KSC-SPEC-P-0019
July 20, 1999

SOLVENT, CLEANING, 1,1,1,2,3,4,4,5,5,5-DECAFLUOROPENTANE (62 WT%) AND TRANS-1,2-DICHLOROETHYLENE (38 WT%), VERTREL MCA®, SPECIFICATION FOR

LOGISTICS OPERATIONS DIRECTORATE

THIS DOCUMENT CONTAINS HAZARDOUS OPERATIONS

National Aeronautics and Space Administration

Kennedy Space Center

SPACE SHUTTLE

KSC FORM 23-352C (REV. 2/93) PREVIOUS EDITIONS MAY BE USED

*U.S. Government Printing Office: 1998 - 635-030/60290

KSC-SPEC-P-0019
July 20, 1999

SOLVENT, CLEANING, 1,1,1,2,3,4,4,5,5,5-DECAFLUOROPENTANE (62 WT%) AND TRANS-1,2-DICHLOROETHYLENE (38 WT%), VERTREL MCA®, SPECIFICATION FOR

JOHN F. KENNEDY SPACE CENTER, NASA

P1/MSWord/Specs-m/P-0019.doc

TABLE OF CONTENTS

TABLE OF CONTENTS (cont)

SOLVENT, CLEANING, 1,1,1,2,3,4,4,5,5,5-DECAFLUOROPENTANE (62 WT%) AND TRANS-1,2- DICHLOROETHYLENE (38 WT%), VERTREL MCA®, SPECIFICATION FOR

1. SCOPE

This specification establishes the requirements for Vertrel MCA®, the solvent mixture of 1,1,1,2,3,4,4,5,5,5-Decafluoropentane [62 weight-percent (wt%)] and Trans-1,2-Dichloroethylene (38 wt%). This material is intended for use as a precision cleaning fluid for spaceflight hardware and related ground support equipment, their interfaces, and any other systems in which it may be used to clean. Its use is part of a comprehensive effort to replace CFC-113 (Freon 113, Freon TF, or Genesolv D) with the exception of final flushing and cleanliness verification of oxygen systems and related components.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

Federal

PPP-D-729	Drums, Shipping and Storage, Steel, 55-Gallon (208 Liters)

2.1.2 Standards.

John F. Kennedy Space Center (KSC)

KSC-C-123	Surface Cleanliness of Fluid Systems, Specification for

Federal

29 CFR 1910	Occupational Safety Administration, Labor (Occupational Safety and Health Standards)

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Governmental

American Society for Quality Control (ASQC)

ASQC Z1.4	Sampling Procedures and Tables for Inspection by Attributes

(Applications for copies should be addressed to the American Society for Quality Control, 611 East Wisconsin Ave., Milwaukee, WI 53202-3005.)

American Society for Testing and Materials (ASTM)

ASTM D2109	Standard Test Methods for Nonvolatile Matter in Halogenated Organic Solvents and Their Admixtures
ASTM D2276	Standard Test Method for Particulate Contaminants in Aviation Fuel by Line Sampling
ASTM D2988	Standard Test Method for Water-Soluble Halide Ion in Halogenated Organic Solvents and Their Admixtures (Method 3)
ASTM D2989	Standard Test Method for Acidity-Alkalinity of Halogenated Organic Solvents and Their Admixtures
ASTM D3401	Standard Test Methods for Water in Halogenated Organic Solvents and Their Admixtures

(Applications for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.)

National Institute of Standards and Technology

NIST Handbook 44	Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

(Applications for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325.)

3. REQUIREMENTS

3.1 Chemical and Physical Properties. - The solvent shall conform to the requirements of table 1 when tested as specified in section 4.

3.2 Shelf Life. - Shelf life is considered to be indefinite at ambient conditions unless degradation or discoloration is detected. The fluid shall be tested prior to actual use on flight hardware or flight interface hardware.

3.3 Qualitative. - When examined visually, the solvent shall be a homogeneous, clear, colorless liquid that is free of particles.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification and Acceptance Tests. - Qualification and acceptance tests shall include all the tests required in this specification.

4.2 Certification. - A certified test report from the supplier shall accompany each lot of material comprising a shipment stating that the material meets all the requirements of this specification. This report shall include the actual test data (e.g., sample analysis report and actual laboratory results) for all requirements of this specification.

4.3 Responsibility for Inspection and Testing. - The supplier is responsible for the performance of all inspections and testing specified herein. The supplier may, with the approval of the procuring agency, use their own facilities or those of a commercial laboratory. The procuring agency reserves the right to perform any of the inspections and testing set forth in this specification, where such are deemed necessary to ensure compliance with specification requirements.

Table 1. Requirements and Test Methods

Property	Requirement	Test Method (Paragraph)
Mixture ratio (wt%):		4.4.1
1,1,1,2,3,4,4,5,5,5- Decafluoropentane	62 ±1%	
Trans 1,2-Dichloroethylene	38 ±1%	
Moisture content, parts per million (ppm), maximum by weight	100	4.4.2
Acidity (equivalent hydrochloric acid ppm, maximum by weight)	1.0	4.4.3
Chloride ion, ppm, maximum by weight	1.0	4.4.4
Chemical purity, minimum percent	99.8	4.4.1
Residue, maximum ppm by weight	10	4.4.5
Particulate matter, milligrams per liter	2.0	4.4.6

4.3.1 Material Inspection.

4.3.1.1 Inspection Lot. - Containers filled in a 24-hour period from the same source and with the same type of solvent shall be considered a lot.

4.3.1.2 Sampling. - Sampling for tests shall be performed from filled containers and shall be in accordance with ASQC Z1.4.

4.3.1.3 Examination. - Samples selected in accordance with 4.3.1.2 shall be tested for conformance to the requirements listed in table 1 and 3.3. A result other than that specified shall constitute failure of the test.

4.4 Test Methods.

4.4.1 Mixture Ratio and Chemical Purity. - The solvent consists of two components. The mixture ratio and purity shall be tested by the following gas chromatography (GC) method or an equivalent test method. This method shall be considered the "referee method":

Column: RTX-1 (100-percent dimethyl polysiloxane), 1.0-μm film, 0.25-mm inside diameter, 105-meter capillary column (Restek Corp.)

Conditions: Oven temperature: 35 degrees Celsius (°C)
Time: 13 minutes
Rate: 5 °C per minute
Temperature-2: 200 °C
Time-2: 20 minutes
Injector temperature: 175 °C
Detector temperature: 250 °C
Split ratio: 60:1
Detector: flame ionization
Carrier gas: helium

4.4.2 Moisture Content. - The solvent shall be tested for moisture content in accordance with ASTM D3401 or an equivalent test method.

4.4.3 Acidity. - The acidity of the solvent shall be determined in accordance with ASTM D2989 or an equivalent test method.

4.4.4 Chloride Ion. - The chloride ion content of the solvent shall be determined in accordance with ASTM D2988 or an equivalent test method.

4.4.5 Nonvolatile Residue. - The residue in the solvent shall be determined using either a sample volume of 1,000-milliliter (mL) samples in accordance with ASTM D2109, or equivalent test method.

4.4.6 Particulate Matter. - Particulate contamination of the solvent shall be determined by ASTM D2276, Method A, or an equivalent test method, with the following modifications:

a. Mix the sample thoroughly without exposure to air. Immediately pour 1,000 mL of the sample into a clean 1,000-mL graduated cylinder.

b. Use a solvent-resistant filter disk made from such materials as Millipore FALP04700, plain, white, 1 micron, 47 millimeters (mm) in diameter, or equivalent, instead of that specified in ASTM D-2276.

c. The drying oven temperature shall be 70 °C [158 degrees Fahrenheit (°F)] instead of the 90 °C (194 °F) specified in ASTM D-2276.

d. Filtered demineralized water shall be used for rinsing the sample bottle and filter holder instead of petroleum ether specified in ASTM D-2276.

4.5 Inspection of Packaging. - The packing of the drums of the solvent shall be examined to ensure there is no leakage, corrosion, or visible contaminants that could degrade the solvent or cause it to be inadvertently released from its container.

5. PREPARATION FOR DELIVERY

5.1 Packaging. - This solvent shall be furnished in 55-gallon drums conforming to PPP-D-729, or in larger containers (e.g., tankers, portable tanks, or "totes") in accordance with the manufacturer's commercial practice and this specification. Packaging shall have integrity control seals installed on all outlets after filling and sampling is completed by the manufacturer.

5.2 Marking. - Each container of material shall include proper warning labels for personnel safety purposes and marking in accordance with 29 CFR 1910. Each container shall be legibly and permanently labeled with the following information:

MATERIAL: Solvent, cleaning
SPECIFICATION: KSC-SPEC-P-0019
MANUFACTURER'S NAME AND PRODUCT IDENTIFICATION:
DATE OF MANUFACTURE:
LOT NUMBER:
QUANTITY IN THIS CONTAINER:
PURCHASE ORDER NUMBER:

5.3 Container Inspection and Cleaning. - Containers shall be cleaned as required by the filling contractor to meet the requirements listed in table 1. All container interiors shall be clean and free of contaminants that could alter the properties of the fluid.

5.4 Filling Containers. - Unless otherwise specified, containers shall be filled to the rated capacity of the container leaving at minimum a 3 percent by volume ullage. The weight of the solvent supplied shall be the difference between the filled (gross) weight and the unfilled (tare) weight of the container. The scale must be calibrated for commerce in accordance with NIST Handbook 44.

5.5 Leakage. - Containers and valves shall not leak after being filled and sealed.

6. NOTES

6.1 Intended Use. - The solvent described in this specification is intended for use as a cleaning agent.

6.2 Acquisition Requirements. - Acquisition documents must specify:

a. Title, number, and date of this specification

b. Method of shipment and the type and capacity of containers

c. Quantity by weight

d. When a different sampling plan is required (see 4.3.2.2)

e. Packaging requirements (see section 5)

6.3 Recovery and Re-use of Solvent. - The solvent may be recovered and re-used if it meets the purity requirements of the user. The analytical methods of this specification should be used to determine if the recovered solvent is suitable for re-use.

Custodian:

NASA John F. Kennedy Space Center

Preparing Activity:

John F. Kennedy Space Center
Propellants and Fluid Management Office
Logistics Operations