



Your Questions Re: Stoddard Solvent and PCE

Jessica Ferrell o James Costello

02/27/2009 07:23 PM

History: This message has been replied to and forwarded.

Jim:

In response to your voicemail and emails from yesterday (attached for your reference):

1) Yes, the P-D-680 series of specifications governs two types of solvent -- Stoddard and 140 F. Between 1999 and 2006, it governed four types of solvent. Some maintenance manuals for equipment maintained at the Solano facility (M42s, vehicles, and other weapons and machinery) call for the use of P-D-680 Type II (140 F). Other manuals and orders require the use of "dry cleaning solvent," without reference to P-D-680 or a type. The versions of P-D-680 that contained PCE are MIL-PRF-680, MIL-PRF-680A, and MIL-PRF-680B. I have attached the cover sheet and relevant pages of those specifications here, with the relevant portions highlighted. The transcripts of our interviews of former Guard officers Casimiro Gonzales and Antonio Marta contain statements that they each used dry cleaning solvent at the Solano facility, and that they disposed of that solvent directly onto the ground.

2) With respect to flash points, those are identified on the specifications that I sent you on CD on February 10, 2009. Details are also provided in the last paragraph of this email and on the attached index.

3) We do not yet know whether Stoddard solvent was used at the Solano facility or if it contains PCE. However, I have attached an excerpt of an MSDS indicating that it does contain a small percentage of PCE.

I have also attached the index of the specifications that I sent you earlier this month. It includes explanations of the series of specifications that governed during different time periods. It also provides explanations of how the specifications interrelate. We are missing some specifications, but have requested those from EPA Regions 7 and 9 and expect to receive them in March 2009. I will send those to you upon receipt. Here is an excerpt from the index that responds to some of your questions on P-D-680:

The P-D-680 series of specifications were incorporated by M42 operation and maintenance manuals that required the use of dry cleaning solvent or minerals spirits paint thinner for various tasks. According to every M42 manual that we have located, all M42 components required cleaning with dry cleaning solvent or mineral spirits paint thinner. The former National Guard personnel who the City and County have interviewed recall using dry cleaning solvent for this purpose. Some specifications call for the use of the P-D-680 series of dry cleaning solvent. Other specifications do not. These specifications could have instead required, for example, the use of O-T-236C or its precursors, governing drycleaning grade tetrachloroethylene. We are continuing to research this question.

As specifications became more sophisticated, they contained more information and detail. For example, the first table in at least three later versions of P-D-680, MIL-PRF-680 (December 13, 1999), MIL-PRF-680A (July 25, 2003), and MIL-PRF-680B (Oct. 26, 2006), provide for tetrachloroethylene as a constituent of each type of solvent governed by the various specifications. Allowable constituents were not listed on relevant specifications issued before the late 1980s (such as P-D-680).

According to the specifications that we have located for this substance, the physical and chemical properties of "dry cleaning solvent" governed by the P-D-680 series remained largely the same over the years. For example, the initial boiling point set forth in all available specifications (issued in 1963, 1988, 1999, 2003, and 2006) is 149 degrees Celsius for type I, and 177 degrees Celsius for type II. The dry point



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is between 208 and 210 degrees Celsius for type I, and between 211 and 212.7 degrees Celsius for type II. Similarly, the flash point for the P-D-680 substance, as constituted between 1963 and 2006, was between 38 and 60 for type I, and between 60 and 92 for type II.

Please let me know if you have any questions. Thanks.

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----- Message from <Costello.James@epamail.epa.gov> on Thu, 26 Feb 2009 17:03:32 -0800 -----

To: "Jessica Ferrell"
<jferrell@martenlaw.com>

Subject: Dry Cleaner Safety

<http://www.scif.com/safety/safetymeeting/Article.asp?ArticleID=471>

evidently perc has a higher flash point (i.e., less flammable) than stoddard. Didn't you say you had info on flash points?

----- Message from <Costello.James@epamail.epa.gov> on Thu, 26 Feb 2009 16:59:04 -0800 -----

To: "Jessica Ferrell" <jferrell@martenlaw.com>

Subject: Mil Spec for PD 680 (Stoddard Solvent) 1963.pdf - Adobe
: Reader

(See attached file: Mil Spec for PD 680 (Stoddard Solvent) 1963.pdf)

Looks like 680 could be one of two solvents. If it is Stoddard solvent



it may not be perc according to the other email I sent to you. Mil Spec for PD 680 (Stoddard Solvent) 1963.pdf

----- Message from <Costello.James@epamail.epa.gov> on Thu, 26 Feb 2009 16:56:47 -0800 -----

To: "Jessica Ferrell" <jferrell@martenlaw.com>
Subject NIOSH Worker Notification Program - Dry Cleaners
: (1)

<http://www.cdc.gov/niosh/pgms/worknotify/Drycleaner1.html>

This seems to say stoddard solution is not perc (see my other email)



Index - Docs to EPA re. National Guard 2.10.09 from JKF (00180692-2).PDF



Safety-Kleen 105 Solvent Recycled MSDS 11-27-02 (00182048).PDF



MIL-PRF-680B Performance Specification Degreasing Solvent (00182052).PDF



MIL-PRF-680 Performance Specification Degreasing Solvent (00182054).PDF



MIL-PRF-680A Degreasing solvent properties (00182051).PDF

P-D-680

March 27, 1968

SUPERSEDING

Int. Fed. Spec. P-S-00661c(GSA-FSS)

June 18, 1963 and

Fed. Spec. P-S-661b

April 6, 1954

FEDERAL SPECIFICATION

DRY CLEANING SOLVENT

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

1. SCOPE AND CLASSIFICATION

1.1 **Scope.** This specification covers two types of petroleum distillates employed for dry cleaning of textile materials, and referred to industrially as "Stoddard Solvent" and as "140° F. Solvent".

1.2 Classification.

1.2.1 **Types.** Dry-cleaning solvent shall be of the following types, as specified:

Type I.—100° F. Solvent (Stoddard Solvent).

Type II.—140° F. Solvent.

2. APPLICABLE SPECIFICATIONS, STANDARDS, AND OTHER PUBLICATIONS

2.1 **Specifications and Standards.** The following specifications and standards, of the issues in effect on date of invitation for bids, form a part of this specification:

Federal Standards:

Fed. Std. No. 102—Preservation, Packaging, and Packing Levels.

Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).

Fed. Test Method Std. No. 791—Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications, Standards, and Handbooks and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, and Auburn, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications, Standards, and Handbooks 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-290—Packaging, Packing and Marking of Petroleum and Related Products.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

FSC 6850

2.2 Other publications. The following publications form a part of this specification. Unless otherwise indicated, the issues in effect on date of invitation for bids shall apply:

American Society for Testing and Materials Publication:

Part 7—Petroleum Products and Lubricants.

(Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

Uniform Classification Committee Publication:

Uniform Freight Classification Rules.

(Application for copies should be addressed to Uniform Classification Committee, 202 Union Station, Chicago 6, Illinois.)

3. REQUIREMENTS

3.1 Material. The material shall be a petroleum distillate.

3.2 Physical and chemical properties. The physical and chemical properties of the solvents shall conform to the requirements specified in table I.

3.3 Workmanship. The dry cleaning solvent shall be clear, free from suspended matter and undissolved water as determined by visual inspection.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or

TABLE I. *Physical and chemical properties*

	Type I	Type II	Test Para.
Appearance	Clear, free from suspended matter, and undissolved water		4.4.2
Color, Saybolt, not greater than . . .	21	21	
Odor	Sweet	Sweet	4.4.3
Corrosion of copper strip 212° F. for 8 hours	Slight tarnish ¹		
Distillation range:			
Initial boiling pt., min.	300° F.	350° F.	
50% distilled by vol., min.	350° F.	376° F.	
End point, max.	410° F.	415° F.	
Distillation residue, max.	1.5%	1.5%	4.4.4
Acidity-reaction of residue to methyl orange	Neutral	Neutral	4.4.5
Doctor test	Negative	Negative	4.4.1
Flash Point, Tag Closed Cup, min.	100° F.	138° F.	4.4.1
Sulfuric acid absorption, max.	5%	5%	4.4.1

¹ Shall correspond to classification number 1 of ASTM designation D 130.

order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Lot. For purposes of sampling, a lot shall consist of solvents from one batch or tank offered for delivery at one time. If material cannot be identified by batch or tank, a lot shall consist of not more than 10,000 gallons offered for delivery at one time.

4.2.2 Sampling for inspection of containers. A random sample of filled containers shall be taken by the Government inspector in accordance with Military Standard MIL-

STD-105 at inspection level I and acceptable quality level - 2.5 percent defective to verify compliance with this specification in regard to fill, closure, marking, and other requirements not involving tests.

4.2.3 Sampling for tests. From each inspection lot (see 4.2.1), the inspector shall take two containers at random. From each of the two containers 1-quart specimens shall be taken and placed in separate, clean, dry, metal, or glass containers, and then sealed, marked, and forwarded to the testing laboratory designated by the procuring activity.

4.3 Inspection of containers. Each sample filled container shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory markings; each filled container shall be weighed to determine the amount of contents. Any container in the sample having one or more defects, or under required fill, shall be rejected and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.4 Test procedures

4.4.1 Physical and chemical properties. These determinations shall be made in accordance with the methods specified in table II.

4.4.2 Appearance. Examine the solvent for undissolved water, sediment and suspended matter by the use of transmitted light.

4.4.3 Odor. If the odor is questionable the following test shall be performed. Sized and laundered bleached cotton cloth of 3.6 to 4.0 ounces per square yard shall be used for this test. The cloth when lightly steamed shall have no odor except that of clean cotton cloth. The cloth shall be conditioned at 50 to 80 percent R.H. and 85°

TABLE II. Test procedures

	Applicable method in Fed. Test Method Std. No. 791	Test method paragraph	Requirement paragraph
Appearance	—	4.4.2	Table I
Color	101.6	—	Table I
Odor	—	4.4.3	Table I
Copper Corrosion .	5325.2	—	Table I
Distillation			
Distillation range	1001.9		Table I
Distillation residue		4.4.4	Table I
Acidity	—	4.4.5	Table I
Doctor test	5203.2	—	Table I
Flash point	1101.5	—	Table I
Sulfuric Acid Absorption	(See Note)	—	

Note: Determine according to ASTM D464-52.

to 90°F. for 4 hours. A piece of the conditioned cloth approximately 12 inches square shall be placed in 100 milliliters of solvent so as to be completely submerged, and allowed to soak for 5 minutes. The cloth shall then be removed, drained, but not squeezed or extracted and hung at room temperature for 2 hours. The cloth shall then be dried in a stream of fresh air heated to 140° to 160° F. (60° to 71°C.) for 1 hour. The odor of the dried cloth when steamed over boiling water for 4 to 5 seconds, shall not differ from that of an untreated sample similarly steamed.

4.4.4 Distillation residue. Pour the distillation residue from the flask into a small cylinder graduated to 0.1 milliliter. Cool, measure and record the volume as residue.

4.4.5 Acidity. Make this test immediately after recording the volume of distillation residue. Transfer the cooled residue to a test tube, add three volumes of distilled water, and shake the tube thoroughly. Allow the mixture to separate and remove the aqueous layer to a clean test tube by means of a pipette. Add 1 drop of 0.1 percent aqueous solution of methyl orange. A pink or red color indicates the presence of mineral acid.

5. PREPARATION FOR DELIVERY

For civil agency procurement, the definitions and applications of the levels of packaging and packing shall be in accordance with Fed. Std. No. 102.

5.1 Packaging and packing.

5.1.1 *Levels A and B.* The solvent shall be packaged and packed in accordance with MIL-STD-290 as specified for the applicable level (see 6.2).

5.1.2 *Level C.* Commercial unit and bulk containers shall be packed so as to be acceptable by common or other carriers for safe transportation to point of destination specified in shipping instruction at the lowest transportation rate.

5.2 Marking.

5.2.1 *Civil agencies.* In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with Fed. Std. No. 123.

5.2.2 *Military agencies.* In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 *Intended use.* The product is intended for use as a dry-cleaning solvent.

6.1.1 *Type I* is intended for use as a comparatively safe dry-cleaning solvent.

6.1.2 *Type II* is intended for use in dry-cleaning plants where a solvent with a higher flash-point is desirable as an additional safety factor.

6.2 *Ordering data.* Procurement documents should specify the following:

(a) Title, number and date of this specification.

(b) Type of solvent required (see 1.2).

(c) Size of containers and level of protection required (see 5.1 and 5.2).

6.3 *Purchase unit.* The solvent shall be purchased by volume, the unit being a U.S. gallon of 231 cubic inches at 60°F. (15.6°C.). The volume may be determined by dividing the net weight, in pounds, by the weight per gallon.

6.4 *Transportation description.* Transportation descriptions and minimum weights applicable to this commodity are:

Roll:

Chemicals, not otherwise indexed by name.

Carload minimum weight 24,000 pounds, subject to Rule 34, Uniform Freight Classification.

Motor:

Chemicals, not otherwise indexed.

Truckload minimum weight 24,000 pounds, subject to Rule 115, National Motor Freight Classification.

6.5 *Certification.* Solvent delivered in cans, drums, or tank cars shall either be accompanied by an official gager's certificate showing the net contents of each container and also the temperature of the contents at the time of gaging or shall be subject to gaging by the Government inspector. In the absence of a statement of the temperature at the time of gaging on the official gager's certificate, or in case the barrels show evidence of loss by leakage or other shortages, the delivery shall be subject to

re-inspection and re-gaging by the Government inspector.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any manner licensing the holder or any

other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

MILITARY INTERESTS:

Army—MU MR GL

Navy—Sh

Air Force—MAAMA

Copies of this specification may be purchased for 5 cents each.

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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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**Documents Sent to Jim Costello (EPA Senior Attorney)
and Cynthia Brown (EPA Removal Enforcement Coordinator), February 2009**

Re: New Mexico National Guard Liability at Walnut and Griggs Ground Water Plume

{00180218.DOC /3}

Interview Transcript

Date	Document	Primary Relevance
January 12, 2009	<p>Transcription of interview conducted by Ed Fridenstine (Doña Ana County) of former National Guardsman Casimiro Gonzales</p> <ul style="list-style-type: none"> - Mr, Gonzales was stationed at Solano and Hadley Armory (the "Solano armory") in Las Cruces, Mobilization and Training Equipment Site, from 1965-68 and 1971-73. - Former positions/ranks: maintenance mechanic, ordnance branch, National Guard State Organizational Maintenance Officer, Captain, Lieutenant Colonel. 	<ul style="list-style-type: none"> - Mr. Gonzales reports the use of dry cleaning solvent for M42 maintenance at the armory. See Transcript ("TR") page 8. - Reports use of dry cleaning solvent in wash racks at Solano armory in one and possible five and 55-gallon drums. TR pp. 8-11. - Reports use of dry cleaning solvent by mechanics in vats inside armory maintenance bays, and disposal of solvents into sumps. TR pp. 8, 11. - Reports use of dry cleaning solvent on gun barrels and spraying engines and tracks down with dry cleaning solvent through air-compressed spray guns. Solvent was sprayed onto equipment on the outdoor steam rack next to armory. Solvents drained onto concrete and into a sump. From there, solvents drained to the ground or, potentially, the sewage system. (Mr. Gonzales was not certain whether the sump was connected to the sewer or not.) TR pp. 6-8, 10. - Reports operating according to the Department of the Army TM 9-2910-213-34&P, Direct Support and General Support Maintenance Manual for pump, Fuel, Engine, Assembly (December 1985), which required the use of dry cleaning solvent P-D-680, Type II (81348). TR page 9. (See pages 3-2 and C-1 of TM 9-2910-213-34&P) - Confirmed use of dry cleaning solvent, per operator's manual portion of Department of the Army Technical Manual ("TM") 9-7218, Twin 40-MM Full Tracked Self-Propelled Gun M42 (T141). TR p. 5.

{00180218.DOC /3}

Military and Federal Specifications

P-D-680 Series Governing Dry Cleaning Solvent

The P-D-680 series of specifications were incorporated by M42 operation and maintenance manuals (also listed below) that required the use of dry cleaning solvent or mineral spirits paint thinner for various tasks.

According to every M42 manual that we have located, all M42 components required cleaning with dry cleaning solvent or mineral spirits paint thinner. The former National Guard personnel who the City and County have interviewed recall using dry cleaning solvent for this purpose. Some specifications call for the use of the P-D-680 series of dry cleaning solvent. Other specifications do not. These specifications could have instead required, for example, the use of O-T-236C or its precursors, governing drycleaning grade tetrachloroethylene. (The earliest version of O-T-236 that we have found so far, issued on August 6, 1979, is provided as an example in the "1970s specifications" folder). We are continuing to research this question.

As specifications became more sophisticated, they contained more information and detail. For example, the first table in MIL-PRF-680 (December 13, 1999), MIL-PRF-680A (July 25, 2003), and MIL-PRF-680B (Oct. 26, 2006), provides for tetrachloroethylene as a constituent of each type of solvent governed by the various specifications. Allowable constituents were not listed on relevant specifications issued before the late 1980s.

According to the specifications that we have located for this substance, the physical and chemical properties of "dry cleaning solvent" governed by the P-D-680 series remained largely the same over the years. For example, the initial boiling point set forth in all available specifications (issued in 1963, 1988, 1999, 2003, and 2006) is 149 degrees Celsius for type I, and 177 degrees Celsius for type II. The dry point is between 208 and 210 degrees Celsius for type I, and between 211 and 212.7 degrees Celsius for type II. Similarly, the flash point for the P-D-680 substance, as constituted between 1963 and 2006, was between 38 and 60 for type I, and between 60 and 92 for type II.

Date	Document	Primary Relevance
March 27, 1963	Federal Specification P-D-680, Dry Cleaning Solvent (superseding Int. Fed. Spec. P-S-99661c (GSA-PSS) June 1, 1962 and Fed. Spec. P-S-661b (April 6, 1958)	Governs two types of petroleum distillates employed for dry cleaning of textile materials, referred to industrially as "Stoddard Solvent" and "140 degree Solvent."

{00180218.DOC /3}

September 9, 1988	Federal Specification P-D-680A, Dry Cleaning and Degreasing Solvent (superseding Federal Specification P-D-680, Dry Cleaning Solvent (March 27, 1963))	Governs regular (Stoddard solvent, type I) and high flash point (type II), used for dry cleaning, spot and stain removing, and degreasing of machine parts in equipment maintenance. Allowable constituents include toluene, ethylbenzene, solvent with olefinic or cycloolefinic unsaturation, aromatic compounds, and branched chain ketones. See page 4.
December 13, 1999	Performance Specification MIL-PRF-680, Degreasing Solvent (superseding P-D-680B (Oct. 29, 1992))	Governs degreasing solvents types I-IV: Type I (low flash point Stoddard solvent); Type II (high flash point); Type III (very high flash point, 200 degrees F); and Type IV (high flash point with citrus odor). All are for degreasing of machine parts in equipment maintenance. All four provide for up to 0.5 mg/L of tetrachloroethylene as a chemical constituent. See pages 1, 5-6
July 25, 2003	Performance Specification MIL-PRF-680A, Degreasing Solvent (superseding MIL-PRF-680 (December 13, 1999))	Governs degreasing solvents types I-IV: Type I (low flash point Stoddard solvent); Type II (high flash point); Type III (very high flash point, 200 degrees F); and Type IV (high flash point with citrus odor). All are for degreasing of machine parts in equipment maintenance. All four also provide for up to 0.7 mg/L of tetrachloroethylene as a chemical constituent. See pages 1; 5-6, tbl. I; 7, tbl. II.
Oct. 26, 2006	Performance Specification MIL-PRF-680B, Degreasing Solvent (superseding MIL-PRF-680A, Dec. 25, 2003) (superseding MIL-PRF-680A, December 25, 2003)	Governs degreasing solvents types I-IV: Type I (low flash point Stoddard solvent); Type II (high flash point); Type III (very high flash point, 200 degrees F); and Type IV (high flash point with citrus odor). All are for degreasing of machine parts. Also provides for up to 0.7 mg/L of tetrachloroethylene as a chemical constituent of types I-IV of solvent. See page 5, tbl. 1 and page 7, tbl. II.

{00180218.DOC /3}

1950s Specifications		
Date	Document	Primary Relevance
May 1952	Department of the Army Technical Manual 9-252, 40-MM Automatic Gun M1 40-MM, Antiaircraft Gun Carriage M2A1 and 40-MM Gun Mount M3	Requires use of dry cleaning solvent or volatile mineral spirits paint thinner for cleaning, care, and other maintenance of M42s. See Chapter 9.
May 1957	Department of the Army Technical Manual 9-7218, Twin 40-MM Full Tracked Self-Propelled Gun M42 (T141), including Lubrication Order ("LO") 9-7218, Gun, Self-Propelled, Full Tracked: Twin 40-mm, M42 and M42A1 (March 30, 1954) <i>(excerpt)</i> .	Requires use of dry cleaning solvent or mineral spirits paint thinner for various maintenance functions.
June 10, 1957	Department of the Army Technical Bulletin 9-7218-1, Twin 40-MM Full Tracked Self-Propelled Gun M42A1: Operation and Organizational Maintenance Instructions for Peculiar Items <i>(excerpt)</i>	Requires use of dry cleaning solvent or mineral spirits paint thinner for cleaning and inspection of filter element and drive screen vent. See pages 14, 47. During disassembly, requires use of dry cleaning solvent or mineral spirits paint thinner for cleaning and inspection of "all parts" on M42s. See pages 42, 440.

1960s Specifications		
Date	Document	Primary Relevance
April 5, 1966	Military Specification MIL-G-45178A(MD) Gun, Self-Propelled, Full Tracked: Twin 40MM, M42 and M42A1; Preparation For Storage and Shipment Of.	Requires use of, among many other chemicals, MIL-C-16173 ("Corrosion Preventive Compound, Solvent Cutback, Cold-Application"), which, in turn, required the use of dry cleaning solvent conforming to P-D-680. <i>*This specification calls for the use of various other substances containing unknown chemicals. See pages 1-2. We have requested several of the specifications governing those substances from, among other entities, the National Guard Bureau, Department of the Army, Army Publishing Directorate, and National Archives and Records Administration under FOIA, and from the New Mexico Department of Military Affairs under the New Mexico Public Records Act. We have yet to receive them, so do not yet know whether they contained PCE.</i>
October 20, 1966	Military Specification MIL-C-16173, Corrosion Preventive Compound, Solvent Cutback, Cold-Application	Mandated for use in preparation of M42s for storage and shipment by Military Specification MIL-G-45178A(MD) (April 5, 1966). Required use of a "dry cleaning solvent conforming to type I of P-D-680" for removability determination. See pages 1, 10 (section 4.6.7).
June 7, 1968	US Army Lubrication Order ("LO") 9-2350-202-12, Gun, Antiaircraft, Artillery, Self-Propelled: Twin 40MM, M42 and M42A1 (<i>excerpt</i>)	Requires use of dry cleaning solvent or mineral spirits paint thinner for parts cleaning on M42s. See page 1.

1970s Specifications		
Date	Document	Primary Relevance
February 24, 1975	Military Specification MIL-C-16555D, Coating Compound, Strippable, Sprayable.	Mandated for use in preparation of M42s for storage and shipment by Military Specification MIL-G-45178A(MD). Provided for use of volatile solvents and other hazardous substances detected at the Griggs and Walnut Ground Water Site. See pages 3 (coating compound compositions included between 66 and 70% volatile solvent content by weight), 6, 15 (solvent to consist of methyl ethyl ketone and/or toluene, with volatile stabilizers).
May 8, 1978	Federal Specification TT-T-291F, Thinner, Paint, Mineral Spirits, Regular and Odorless	<ul style="list-style-type: none"> - May have been used as a maintenance substance alternate to P-D-680 dry cleaning solvent for M42 and gun cleaning, per M42 manuals identified herein. - Provides for benzene, toluene, and additional hazardous substances detected at the Griggs and Walnut Ground Water Site as allowable chemical constituents of mineral spirits paint thinner. See page 3.
August 6, 1979	Federal Specification O-T-236C, Tetrachloroethylene (Perchloroethylene), Technical	<p>Governs drycleaning grade and vapor degreasing grade tetrachloroethylene.</p> <p><i>*We are continuing to research earlier versions of this and related specifications to determine their applicability at the Solano armory.</i></p>

1980s Specifications		
Date	Document	Primary Relevance
November 1980	US Army ST 44-177-1, Operator and Maintenance Procedures for M42/M42A1 Twin 40-MM, Self-Propelled, Antiaircraft Gun (<i>excerpt</i>)	Requires use of drycleaning solvent or mineral spirits paint thinner for washing M42 oil filters. See pages 2-3.
March 1985	Department of the Army TM 9-2350-202-10, Operator and Maintenance Manual for Gun, Self-Propelled: Twin 40MM, M42 and M42A1	Requires use of dry cleaning solvent or mineral spirits paint thinner for engine fuel filter element cleaning. See page 3-43.
November 29, 1985	Military Specification MIL-D-45064D, Degreaser, Portable, Solvent Type, Tank Immersion	Provided as an example of the type of parts degreaser that may have been at the Solano armory, according to statements by Colonel Harold Uttley and Antonio Marta. Calls for drycleaning solvent P-D-680. See pages 1, 8.
December 1985	Department of the Army TM 9-2910-213-34&P, Direct Support and General Support Maintenance Manual for pump, Fuel, Engine, Assembly	Requires use of dry cleaning solvent P-D-680, Type II (81348) for fuel pump report. See pages 3-2 and C-1.

Material Safety Data Sheets

According to the New Mexico Department of Military Affairs' September 17, 2004 CERCLA Section 104(e) response, "the solvents and degreasers" that the National Guard used at the Solano armory were "provided by the U.S. Army through the standard requisition and issue supply system and disposed of through contractors such as Safety Kleen" According to the Safety Kleen, Inc. legal department, Safety Kleen may have supplied and picked up solvent from at least one former National Guard facility in Las Cruces. (It is currently conducting a records search at the request of the City and County.) Therefore, Safety-Kleen products conforming to applicable military standards may have been used at the Solano armory. We have provided potentially applicable Safety Kleen Material Safety Data Sheets, and will supplement this information upon receipt of additional Material Safety Data Sheets (or equivalent historical information sheets) governing dry cleaning solvents and mineral spirits paint thinner during the relevant time period – approximately 1941-1990 – from Safety-Kleen and other sources.

Date	Document	Primary Relevance
Nov. 27, 2002	Safety-Kleen 105 Solvent Recycled	<p>This is the oldest specification governing the dry cleaning solvent that was likely used at the armory that we have been able to locate so far. The specification governs substances used for cleaning and degreasing metal parts. Synonyms: "Parts Washer Solvent; Petroleum Distillates; Petroleum Naptha; Naptha, Solvent; Stoddard Solvent; Mineral Spirits." These substances are similar or identical to those mandated for use in M42 and other equipment maintenance at the Solano armory – namely, dry cleaning solvent complying with P-D-680.</p> <p>According to Safety Kleen's MSDS for this substance, it contained tetrachloroethylene. See pages 1, 7, 9 ("Based on the ingredients listed in SECTION 2, this product contains the following "hazardous substance" listed under . . . CERCLA, . . . Perchloroethylene").</p>
October 21, 2005	Safety-Kleen 105 Solvent Recycled	See discussion of 2002 MSDS for the same substance. The 2005 MSDS states that this contained tetrachloroethylene . See pages 2, 9, 11.
October 13, 2008	Safety-Kleen 105 Solvent Recycled	See discussion of 2002 MSDS for the same substance. The 2008 MSDS states that this contains tetrachloroethylene . See pages 3, 13.

**SAFETY-KLEEN 105 SOLVENT RECYCLED
MATERIAL SAFETY DATA SHEET FOR USA AND CANADA**

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: SAFETY-KLEEN 105 SOLVENT RECYCLED

SYNONYMS: Parts Washer Solvent; Petroleum Distillates; Petroleum Naptha; Naptha, Solvent; Stoddard Solvent; Mineral Spirits.

PRODUCT PART

NUMBERS: 6614, 6617, 1011662, 1014662.

PRODUCT USE: Cleaning and degreasing metal parts.

If this product is used in combination with other products, refer to the Material Safety Data Sheets for those products.

24-HOUR EMERGENCY PHONE NUMBERS

These numbers are for **MEDICAL: TRANSPORTATION (SPILL): emergency use only. If you desire non-emergency 1-800-752-7869 1-800-468-1760 product information, please call a phone number listed below.**

SUPPLIER: Safety-Kleen Systems, Inc.

5400 Legacy Drive
Cluster II, Building 3
Plano, Texas 75024
USA
1-800-669-5740

TECHNICAL INFORMATION: 1-800-669-5740, Press 1 then Extension 7500

MSDS FORM NUMBER: 82310	ISSUE: November 27, 2002
ORIGINAL ISSUE: April 8, 1976	SUPERSEDES: March 24, 2000
PREPARED BY: Product MSDS Coordinator	APPROVED BY: MSDS Task Force

Revision 11/02; MSDS Form No. 82310 - Page 1 of 11 **SAFETY-KLEEN 105**

**SOLVENT RECYCLED MATERIAL SAFETY DATA SHEET FOR
USA AND CANADA** Revision 11/02; MSDS Form No. 82310 - Page 2 of 11

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

OSHA PEL				ACGIH TLV®					
WT%	NAME	SYNONYM	CAS NO.	TWA	STEL	TWA	STEL	LD	LC
99 to 100	Distillates (petroleum), hydrotreated lighte	N.Av.	64742-47-8 500d	ppm	N.Av.	100d ppm	N.Av.	>5000g, c	>5500d, h mg/m3/4 hours
.0 to 0.2*	Tetrachloroethene	Perchloroethylene; Tetrachloroethylene	127-18-4	100 ppm	200 ppm (ceiling)	25 ppm	100 ppm	2629a,f	34200b mg/m3/8 hours

NOT MEASUREMENT
SENSITIVE

MIL-PRF-680B
26 October 2006
SUPERSEDING
MIL-PRF-680A
25 December 2003

PERFORMANCE SPECIFICATION DEGREASING SOLVENT

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

1. SCOPE

1.1 Scope. This specification covers degreasing solvent that consists of four types of petroleum distillates. The different types are referred to as "Stoddard solvent", "141 degrees Fahrenheit (°F) (60.6 degrees Celsius (°C)) solvent", "200°F (93.3°C) solvent", and "141°F d-limonene blended solvent". They are used for degreasing of machine parts in equipment maintenance.

1.2 Classification. Degreasing solvents are of the following types (see 6.2).

Type I	- Low flash point (Stoddard solvent) (Military Symbol SD-1)
Type II	- High flash point (Military Symbol SD-2)
Type III	- Very high flash point (200°F) (Military Symbol SD-3)
Type IV	- High flash point with citrus odor (Military Symbol SD-4)

1.2.1 NATO classification:

Type I	- S-752
Type II	- S-753
Type III	- S-760
Type IV	- None

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this specification. This section does not include documents cited in other sections of this

Beneficial comments, suggestions, or questions on this document should be addressed to U.S. Army Tank-automotive and Armaments Command, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or emailed to standardization@tacom.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

AMSC N/A

FSC 6850

MIL-PRF-680B

3.7 Physical and chemical property requirements. The solvents shall conform to the physical and chemical requirements in Table I when tested as specified in Table II.

TABLE I. Degreasing solvent properties.

Characteristics	Type I	Type II	Type III	Type IV
Flash point (pt), °C (°F)	38-60 (100-140)	61-92 (141-198)	93-116 (200-241)	61-92 (141-198)
Distillation, °C:				
Initial boiling pt., minimum (min)	149	177	220	171
Dry point, °C, maximum (max)	208	212	300	240
Kauri-Butanol value	27 to 45	27 to 45	27 to 45	27 to 45
Aromatic content, vol %, max	1	1	1	1
Total phenol content, parts per million (ppm), max	0.5	0.5	0.5	0.5
Dichlorobenzene, milligrams per liter (mg/L), max	0.5	0.5	0.5	0.5
Benzene, mg/L, max	0.5	0.5	0.5	0.5
Tetrachloroethylene, mg/L, max	0.7	0.7	0.7	0.7
Trichloroethylene, mg/L, max	0.5	0.5	0.5	0.5
Apparent specific gravity, 60/60°F	0.754 to 0.820	0.754 to 0.820	0.754 to 0.840	0.754 to 0.820
Total chlorine content (ppm), Max	100	100	100	100
Non-volatile residue, (mg/100 mL), max	8	8	8	8
Color, min	25	25	25	25
Odor <u>1/</u>	Low & non-residual	Low & non-residual	Low & non-residual	Citrus & non-residual
Corrosion, copper, max <u>2/</u>	1b	1b	1b	1b
Sandwich corrosion, max	1	1	1	1
Total immersion corrosion <u>3/</u>	Pass	Pass	Pass	Pass
Titanium stress corrosion	No cracking	No cracking	No cracking	No cracking
Acidity	Neutral	Neutral	Neutral	Neutral

MIL-PRF-680B

Doctor test	Negative	Negative	Negative	Negative
Vapor pressure, millimeters of Mercury (mm Hg) @ 20°C, max	7.0	2.0	0.4	2.0
Soil cleaning test, %, min	85	85	85	88

1/ Samples of MIL-PRF-680A, Type III, having satisfactory low odor characteristics shall be used as reference standards.

2/ Test for three hours at 100 °C (212°F).

3/ See 4.4.2

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2)
- b. Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance the test conditions specified in 4.2.

4.2 Qualification inspection. The qualification inspection shall consist of all tests specified herein. Failure of any test shall be cause for rejection.

4.3 Conformance inspection. Conformance inspection shall consist of a sample for tests (see 4.3.2), samples for examination of filled containers (see 4.3.3), and the tests specified in Table II except for sandwich corrosion, total immersion corrosion, and titanium stress corrosion.

4.3.1 Lot. A lot shall consist of solvents from one batch or tank offered for delivery at one time. If material cannot be identified by batch or lot, a lot shall consist of not more than 10 000 gallons offered for delivery at one time (see 6.2).

4.3.2 Sampling for tests. Sampling of a lot for test purposes shall be in accordance with ASTM D 4057 or D 4177.

4.3.3 Sample for examination of filled containers. A random sample of filled unit containers and a sample of shipping containers fully prepared for delivery shall be selected from each lot of solvent in accordance with ASQ Z1.4.

4.4 Methods of inspection.

NOT MEASUREMENT
SENSITIVE

MIL-PRF-680
13 December 1999
SUPERSEDING
P-D-680B
October 29, 1992

PERFORMANCE SPECIFICATION

DEGREASING SOLVENT

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

1. SCOPE

1.1 Scope. This specification covers degreasing solvent that consists of four types of petroleum distillates. The different types are referred to as "Stoddard solvent", "141°F solvent", "200°F solvent", and "141°F d-limonene blended solvent". They are used for degreasing of machine parts in equipment maintenance.

1.2 Classification. Degreasing solvent are of the following types:

- | | |
|----------|---|
| Type I | - Low flash point (Stoddard solvent) (Military Symbol SD-1) |
| Type II | - High flash point (Military Symbol SD-2) |
| Type III | - Very high flash point (200 °F) (Military Symbol SD-3) |
| Type IV | - High flash point with citrus odor (Military Symbol SD-4) |

1.2.1 NATO classification.

- | | |
|----------|---------|
| Type I | - S-752 |
| Type II | - S-753 |
| Type III | - None |
| Type IV | - None |

Beneficial comments (recommendations, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/IE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6850

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

MIL-PRF-680

2.4 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 takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.2.

3.2 Materials. The hydrocarbon solvent shall be a virgin grade or recycled solvent derived from petroleum distillates, fraction from reclaiming and re-refining processes, or a mixture of these fractions. The d-limonene and hydrocarbon blended solvent is permitted as a Type IV solvent. The resultant solvent must be produced in such a manner as is necessary to meet the specified requirements.

3.3 Appearance. The solvent shall be clear and free from suspended matter and undissolved water when observed at a temperature between 15.6 and 25.6 °C.

3.4 Toxicity. The solvent shall have no adverse effects on human health when used as intended (see 6.1). A Material Safety Data Sheet (MSDS) must be prepared and submitted in accordance with FED-STD-313; additionally, it must conform to 29 CFR 1910.1200 (see 6.6).

3.5 Carcinogenicity. The solvent shall contain no chemicals listed as carcinogens (see 6.7). Any carcinogenic components in the solvent in a concentration of 0.1 percent or greater by weight or volume will be regarded as the presence of a carcinogen in the solvent.

3.6 Physical and chemical property requirements. The solvents shall conform to the physical and chemical requirements in table I when tested as specified in table II.

TABLE I. Degreasing solvent properties.

Characteristics	Type I	Type II	Type III	Type IV
Flash point, °C, (°F)	38-60 (100-140)	61-92 (141-198)	93-116 (200-241)	61-92 (141-198)
Distillation, °C:				
Initial boiling pt., min	149	177	220	171
Dry point, °C, max	208	212	300	240
Kauri-butanol value	27 to 45	27 to 45	27 to 45	27 to 45
Aromatic content, vol %, max	1	1	1	1
Total phenol content, ppm, max	0.5	0.5	0.5	0.5

MIL-PRF-680

TABLE I. Degreasing solvent properties - Continued.

Characteristics	Type I	Type II	Type III	Type IV
Dichlorobenzene, mg/L, max	0.5	0.5	0.5	0.5
Benzene, mg/L, max	0.5	0.5	0.5	0.5
Tetrachloroethylene, mg/L, max	0.7	0.7	0.7	0.7
Trichloroethylene, mg/L, max	0.5	0.5	0.5	0.5
Apparent specific gravity, 60/60°F	0.754 to 0.820	0.754 to 0.820	0.754 to 0.840	0.754 to 0.820
Total chlorine content (ppm), max	100	100	100	100
Non-volatile residue, (mg/100 mL), max	8	8	8	8
Color, min	25	25	25	25
Odor <u>1/</u>	Low & non-residual	Low & non-residual	Low & non-residual	Citrus & non-residual
Corrosion, copper, max <u>2/</u>	1b	1b	1b	1b
Sandwich corrosion, max	1	1	1	1
Total immersion corrosion <u>3/</u>	Pass	Pass	Pass	Pass
Titanium stress corrosion	Nocracking	No cracking	No cracking	Nocracking
Acidity	Neutral	Neutral	Neutral	Neutral
Doctor test	Negative	Negative	Negative	Negative
Vapor pressure, mm Hg @ 20°C, max	7.0	2.0	0.4	2.0
Soil cleaning test, %, min	85	85	85	88

1/ Samples of MIL-PRF-680, type III having satisfactory low odor characteristics shall be used as reference standards.

2/ Test for three hours at 100 °C.

3/ See 4.4.2

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.2.

4.2 First article inspection. First article inspection shall consist of tests for all the requirements of this specification. Failure of any test shall be cause for rejection.

NOT MEASUREMENT
SENSITIVE

MIL-PRF-680A
25 July 2003
SUPERSEDING
MIL-PRF-680
13 December 1999

PERFORMANCE SPECIFICATION

DEGREASING SOLVENT

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

1. SCOPE

1.1 Scope. This specification covers degreasing solvent that consists of four types of petroleum distillates. The different types are referred to as "Stoddard solvent", "141 degrees Fahrenheit (°F) (60.6 degrees Celsius (°C)) solvent", "200°F (93.3°C) solvent", and "141°F d-limonene blended solvent". They are used for degreasing of machine parts in equipment maintenance.

1.2 Classification. Degreasing solvents are of the following types (see 6.2). Types III and IV are less hazardous than I or II.

- | | |
|----------|---|
| Type I | - Low flash point (Stoddard solvent) (Military Symbol SD-1) |
| Type II | - High flash point (Military Symbol SD-2) |
| Type III | - Very high flash point (200°F) (Military Symbol SD-3) |
| Type IV | - High flash point with citrus odor (Military Symbol SD-4) |

1.2.1 NATO classification:

- | | |
|----------|---------|
| Type I | - S-752 |
| Type II | - S-753 |
| Type III | - S-760 |
| Type IV | - None |

Beneficial comments (recommendations, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/ESA, 6501 E. 11 Mile Road, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6850

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

MIL-PRF-680A

3.2 Materials. The hydrocarbon solvent shall be a virgin grade or recycled solvent derived from petroleum distillates, fraction from reclaiming and re-refining processes, or a mixture of these fractions. The d-limonene and hydrocarbon blended solvent is permitted as a Type IV solvent. The resultant solvent must be produced in such a manner as is necessary to meet the specified requirements.

3.3 Appearance. The solvent shall be clear and free from suspended matter and undissolved water when observed at a temperature between 60.1 and 78.1°F (15.6 and 25.6 °C).

3.4 Toxicity. The solvent shall have no adverse effects on human health when used as intended (see 6.1 and 6.6).

3.5 Carcinogenicity. The solvent shall contain no chemicals listed as carcinogens (see 6.7). Any carcinogenic components in the solvent in a concentration of 0.1 percent (%) or greater by weight (wt) or volume (vol) will be regarded as the presence of a carcinogen in the solvent.

3.6 Physical and chemical property requirements. The solvents shall conform to the physical and chemical requirements in Table I when tested as specified in Table II.

TABLE I. Degreasing solvent properties.

Characteristics	Type I	Type II	Type III	Type IV
Flash point (pt), °C (°F)	38-60 (100-140)	61-92 (141-198)	93-116 (200-241)	61-92 (141-198)
Distillation, °C:				
Initial boiling pt., minimum (min)	149	177	220	171
Dry point, °C, maximum (max)	208	212	300	240
Kauri-Butanol value	27 to 45	27 to 45	27 to 45	27 to 45
Aromatic content, vol %, max	1	1	1	1
Total phenol content, parts per million (ppm), max	0.5	0.5	0.5	0.5
Dichlorobenzene, milligrams per liter (mg/L), max	0.5	0.5	0.5	0.5
Benzene, mg/L, max	0.5	0.5	0.5	0.5
Tetrachloroethylene, mg/L, max	0.7	0.7	0.7	0.7
Trichloroethylene, mg/L, max	0.5	0.5	0.5	0.5
Apparent specific gravity, 60/60°F	0.754 to 0.820	0.754 to 0.820	0.754 to 0.840	0.754 to 0.820
Total chlorine content (ppm), max	100	100	100	100

MIL-PRF-680A

TABLE I. Degreasing solvent properties - Continued.

Characteristics	Type I	Type II	Type III	Type IV
Non-volatile residue, (mg/100 mL), max	8	8	8	8
Color, min	25	25	25	25
Odor <u>1/</u>	Low & non-residual	Low & non-residual	Low & non-residual	Citrus & non-residual
Corrosion, copper, max <u>2/</u>	1b	1b	1b	1b
Sandwich corrosion, max	1	1	1	1
Total immersion corrosion <u>3/</u>	Pass	Pass	Pass	Pass
Titanium stress corrosion	No cracking	No cracking	No cracking	No cracking
Acidity	Neutral	Neutral	Neutral	Neutral
Doctor test	Negative	Negative	Negative	Negative
Vapor pressure, millimeters of mercury (mm Hg) @ 20°C, max	7.0	2.0	0.4	2.0
Soil cleaning test, %, min	85	85	85	88

1/ Samples of MIL-PRF-680A, Type III, having satisfactory low odor characteristics shall be used as reference standards.

2/ Test for three hours at 100 °C (212°F).

3/ See 4.4.2

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2)
- b. Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance the test conditions specified in 4.2.

4.2 Qualification inspection. The qualification inspection shall consist of all tests specified herein. Failure of any test shall be cause for rejection.

4.3 Conformance inspection. Conformance inspection shall consist of a sample for tests (see 4.3.2), samples for examination of filled containers (see 4.3.3), and the tests specified in Table II except for sandwich corrosion, total immersion corrosion, and titanium stress corrosion.