



National Aeronautics and  
Space Administration

**MEASUREMENT  
SYSTEM  
IDENTIFICATION  
INCH-POUND**

**MSFC-SPEC-2490**

**REVISION A**

**EFFECTIVE DATE: 06/05/2015**

**George C. Marshall Space Flight Center**  
Marshall Space Flight Center, Alabama 35812

**EM40**  
**MSFC TECHNICAL STANDARD**  
**CLEANER, ORGANIC WITH D-LIMONENE**

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<b>Multiprogram/Project Common-Use Document EM40</b>		
<b>Title: Cleaner, Organic with D-Limonene</b>	<b>Document No.: MSFC-SPEC-2490</b>	<b>Revision: A</b>
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### DOCUMENT HISTORY LOG

<b>Status (Baseline/ Revision/ Canceled)</b>	<b>Document Revision</b>	<b>Effective Date</b>	<b>Description</b>
Baseline			BASELINE INITIAL RELEASE
	SCN 001 5-12-00		REPLACE PAGE 3 WITH NEW Page 3
CHG 2	SCN 002	SB3-01-5390 SM3-01-5543	Remove MSFC-QPL-2490 from MSFC-SPEC-2490. The QPL will be baselined as a stand-alone doc.
Change 3	SCN 003	SB3-01-5547 & SM3-01-5742	Replace pages 3,5,6 and 7 with new pages 3,5,6 and 7
Revision	A	06/05/2015	Revision A Release was authorized by the MSFC Technical Standards Document Control Board (DCB) through the Multiprogram Document Management System (MPDMS). Revision A supersedes previous revisions in its entirety. Changes were submitted to remove Shuttle nomenclature and add references applicable for SLS requirements and update supplier request. Removed MSFC-QPL-2490 and inserted Qualified Supplier information into document

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## **1.0 SCOPE**

This specification establishes the requirements for a hand wipe cleaner. This specification has been approved by the George C. Marshall Space Flight Center (MSFC) and is available for use by MSFC and associated contractors.

Contractors and subcontractors (hereinafter, “contractors”) may use other specifications if they have prior approval of National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC) Materials and Processes (M&P) and meet the product requirements along with the intent of this specification.

### **1.1 Implementing Documentation**

Implementing documentation, such as manufacturing process instructions and process plans and procedures, will contain sufficient detailed instructions and guidelines on operating parameters to ensure reliable and consistent quality processing of hardware. Any subcontractor proposed variations to materials or processes specified in this document will be submitted to NASA MSFC M&P for approval. Approval by NASA MSFC M&P is required before implementation. The contractor will supply necessary technical and supporting test data and Safety Data Sheets.

### **1.2 Requirements with Limited Applicability to Programs/Projects, Hardware items, or contractors**

This specification includes requirements that have applicability to specific program/projects, hardware items, or contractors. When a requirement has limited applicability, the program/project or hardware item applicability is identified preceding the requirement (i.e. paragraph heading or preceding sentence) or is identified in parentheses immediately following the requirement. When requirements include references to contractor documents, those requirements are only applicable to the contractor that originated the applicable document. Access to contractor documentation is only available from the issuing contractor.

#### **1.2.1 Space Launch System (SLS)**

MSFC-SPEC-2490 is a material specification for Space Launch System (SLS) hardware per the SLS Project Offices. The qualification tests conducted during the Space Shuttle program are still applicable for use on the SLS Booster Project.

## **2.0 APPLICABLE DOCUMENTS**

### **2.1 GOVERNMENT DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or requests for proposals will apply.

<b>Multiprogram/Project Common-Use Document EM40</b>		
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(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.

## **2.2 NON-GOVERNMENT DOCUMENTS**

The following documents, of the issue in effect on the date of invitation for bids, or request for proposal, form a part of this standard to the extent specified herein.

### **2.2.1 STANDARDS**

#### **AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

- ASTM D 56      Flash Point by Tag Closed Cup Tester, Standard Test Method for
- ASTM D 86      Distillation of Petroleum Products at Atmospheric Pressure, Standard Test Method for
- ASTM D 1298    Density, Relative Density or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method, Standard Method for
- ASTM D 1353    Nonvolatile Matter in Volatile Solvents for use in Paint, Varnish, Lacquer and Related Products, Standard Test Method for
- ASTM D 4045    Sulfur in Petroleum Products by Hydrogenolysis and Rateometric Colorimetry, Standard Test Method for
- ASTM D 4052    Density, Relative Density and API Gravity of Liquids by Digital Density Meter, Standard Test Method for

(Application for copies should be addressed to <http://www.astm.org>).

#### **EXXON CHEMICAL COMPANY**

- AM-S 140.31    Aromatic Content of Low Olefin Stocks, UV Absorption Method, April 1975.

(Application for copies should be addressed to Exxon Chemicals, P.O. Box 5200, Baytown, TX 77520)

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### 3.0 REQUIREMENTS

#### 3.1 MATERIAL

The cleaner shall consist of an organic base and shall meet the requirements of this specification.

#### 3.2 PHYSICAL PROPERTIES

Physical properties of the cleaner shall be in accordance with Table I.

**Table I. Cleaner Physical Properties**

Property	Requirement	Test Paragraph
Distillation Range (Base Component)	365° F – 430° F	4.7.1.1
Flash Point (TCC)	140° F, minimum	4.7.1.2
Butylhydroxytoluene (BHT) Content	5 ppm, minimum	4.7.1.3
Percent Non-Volatile Solids	≤100 ppm	4.7.1.4
Specific Gravity	00.750 – 0.770	4.7.1.5
Sulfur Content	5 ppm, maximum	4.7.1.6
Percent Allowable Aromatic Hydrocarbon Content:	0.0 – 0.03 wt%	4.7.1.7

#### 3.3 APPEARANCE AND ODOR

The cleaner shall be a clear liquid, free of foreign material as determined by visual inspection with the unaided eye (corrective lenses permitted) and have a faint citrus odor.

#### 3.4 SHELF LIFE AND STORAGE

The cleaner shall be stored at 0 to 120°F in the original sealed containers in a closed and vented facility away from direct sun or rain (see 5.3). The storage life under these conditions shall be 24 months from date manufacture.

#### 3.5 TOXIC PRODUCTS AND SAFETY

The vendor shall furnish a Safety Data Sheet (SDS) to the procuring activity.

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### **3.6 SHELF LIFE EXTENSION REQUIREMENTS**

#### **(APPLICABLE TO THE PROCURING ACTIVITY ONLY)**

Allowable shelf life extension shall be twelve months from the date of test on material taken from the original sealed container provided storage requirements have been met and the material passes all of the specified vendor lot acceptance tests in 4.5.1. Only one twelve-month shelf life extension is permitted for this material.

### **4.0 VERIFICATION**

#### **4.1 IN-PROCESS MATERIAL (APPLICABLE TO USERS)**

When the vendor container is opened at the user's site, the material is regarded as in-process material. In-process material can be used up to its certified shelf life provided that normal precautions are taken for handling and storage including those precautions cited below.

- A. When in-process material is not in use, the material's container shall be closed immediately in a manner as closely as possible to its original state. Opening of containers for inspection of contents shall be limited to less than 10 minutes.
- B. Said container shall be stored in a safety approved location within a vented facility, away from direct sun or rain.
- C. For a given work station, opened containers shall be used to exhaustion before another vendor container of the material is opened for use at the station.
- D. If the integrity of in-process material is at any time suspect (e.g. agglomeration due to moisture absorption, not free flowing, or failure of visual inspection criteria), then the material in question shall be either recertified per 3.6 or discarded.

#### **4.2 GENERAL PROVISIONS**

The vendor shall provide and maintain a quality control system in accordance with the requirements of the purchase document. Vendors shall only submit those materials which meet the requirements of this specification.

#### **4.3 RESPONSIBILITY FOR INSPECTION AND TEST**

##### **4.3.1 Vendor**

The vendor is responsible for the performance of all inspection and test requirements as specified herein. Unless otherwise indicated, the vendor may utilize his own or any other inspection



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facilities and services acceptable to the procuring activity. Records of the examination and tests shall be transported to the procuring activity with the material.

The vendor shall notify the procuring activity of any changes in formulation or procedures used in product manufacture.

#### **4.3.2 Procuring Activity**

The procuring activity is responsible for verifying acceptability of the vendor test data or vendor certifications of selected acceptance tests.

### **4.4 QUALIFICATION TESTS (SEE ALSO 6.3.1)**

Qualification testing shall consist of all examinations and tests specified in Table II and any other tests as deemed necessary by the MSFC Materials and Processes Laboratory. The test data shall be submitted to the procuring activity. The lots subjected to the qualification tests shall be representative of the manufactured lot from the proposed production facility.

### **4.5 QUALITY CONFORMANCE TESTS (SEE ALSO 6.3.2)**

#### **4.5.1 Vendor Tests**

The following tests specified in Table II are inspection tests for this specification which are to be performed by the vendor and reported to the procuring activity along with certifications of compliance to the requirements below.

**Table II. Vendor Tests**

<b>Examination or Test</b>	<b>Requirement Paragraph</b>	<b>Examination or Test Paragraph</b>
Distillation Range (Base Component)	3.2	4.7.1.1
Flash Point (TCC)	3.2	4.7.1.2
Percent Non-Volatile Solids	3.2	4.7.1.4
Specific Gravity	3.2	4.7.1.5
Visual/Odor	3.3	3.3

#### **4.5.2 Vendor Certifications**

The vendor shall supply certifications of compliance for the tests in Table III.

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Table III. Certifications Requirements

Examination or Test	Requirement Paragraph	Examination or Test Paragraph
Butylhydroxytoluene Content	3.2	4.7.1.3
Sulfur Content	3.2	4.7.1.6
Aromatic Hydrocarbon Content	3.2	4.7.1.7

## 4.6 SAMPLING

A sample of sufficient size to perform the required tests shall be randomly selected from each lot.

## 4.7 TEST METHODS

The following test methods and procedures shall be used. Unless otherwise specified in the test or procedure description, all weights, volumes, and temperatures shall be measured to the nearest specified unit or decimal. When a referenced document provides the test method description, that document applies only to the extent of specifying the method.

**NOTE:** Unless otherwise specified within this specification, reagent grade chemicals shall be used for chemical reactions in the conduct of all tests defined in this specification. Solvents and indicators may be commercial nonreagent grade materials unless otherwise specified with this specification.

### 4.7.1 4.7.1 Properties Tests

#### 4.7.1.1 Distillation Range

Distillation shall be determined per ASTM D 86.

#### 4.7.1.2 Flash Point (TCC)

Flash point shall be determined per ASTM D 56.

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#### 4.7.1.3 **BHT**

BHT content shall be verified based on the following, which shall be shipped with each lot PF Solvent.

- A. **Orange Terpene:** The PF Solvent manufacturer shall provide the subvendor's Orange Terpene Certificate of Analysis verifying that 0.015% wt% BHT was added to the Orange Terpene used in the manufacture of the PF Solvent. Certification shall include the Orange Terpene lot number and the Gas Chromatograph results verifying the presence of BHT.
- B. **PF Solvent:** PF Solvent Certificate of Analysis from its manufacturer with Pass/Fail Criterion for 5 ppm, minimum BHT content and a Pass/Fail Criterion for 0.08 wt.% Fraction Orange Terpene with corresponding Lot Number to one (A) above used in the formulation of PF Solvent.

A quantitative test method is acceptable in lieu of the information required by A and B above and shall be pre-coordinated with the procuring agency.

#### 4.7.1.4 **Percent Non-Volatile Solids**

The percent of non-volatile solids shall be determined by either ASTM D 1353 Modified (10 gram sample at 105° +/- 5° C) or the following gravimetric method.

- A. Weigh a clean dry Teflon weighing dish to the nearest 0.1 mg.
- B. Add a 10 ml sample of the cleaner to the weighing dish and reweigh to the nearest 0.1 mg.
- C. Place the weighing dish on a hotplate at 70° C max and heat until no liquid is visible.
- D. Reweigh the Teflon dish to the nearest 0.1 mg and calculate the percent non-volatile solids.

#### 4.7.1.5 **Specific Gravity**

Specific gravity shall be determined per ASTM D 1298 or ASTM D 4052.

#### 4.7.1.6 **Sulfur Content**

Sulfur content shall be determined per ASTM D 4045.

#### 4.7.1.7 **Percent Allowable Aromatic Hydrocarbon Content**

Aromatic hydrocarbon content shall be determined per AM-S 140.31, April 1975 revision.

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## **4.8 REJECTION**

Failure to meet any requirements of this specification is cause for rejection.

## **5.0 PACKAGING**

### **5.1 PACKAGING AND PACKING**

Packaging and packing of the cleaner material shall be in accordance with standard commercial practice in conformance to federal and state regulations applicable to the type of material. Containers in the same shipment shall be of the same size and of such construction and materials that the cleaner material will be adequately protected against loss or contamination.

### **5.2 MARKING**

Marking for shipment shall contain as a minimum:

- a. Product/component Identification
- b. Manufacturer's name
- c. Batch Number or manufacturer Lot number

### **5.3 STORAGE**

After receipt of the material, the procuring activity is responsible for storage.

## **6.0 NOTES**

### **6.1 INTENDED USE**

The material will be used as a cleaner for flight or associated hardware.

### **6.2 ORDERING DATA**

Purchase documents should specify the following:

- a. Title, number, and revision letter of this specification
- b. Types and quantity of material required

This specification requires procurement from vendors who are listed in Para. 6.5.

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## 6.3 DEFINITIONS

### 6.3.1 Qualification Tests

Qualification tests are those tests necessary to qualify a supplier as an approved source. Once the material is qualified, these tests need not be repeated, provided the formulation or process of manufacturer does not change.

### 6.3.2 Quality Conformance Tests

Quality conformance tests are those tests performed on each lot of material to verify compliance with specification requirements.

### 6.3.3 Lot

A lot will consist of all material manufactured in the same production shift, from the same raw materials and by the same manufacturing process and submitted for acceptance at one time.

## 6.4 MODIFICATIONS OR CHANGES

Recommendations for modifications or changes to the requirements specified herein will be submitted in writing to the Materials and Processes Laboratory at MSFC for consideration.

## 6.5 QUALIFIED MATERIAL

This list has been prepared for use by and or for the government to be used in the procurement of products covered by the subject specification; and such listing of product is not intended to and does not connote endorsement of the product by the government. All products listed herein have been qualified according to the requirements for the products specified in the latest effective issue of the applicable specification. This list is subject to change without notice; a revision or amendment will be issued as necessary. The listing of a product does not release the supplier from compliance with the specification requirements. Use of the information shown herein for advertising or publicity purposes is forbidden.

The activity responsible for this qualified products list is the Materials and Processes Laboratory, George C. Marshall Space Flight Center.

MSFC DESIGNATION	MANUFACTURER'S DESIGNATION	TEST OR QUALIFICATION REFERENCE	MANUFACTURER'S NAME AND ADDRESS
CLEANER, ORGANIC WITH D-LIMONENE	PF SOLVENT	USBI-ANAL-277-94	ITW PROBRANDS 4647 Hugh Howell Road Tucker, GA 30084

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## **APPENDIX A ACRONYMS AND ABBREVIATIONS AND GLOSSARY OF TERMS**

### **A1.0 ACRONYMS AND ABBREVIATIONS**

TCC     Tag Closed Cup  
BHT     Butylhydroxytoluene