlorotrifluoroethane
ANSI/ASTM D 3445	-	Nonvolatile Matter in Trichlorotrifluoroethane
ANSI/ASTM D 3446	-	Water Content of Trichlorotrifluoroethane with Karl Fischer Reagent
ANSI/ASTM D 3447	-	Purity of Trichlorotrifluoroethane
ANSI/ASTM F 302	-	Field Sampling of Aerospace Fluids in Containers

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

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI Z 129.1	-	Precautionary Labeling of Hazardous Industrial Chemicals
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(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification Rules

(Application for copies should be addressed to the National Motor Freight Traffic Association, Tariff Department, 1616 P Street, N.W. Washington, DC 20036).

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Rules

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

2.2.1 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. The material covered by this specification shall be 1, 1, 2 -trichloro 1, 2, 2 -trifluoroethane.

3.2 Chemical and physical properties. The solvent shall conform to the requirements of table I and 3.3 through 3.5 when tested as specified in 4.4

3.3 Leakage (Type IIA only). When tested as specified in 4.4.8, the pressurized container shall not leak nor become distorted.

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3.4 Weight (Type IIA only). When tested as specified in 4.4.9, the content of the pressurized container shall weigh not less than 13 ounces (avoirdupois) for the 16 ounce Type IIA container and 9 ounces (avoirdupois) for the 12 ounce Type IIA container.

3.5 Content (Type IIA only). When tested as specified in 4.4.10, the filled pressurized can shall contain a minimum of 12 ounces (by weight) for the 16 ounce Type IIA container and 8 ounces (by weight) for the 12 ounce Type IIA container of solvent and the remainder shall be carbon dioxide. The amount of carbon dioxide propellant shall be adequate to expel all the solvent.

3.6 Material Safety Data Sheets. A Material Safety Data Sheet shall be prepared and submitted in accordance with FED-STD-313. Questions pertinent to the effect of trichlorotrifluoroethane on the health of personnel when used for its intended purpose shall be referred by the acquiring activity to the appropriate medical service who will act as adviser to the acquiring activity see 4.5 and 6.2(g)).

3.7 Workmanship. When examined visually, the solvent shall be a clear colorless liquid.

#### 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 this specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Test facilities. When specified by the acquiring activity detailed test procedures, schematic diagrams of the test setups and a list of test equipment to be used shall be retained by the contractor and made available to the acquiring activity for approval prior to use.

4.2 Test conditions. Unless otherwise specified, all inspections shall be performed in accordance with the applicable paragraph herein.

4.3 Classification of inspections. The inspections specified herein are classified as follows:

- (a) Quality conformance inspection (normal) (see 4.3.1)
- (b) Quality conformance inspection (special) (see 4.3.2)

4.3.1 Quality conformance inspection. The quality conformance inspection shall consist of the tests and examinations in 4.3.4 through 4.3.8 and the tests specified in table II.

4.3.2 Special inspection (types I and II). When specified (see 6.2), a special inspection shall be performed by the procuring activity at the manufacturer's or other designated facility. When such an inspection is performed, the results shall constitute acceptance or rejection, voiding the normal quality conformance inspections. Under normal inspection conditions,

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samples for this special inspection shall be selected in accordance with 4.3.4.1 and 4.3.8. However, the acquiring activity reserves the right to establish the sample size at any level deemed necessary to assure the quality of the solvent.

#### 4.3.3 Lot formation.

4.3.3.1 Packaged lot. A packaged lot shall consist of the total number of containers of the same size and construction that have been filled with solvent produced by one manufacturer, at one plant, from the same materials, and under essentially the same conditions provided the operation is continuous and does not exceed a 24-hour period. In the event the process is a batch operation, each batch shall constitute a lot (see 6.3).

4.3.3.2 Bulk lot. A bulk lot shall be an indefinite quantity of solvent produced in accordance with 4.3.3.1 and limited to one container.

#### 4.3.4 Sampling for tests.

4.3.4.1 Packaged lot. Containers of types I and II solvents shall be selected in accordance with ANSI/ASTM F 302. One liter of solvent shall be withdrawn from each container for the performance of the test; specified in table I. Type I solvent shall be sampled under clean room conditions. If one or more properties fail to meet the requirement, the lot represented by the sample shall be rejected. The sample unit shall be one container. For type IIA solvent, 15 containers shall be selected at random and tested as a composite sample for the properties listed in table II. Each determination shall be in duplicate and average results reported. The tests in 4.4.8 through 4.4.10 shall be performed prior to the remainder of the tests in table II.

4.3.4.2 Bulk lot. Samples shall be taken under the cleanest conditions possible after the container has been filled. When the container is equipped with a pumping system that will completely recirculate its contents within one hour, take samples at intervals of one and two hours after initiation of recirculation. When the content cannot be thoroughly circulated, three samples representing the top, middle and bottom sections respectively of the container shall be drawn in accordance with ASTM D 270. The samples shall be tested for the requirements specified in table II. Nonconformance of one or more characteristics to any requirements of a sample unit shall be cause for rejection of the lot represented by the sample.

4.3.5 Visual examination of the end item. The sample unit for this examination shall be one filled unit container. The content shall be examined for the defects listed in table IV. The sample size shall be in accordance with table III. Any evidence of nonconformance shall be cause for rejection of the lot.

4.3.6 Net content packaged lot. The determination shall be applicable only to types I and II packaged lots. The sample unit for this examination shall be one filled unit container. The sample size shall be as specified in table V. The lot shall be unacceptable if the average net content per container for all units examined is less than specified.

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4.3.7 Bulk lot content. The container shall be examined for conformance to 5.1.1.2. If the quantity of solvent is less than the quantity specified by the acquiring activity (see 6.2), the lot shall be rejected.

4.3.8 Examination of packaging and marking. An examination shall be made to determine that packaging, packing and marking comply with the requirements of Section 5 of this specification. Defects shall be scored in accordance with table VI. The sample unit for this examination shall be one shipping container fully prepared for delivery except that it shall not be palletized and need not be sealed. Shipping containers fully prepared for delivery that have not been palletized shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot. The samples for this examination shall be selected at random in accordance with MIL-STD-105, inspection level S-2 and acceptable quality level (AQL) 4.0 defects per hundred units.

4.3.9 Examination for palletization. An examination shall be made to determine that palletization complies with the requirements of Section 5 of this specification. Defects shall be scored in accordance with table VII. The sample unit shall be one palletized unit load fully prepared for delivery. The lot size shall be the number of palletized unit loads in the end item inspection lot. The samples for this examination shall be selected at random in accordance with MIL-STD-105, inspection level S-1 and acceptable quality level (AQL) 6.5 defects per hundred units.

#### 4.4 Test methods.

4.4.1 Boiling point. Add 250 ml of solvent to a clean, dry T 24/40 joint, 500-ml round bottom flask containing three boiling chips. Assemble the apparatus as shown in figure 1, using polytetrafluoroethylene sleeves at each ground glass joint. (NOTE: Do not use lubricants to seal the ground glass joints.) Position the calibrated JL-3 thermometer tip 0.5 inch above the surface of the liquid. Adjust the water flow through the condenser. Wrap glass wool around the exposed portion of the flask, leaving a small opening in the glass wool so that the thermometer bulb can be observed. Seat the flask in an electric heating mantle and adjust the heat rate so that a reflux rate of approximately two drops per second is maintained at the thermometer bulb. Allow the solvent to reflux at equilibrium in a draft-free area for 30 minutes prior to recording the boiling point temperature and the barometric pressure (see 6.4). (NOTE: The barometer shall be located in the same room and within 3 feet of the boiling point apparatus. Correct the boiling point for barometric pressure using the graph in figure 2.)

4.4.2 Purity. The purity of the solvent shall be determined in accordance with ANSI/ASTM D 3447.

4.4.3 Moisture content. The moisture content of the solvent shall be determined in accordance with ANSI/ASTM D 3446.

4.4.4 Chloride ion. The chloride ion content of the solvent shall be determined in accordance with ANSI/ASTM D 3443.

4.4.5 Acid number. The acid number of the solvent shall be determined in accordance with ANSI/ASTM D 3444.

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4.4.6 Residue. The residue shall be determined in accordance with ANSI/ASTM D 3445. The sample shall be collected in clean room conditions.

4.4.7 Particulate matter. Particulate matter shall be determined in accordance with Method 3009 of FED-STD-791, except that a 500 ml portion of each sample shall be subjected to the test. The following precautions shall be observed:

CAUTION: Never strike the membrane filter disc with a stream of the test or rinse solvents.

CAUTION: Use forceps with unserrated tips to handle the membrane filter discs.

4.4.8 Leakage. Using a filled pressurized can, spray the solvent for three seconds and pause for two seconds. Repeat this operation five times. The can shall then be submerged completely in a saturated sodium chloride or brine solution maintained at 54 deg. C +/- 1 deg. C (130 deg. +/- 2 deg. F). Let the can remain for five minutes. The emission of bubbles shall indicate leakage. At the end of five minutes, remove the can from the water and examine it for evidence of distortion. Invert the can and submerge for an additional three minutes to check for leakage.

4.4.9 Weight. Weigh the filled pressurized can to the nearest 0.01g. Spray the content for 3 minutes and pause for one minute. Again, spray for 3 minutes and pause for one minute. Repeat the cycle until there is no evidence of spray formation. Puncture a hole in the can and empty it completely. Weigh the empty can to the nearest 0.01g. Calculate the weight of the content by subtracting the weight of the empty can from the weight of the full can.

4.4.10 Content. Accurately weigh the filled can to the nearest 0.01g. Place the can for a minimum of 24 hours in a cold box maintained at -23 deg. C +/- 1 deg. C (-10 deg. F +/- 2 deg. F). Remove the sample and puncture a small hole in the top of the can. Allow the temperature of the sample to rise gradually until it reaches room temperature. Weigh the remainder (can plus solvent) to the nearest 0.01g. The can shall then be emptied and weighed to the nearest 0.01g. Calculate the weight of the propellant and the solvent as follows:

$$\text{Weight of propellant} = W_{f1} \pm W_{f2}$$

$$\text{Weight of solvent} = W_{f2} \pm W_{f3}$$

Where:  $W_{f1}$  = Initial weight (can plus total content)

$W_{f2}$  = weight of can and solvent after propellant has been expelled

$W_{f3}$  = weight of empty can

4.5 Submission of Material Safety Data Sheets. The contractor shall furnish to the contracting activity the toxicological data and formulations required to evaluate the safety of the material for the proposed use through the submission of the Material Safety Data Sheet detailed in FED-STD-313.

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## 5. PACKAGING

5.1 Preservation. Preservation shall be level A or C as specified (see 6.2), and the Code of Federal Regulations 49 requirements will be met as a minimum.

## 5.1.1 Level A.

5.1.1.1 Unit container. Unless otherwise specified, type I (packaged lot) solvents shall be packaged in 5-gallon or 55-gallon containers, type II (packaged lot) solvents shall be packaged in 5-gallon containers, type IIA shall be packaged in 16-ounce pressurized containers, or 12-ounce pressurized containers. Unless otherwise specified, the 5-gallon container shall conform to type I, class 3 of PPP-P-704; the 55-gallon container shall conform to type I or type II of PPP-D-729 (see 6.2); and the 16-ounce and 12-ounce containers shall conform to type 1X, class 5 of PPP-C-96. The 16-ounce and 12-ounce containers shall have a Newman Green No. R-70-118 valve or equivalent. The spray-head shall be Newman Green No. 102-20-18 or equivalent. Each 16-ounce and 12-ounce container shall be equipped with a snug fitting metal or plastic protective cap. A 5-inch (+/- 0.5 inch) plastic extension designed to fit the sprayhead shall be attached to the outside of the container. The internal surface of all containers, bungs and air vents shall be lined with a smooth coating. The lining, spout, closure and pouring devices shall be composed of the material normally used by industry. The material shall neither affect nor be affected by the solvent. The use of polyethylene or any other material which may cause contamination of the solvent is prohibited. Unless a special color is ordered by the acquiring agency (see 6.2), the exterior color of the container shall be that normally used by the manufacturer. All containers shall be thoroughly cleaned immediately before they are filled. Containers for type I solvent shall be rinsed finally with type I solvent before they are filled. The 16-ounce and 12-ounce pressurized containers shall conform to the applicable requirements of the Code of Federal Regulations, Title 49.

5.1.1.1.1 Cap seals (types I and II). Each closure shall have a plastic cap seal applied that effectively prevents removal of the cap or bung without destroying the seal. The cap seal shall also protect the closures from contamination during shipment and storage.

5.1.1.1.2 Protective covers (types I and II). When specified by the acquiring activity, all containers shall be equipped with a snap-on clear plastic cover that will protect the entire head of the container from contamination during shipment and storage (see 6.2).

5.1.1.2 Bulk delivery (types I and II). Bulk delivery shall be made from a container through a means that effectively prevents contact of the solvent with the outside atmosphere throughout the entire delivery procedure, or from a container that filters and dries the air flowing into the container during delivery. The container hose and piping shall be constructed of materials that will neither affect nor be affected by the solvent. These materials and the delivery system shall be approved by the acquiring activity.

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5.1.1.3 Intermediate packing. Twelve 16-ounce or 12-ounce containers preserved as specified in 5.1.1.1 shall be packed in a fiberboard box conforming to PPP-B-636, class weather resistant. The twelve cans, arranged 3 in width and 4 in length, shall fit snugly in the fiberboard box, and each unit shall be nested in a snug fitting, full height half-slotted style partition. The box and the partition shall be made of the same material. The box closure shall be in accordance with the appendix of PPP-B-636.

5.1.2 Level C. The solvent, shall be preserved in accordance with ASTM D 3951, utilizing containers required by the Code of Federal Regulations, Title 49.

5.2 Packing. Packing shall be level A, B or C.

5.2.1 Level A. Two intermediate packages, as specified in 5.1.1.3, shall be packed in containers conforming to PPP-B-601, type overseas, or PPP-B-621, class 2. The solvent, when preserved in 5-gallon or 55-gallon containers as specified in 5.1.1.1, shall require no overpacking. Standard 4-way entry pallets are required for handling by mechanical equipment.

5.2.2 Level B. Two intermediate packages, as specified in 5.1.1.3, shall be packed in a snug fitting fiberboard box conforming to PPP-B-636, class weather resistant and sealed in accordance with the appendix. The solvent, when preserved in 5-gallon or 55-gallon containers as specified in 5.1.1.1, shall require no overpacking. Standard 4-way entry pallets are required for handling by mechanical equipment.

5.2.3 Level C. The solvent shall be packed in accordance with ASTM D 3951. Shipping containers shall at least conform to The Uniform Classification Rules or other carrier regulations applicable to the mode of transportation.

5.3 Marking. The marking of all unit, intermediate and shipping containers shall be in accordance with MIL-STD-129, Code of Federal Regulations (CFR) 49 for Type IIA material, and Code of Federal Regulations (CFR) 29 1910.1200 Hazard Communication Standard.

5.3.1 Additional Marking. Unit containers and intermediate containers shall be marked with the precautionary information detailed in American National Standard ANSI Z 129.1. In addition, all unit containers shall also be marked as follows:

- (a) Lot number
- (b) Filling date
- (c) Manufacturer
- (d) Supplier if different from manufacturer
- (e) Store in a cool, dry place
- (f) Before opening, wipe off top of drum, use a clean vacuum to clear bungs, rinse top with prefiltered trichlorotrifluoroethane
- (g) Specify DAR Clauses 7-104.98 and 1-323.2

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## 5.3.2 Warning labels. (Type I and type II)

Warning labels, on unit containers, should read as follows:

## TRICHLOROTRIFLUOROETHANE

## WARNING

- o Air concentration of 4500 ppm (0.45% by volume) is nearly odorless and causes impairment of manual dexterity and vigilance. Breathing high concentrations may cause death or serious physical harm. In case of spill, warn others and leave area immediately.
- o May dilute or displace oxygen below levels necessary to sustain life.
- o Do not use in the general vicinity of welding, open flame or hot surfaces. Heat and ultraviolet radiation may cause the formation of highly toxic by-products.
- o When used indoors (in enclosed or confined spaces), in amounts greater than one cup, have a halocarbon detector (with audible alarm) operating. Have emergency escape breathing devices available for all persons working in the area. Ensure halocarbon detector is working properly and is calibrated in accordance with manufacturer's recommendations.
- o Avoid breathing vapor. Liquid is irritant. Avoid skin and eye contact. Use the smallest amount possible to perform required task. Assure good ventilation to maintain vapor levels below maximum permissible concentrations.
- o Do not enter area where stored until well ventilated and assure oxygen content is sufficient to support life.

FIRST AID: In case of direct contact, remove contaminated clothing and wash involved skin with soap and water. Seek medical attention if irritation occurs.

In case of eye contact, flush with potable water for at least 15 minutes. Call a physician.

NOTE: Contact lenses should not be worn when using the chemical.

If inhaled in large amounts, remove person to fresh air at once. If not breathing, give artificial respiration. Keep warm and rest. Call a physician.

If ingested, call a physician immediately. Induce vomiting only if conscious.

Note to Physicians: Trichlorotrifluoroethane has caused cardiac sensitization to epinephrine in experimental animals (dogs). Cardiac arrhythmia, including ventricular fibrillation could occur if epinephrine or one of its congeners is administered to patients exposed to high concentrations of trichlorotrifluoroethane.

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**SPILLS:** Absorb large spills with commercial absorbant. Collect in covered metal drums for disposal in accordance with federal, state and local regulations. NIOSH/OSHA approved respiratory protection based on maximum potential exposure of concern must be used.

### 5.3.3 Warning labels. (Type IIA):

Warning labels, on unit containers, should read as follows:

#### TRICHLOROTRIFLUOROETHANE

#### WARNING

- o Air concentration of 4500 ppm (0.45% by volume) is nearly odorless and causes impairment of manual dexterity and vigilance. Breathing high concentrations may cause death or severe physical harm.
- o May dilute or displace oxygen below levels necessary to sustain life.
- o Do not use in the general vicinity of welding, open flame or hot surfaces. Heat and ultraviolet radiation may cause the formation of highly toxic by-products.
- o When used indoors (in enclosed or confined spaces), in amounts greater than one cup, have a halocarbon detector (with audible alarm) operating. Have emergency escape breathing devices available for all persons working in the area. Ensure halocarbon detector is working properly and is calibrated in accordance with manufacturer's recommendations.
- o Avoid breathing vapor. Liquid is irritant. Avoid skin and eye contact. Use the smallest amount possible to perform required task. Assure good ventilation to maintain vapor levels below maximum permissible concentrations.
- o Do not enter area where stored until well ventilated and assure oxygen content is sufficient to support life.
- o Contents under pressure. Keep away from direct sunlight, radiators, stoves, hot water, and other sources of heat. Do not puncture or incinerate. Do not store above 49 deg. C (120 deg. F).

**FIRST AID:** In case of direct contact, remove contaminated clothing and wash involved skin with soap and water. Seek medical attention if irritation occurs.

In case of eye contact, flush with potable water for at least 15 minutes. Call a physician.

**NOTE:** Contact lenses should not be worn when using the chemical.

If inhaled in large amounts, remove person to fresh air at once. If not breathing, give artificial respiration. Keep warm and rest. Call a physician.

If ingested, call a physician immediately. Induce vomiting only if conscious.

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Note to Physicians: Trichlorotrifluoroethane has caused cardiac sensitization to epinephrine in experimental animals (dogs). Cardiac arrhythmia, including ventricular fibrillation could occur if epinephrine or one of its congeners is administered to patients exposed to high concentrations of trichlorotrifluoroethane.

## 6. NOTES

## 6.1 Intended use.

6.1.1 Type I. Type I solvent is intended for use in the cleaning of space vehicle components, precision assemblies, oxygen systems and electronic equipment by the processes of spraying, flushing, vapor degreasing, or ultrasonics. The solvent is especially applicable for cleaning precision parts and assemblies in clean rooms and for use as a medium in testing the cleanliness of components that are assumed to be clean.

6.1.2 Types II and IIA. Types II and IIA are used when the requirements for purity and cleanliness are less stringent than those of a cleaning process using Type I solvent. Since solvent vapors are purer than the liquid which evolves them, Type II solvent is particularly suitable for vapor degreasing processes.

## 6.2 Ordering data.

6.2.1 Acquisition Requirements. Acquisition documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type of solvent (see 1.2)
- (c) Size of unit container and quantity; or bulk quantity (see 5.1.1.2)
- (d) Levels of preservation and packing (see 5.1 and 5.2)
- (e) Special container color, if required (see 5.1.1.1)
- (f) Protective covers, if required (see 5.1.1.1.2)
- (g) Approval of test facilities, if required (see 4.1.1)
- (h) Special inspection, if required (see 4.3.2)
- (i) Type of container (see 5.1.1.1)
- (j) Specify DAR Clauses 7-104.98 and 1-323.2

6.2.2 Basis of purchase. The solvent shall be purchased by weight at 25 deg. C (77 deg. F).

6.3 Batch. A batch is defined as 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.

6.4 Apparatus. One source for equipment used in the determination of boiling point is Lab Glass, Inc., Vineland, NJ 08360.

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6.5 Application techniques. Although trichlorotrifluoroethane is chemically stable and non-reactive with most materials of construction, it is suggested that samples of materials which will contact the solvent be fully tested with the solvent before initiation of the cleaning process. Reactive metals such as zinc, aluminum, magnesium and beryllium may be affected by continuous exposure to trichlorotrifluoroethane, particularly in the presence of water or a water-alcohol solution. If trichlorotrifluoroethane is allowed to come in contact with finely divided aluminum or magnesium, an explosion may occur, especially at high temperatures.

Under very selective conditions, trichlorotrifluoroethane is reactive with molten sulfur and amines. Other chemical reactions are also possible, but only in the presence of other materials which act as catalysts. For example, trichlorotrifluoroethane may react with (a) hydrofluoric acid in the presence of certain metallic catalysts, (b) primary alcohols if free radicals are present, and (c) zinc and beryllium in the presence of certain minimum amounts of water or a water-alcohol solution. These chemically reactive systems are either rare or nonexistent in most cleaning applications.

Trichlorotrifluoroethane may react violently with highly reactive materials such as alkali and alkali-earth metals, e.g., sodium, potassium, and barium in their free metallic state. Highly reactive materials should not be brought into contact with trichlorotrifluoroethane.

6.6 Safety. Trichlorotrifluoroethane is a nonflammable solvent. The Occupational Safety and Health Administration (OSHA) states the permissible exposure limit (PEL) (a concentration of solvent vapor in the air to which most workers may be exposed without adverse effect during an eight hour work day over a forty hour work week) for trichlorotrifluoroethane is 1000 parts per million.

Trichlorotrifluoroethane may displace oxygen; use only with adequate ventilation. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and may cause delayed pulmonary edema.

Since trichlorotrifluoroethane dissolves natural oils, prolonged contact with the skin should be avoided.

If the solvent is taken internally, consult a physician immediately.

6.7 Cleaning. Pre-filtering of the solvent may be required in cleaning applications that require a very low particulate matter count or to remove particles that are larger than the limits specified for the part, assembly or system being cleaned, flushed or tested.

Since contamination may result from improper storage or arise from a defective drum interior, it may be desirable in critical operations to test the solvent before use. It should be noted that soluble residue or chemicals will not be removed by filtration. Drums should be sampled in accordance with the special instructions available from the manufacturer.

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6.8 Changes from previous issue. Asterisks are not used in the revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Military custodians:  
activity:

Army-MI  
Navy-AS  
0740)  
Air Force-68

Preparing

Navy - AS  
(Project No. 6850-

Review activities:

Army-SM  
Navy-OS, SH  
DLA-GS  
MISC-DS

User activities:

Army-ER  
MISC-NA

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TABLE I. Chemical and Physical Properties.

Property	Requirements		
	Type I	Type II	Types IIA
Boiling point (at standard barometric pressure)	47.6 +/- 0.2 deg. C (117.6 +/-0.4 deg. F)	47.6 +/-0.2 deg. C (117.6 +/-0.4 deg. F)	47.6 +/-0.2 deg. C (117.6 +/-0.4 deg.F)
Chemical purity, trithlorotrifluoroethane; percent, minimum (by weight)	99.9	99.8	99.8
Balance of product	Other halogenated solvents	Other halogenated solvents	Other halogenated solvents
Moisture content, parts per million (ppm), maximum (by weight)	10	10	50
Chloride ion, ppm, maximum (by weight)	0.1	0.1	0.1
Acid number, milligrams KOH per gram of sample, maximum	0.003	0.003	---
Residue, ppm, maximum (by weight)	1	2	25
Particle matter, maximum number of particles per 100 ml of solvent			
Particle size of: 25-100 microns	100	---	---
greater than 100 microns	10	---	---

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TABLE II. Quality conformance tests.

Characteristic	Requirement paragraph	Test method paragraph
Boiling Point	Table I	4.4.1
Chemical purity	Table I	4.4.2
Moisture content	Table I	4.4.3
Chloride ion	Table I	4.4.4
Acid number	Table I	4.4.5
Residue	Table I	4.4.6
Particulate matter	Table I	4.4.7
Leakage	3.3	4.4.8
Weight	3.4	4.4.9
Content	3.5	4.4.10

TABLE III. Testing of the end item. (visual)

Lot size (containers)	Sample size (containers)
Up to 25	2
26 to 150	3
151 to 1200	5
1201 to 35,000	8
35,001 and over	13

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TABLE IV Examination of end item

Examine	Defect
Material	Not as specified
Appearance	Presence of foreign matter

TABLE V Net content

Lot size (containers)	Sample size (containers)
Up to 50	5
51 - 500	7
501 - 35,000	8
35,001 and over	11

TABLE VI Packaging inspection

Examine	Defect
Packaging	Container not as specified, closures not accomplished by specified or required methods or materials. Leakage or seepage of contents. Non-conforming component, component missing, damaged or otherwise defective. Bulged or distorted container.
Marking	Warning labels or marking missing, omitted, illegible, incorrect, incomplete. Not in accordance with contract requirements.

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TABLE VII Palletization inspection

Examine	Defect
Finished dimension	Length, width, or height exceeds specified maximum requirement.
Palletization	Not as specified. Pallet pattern not as specified. Interlocking of loads not as specified. Load not bonded with required straps as specified.
Weight	Exceeds maximum load limits.
Marking	Omitted, incorrect, illegible, of improper size, location, sequence or method of application.

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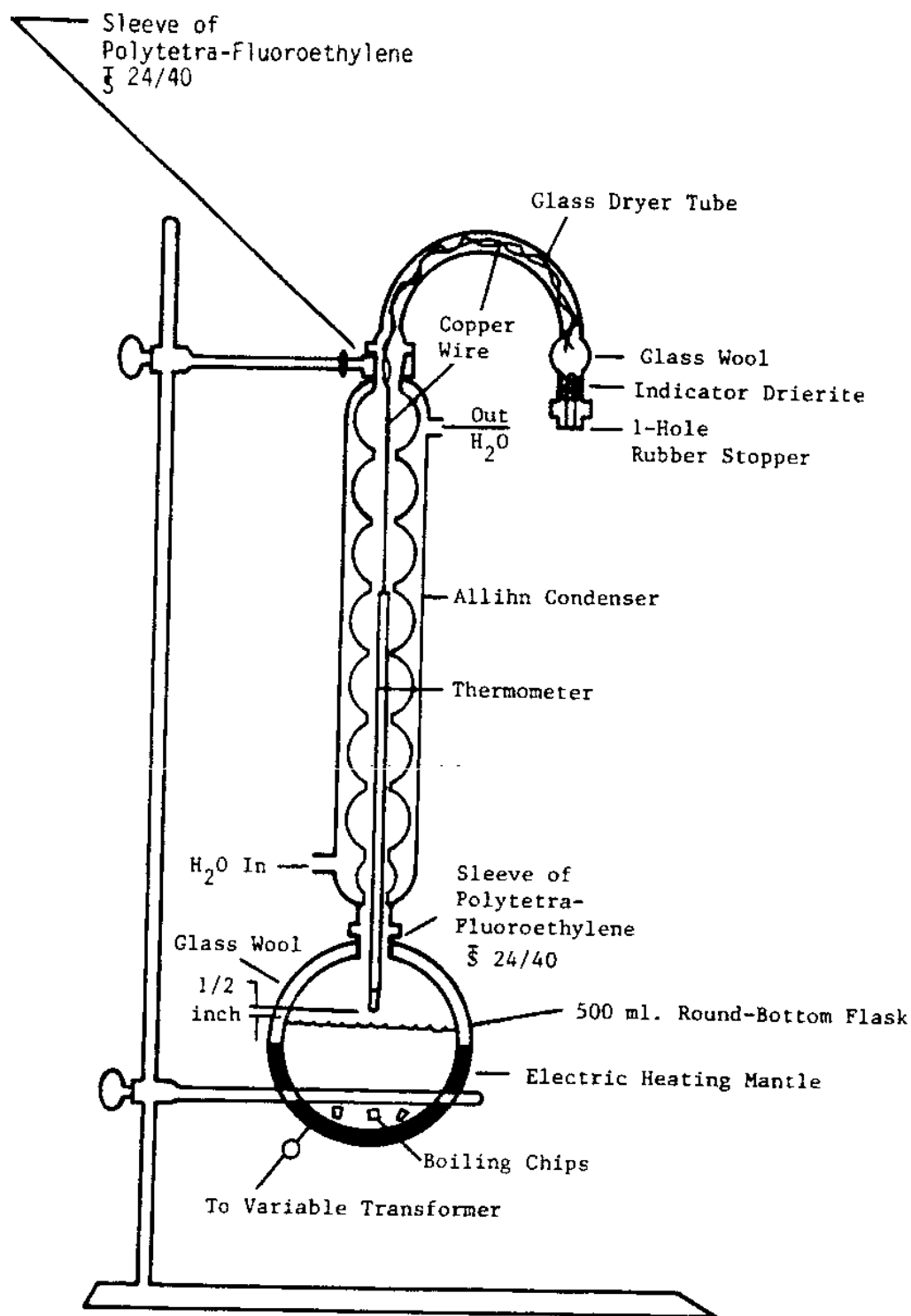
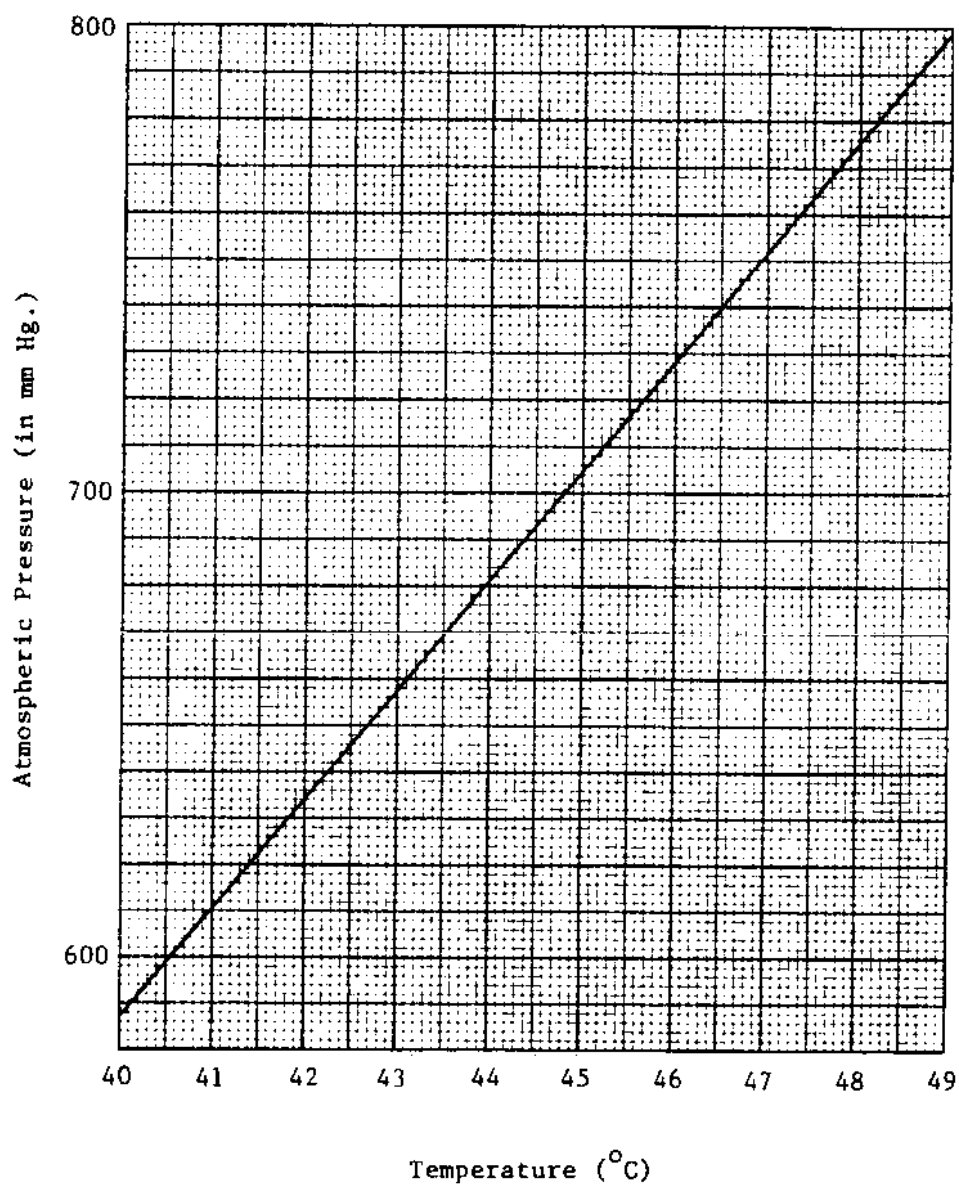


Figure 1. Boiling point apparatus.

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Figure 2. Boiling point of solvent.