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MILITARY STANDARD
QUALITY CONTROL PROCEDURES
FOR
HIGH DENSITY FUELS
GRADES JP-9, JP-10, PF-1 AND RJ-4
AT CONTRACTOR FACILITIES



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DEPARTMENT OF DEFENSE
Washington DC 20301

QUALITY CONTROL PROCEDURES FOR HIGH DENSITY FUELS, GRADES JP-9, JP-10, PF-1 AND RJ-4 AT CONTRACTOR FACILITIES.

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

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1. SCOPE

1.1 Purpose. This Military Standard contains procedures to ensure and maintain the quality of missile fuels for the Air Launched Cruise Missile (ALCM), the Ground Launched Cruise Missile (GLCM) and the Submarine Launched Cruise Missile (SLCM). It applies to contractor facilities where fuel is stored and used for servicing the missile or for testing its engines.

1.2 Classification. Fuels to which this standard applies shall conform to specification MIL-P-87107, High Density Synthetic Hydrocarbon Type, Propellants, Grades JP-9 and JP-10, specification MIL-P-87173, Propellant, Priming Fluid, ALCM Engine, Grade PF-1 and specification MIL-P-82522, Propellant, Jet Engine, T-H Dimer, Grade RJ-4.

2. REFERENCE DOCUMENTS

2.1 Government Documents.

2.1.1 Specification. The following specifications form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-P-704 -Pail, Metal (Shipping Steel, 1 through 12 gallon)

MILITARY

MIL-C-4556 -Coating Kit, Epoxy, for Interior of Steel Fuel Tanks

MIL-F-8901 -Filter Separators, Liquid Fuel, and Filter Coalescer Elements, Fluid Pressure, Inspection Requirements and Test Procedures for

MIL-P-87107 -Propellant, High Density Synthetic Hydrocarbon Type, Grades JP-9 and JP-10

MIL-P-87173 -Propellant, Priming Fluid, ALCM Engine, Grade PF-1

MIL-P-82522 -Propellant, Jet Engine, T-H Dimer, Grade RJ-4

2.1.2 Other Government Documents and Publications. The following other Government documents and publications form a part of this standard to the extent specified herein.

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Code of Federal Regulations (CFR)

49 CFR 100-199 Department of Transportation Rules and Regulations for the Transportation of Dangerous Articles

29 CFR 1910 Occupational Safety and Health Standards

(Application for copies should be addressed to the Superintendent of Documents, US Government Printing Office, Washington DC 20402. When indicated, reprints of certain regulations may be obtained from the federal agency responsible for issuance thereof.)

Technical Orders. These documents are included for reference purposes only and reflect the source of the requirements contained in this standard. They are not intended to be contractually applicable by their inclusion here unless requirements are specifically stated.

TO 21M-AGM86-1-1 -Recovery Procedures, Operational Test Launch (OTL) AGM86 Missile (Boeing)

TO 21M-AGM86-2-1 -Organizational Maintenance Instructions-USAF Series AGM86 Missile (Boeing)

TO 37A9-6-2-1 -Operation and Maintenance Instructions with Illustrated Parts Breakdown Engine Fuel Primer GSU-288/E (Boeing)

TO 42B1-1-21 -Quality Control Procedures - High Density Fuels, Grades JP-9, JP-10, PF-1 and RJ-4

Forms

DD Form 250 Material Inspection and Receiving Report

DD Form 1222 Requests for and Results of Tests

(Copies of forms required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other Publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise specified the issue of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue that is current on the date of the solicitation.

American Society for Testing and Materials (ASTM Standards)

ASTM D 4057 Manual Sampling of Petroleum and Petroleum Products, Practice for

(Copies of ASTM publications may be obtained upon application to the American Society for Testing and Materials, 1916 Race St, Philadelphia PA 19103.)

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General Dynamics Documents. These documents are included for reference purposes only and reflect the source of the requirements contained in this standard. They are not intended to be contractually applicable by their inclusion here unless requirements are specifically stated.

General Dynamics Document #76Z9042 Book 1 Acceptance Inspection Procedures
-Missile Fuels and Final Fuel Leak Check

General Dynamics Document #76Z9272 Book 1 Acceptance Inspection Procedures
-Fast Flush Cleaning and Fuel System Tests

General Dynamics Document #76Z9273 Book 1 Acceptance Inspection Procedures
-Fast Flush Cleaning and Fuel System Tests

(Application for copies should be addressed to ASD/YYLA, Wright-Patterson AFB OH 45433.)

2.3 Order of Precedence. In the event of a conflict between the text of this standard and the reference cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Definitions of Acronyms Used in This Standard.

<u>ALCM</u>	Air Launched Cruise Missile
<u>GLCM</u>	Ground Launched Cruise Missile
<u>SLCM</u>	Submarine Launched Cruise Missile
<u>DODISS</u>	Department of Defense Index of Specifications and Standards
<u>DOD</u>	Department of Defense
<u>TO</u>	Technical Orders
<u>QAR</u>	Quality Assurance Representative

3.2 Filter Separator. The filter separator is a cylindrical vessel containing elements or cartridges that are designed to remove fine sediment particles and to coalesce and separate water from the fuel. Both vertical and horizontal types are in use.

3.3 QAR, Government. The Quality Assurance Representative directly charged with performance of the government procurement quality assurance function at the contractor's facility.

4. GENERAL REQUIREMENTS (Not Applicable)

5. DETAILED REQUIREMENTS

5.1 Fuel System. Paragraphs 5.2 through 5.5

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5.2 Materials of Construction. The following list is generally true for materials in contact with all cruise missile fuels. There may be exceptions for certain applications. The list does not contain all satisfactory or unsatisfactory materials.

5.2.1 Satisfactory Materials.

Mild steel coated with epoxy material conforming to MIL-C-4556

Stainless steel

Aluminum

Epoxy glass laminate

Polytetrafluoroethylene

5.2.2 Unsatisfactory Materials.

Copper

Zinc

Cadmium

Silver

Mild steel, uncoated

Magnesium

Bronze

Brass

Cast Iron

5.3 Filter Separators. See paragraph 30.1.5 for general information.

5.3.1 Installation. Fuel from outside storage tanks shall pass through a filter separator before it enters the dispensing equipment. The final filter (second filter) in a fuel line leading to a test cell or a cruise missile engine shall conform to Facet Water Filter Assembly P/N 050971-13, available from Facet Enterprises, Inc., P.O. Box 50096 Tulsa OK 74150, (918) 834-2929, or equal.

WARNING

The initial fill of a filter separator following element change should be at a very slow rate. An explosive mixture of air and fuel vapors will occur

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during this period. The slow rate of filling will minimize the chance of a fire caused by static electricity. See paragraph 30.1.6.

5.3.2 Elements. Filter separator elements shall conform to the performance criteria of MIL-F-8901. Elements shall be replaced in accordance with manufacturers' recommendations or every six months, whichever occurs first.

5.3.3 Sumps. Filter separator sumps shall be drained daily into a clean, clear glass container and checked visually for water, solids, and color. The sump shall be drained until the collected fuel is free from water and is otherwise clear or until it is determined that the system is contaminated. If the system is contaminated, isolate it and take corrective action.

5.4 Hoses. Dust caps or other means of maintaining the cleanliness of hoses when they are not in use should be employed.

5.5 Inspection and Cleaning. Storage tanks will be serviced every six months by removing any water or bottom sediment. If possible, a visual inspection will be accomplished by removal of the fuel tank man hole cover. Any accessible free water or sediment should be removed by a suction pump with a portable suction pipe. The open end of the suction pipe should be placed in the water or sediment.

NOTE

When fuel storage tanks are open for inspection, precautions must be taken to prevent injury to personnel and contamination of the tank contents. Internal tank inspections must be performed by two or more persons present at all times. Only one person at a time should be working over an open manhole. All loose clothing and personal items (caps, pencils, etc.) should be placed a safe distance from the tank opening.

Anyone working over an open manhole or opening large enough to fall into must be restrained by a rope or safety belt. If tank maintenance involves exposure to fuel fumes or the nitrogen atmosphere over the fuel in a confined space, positive pressure breathing equipment must be provided as well as a body restraint.

5.6 Recirculation. Fuel shall be recirculated following replacement of filter elements and other maintenance actions which may have introduced contaminants into the system.

5.7 Receipt of Fuel. Upon receipt of fuel, compare the shipping and receiving document (DD Form 250) with the shipment to see that the contract number, contractor's name, product specification, grade of fuel, lot or batch number (if applicable) are correct. Ensure seal numbers on tanker match seal numbers recorded on DD Form 250.

5.8 Transfer of Fuel.

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5.8.1 Missile Servicing. For applications which require servicing of missiles the contractor shall place new fuel in a tank which has been emptied to the maximum extent allowed by existing transfer equipment.

5.8.2 Engine Testing. For applications which require the testing of engines the contractor should conform to 5.8.1 whenever available storage and supply schedules allow.

5.9 Sampling and Testing Requirements. Samples shall be drawn and tested according to Table I. Samples may be tested at the contractor's laboratory, or they may be sent to one of the laboratories identified in paragraph 5.13 or to another laboratory approved by San Antonio ALC/SFTT. Test results shall conform to the quality limits of Table I of applicable specification and paragraph 5.12.

5.9.1 Sample Container. Container, fuel sample (NSN 8110-00-128-6819) may be used for shipment of samples to laboratories. This container conforms to DOT specification 17C and Specification PPP-P-704, Type I, Class 4, with epoxy coating. This sample can is designed for one time air shipment of fuel samples and does not require an overpack.

5.9.2 Sample Identification. Samples shipped to laboratories shall be identified by DD Form 1222. The form shall be routed through the Government QAR.

5.9.3 Test Reports. The laboratory shall complete test report forms for each sample. The laboratory shall retain one copy for its files, send one copy to the submitting activity, and provide additional copies to other activities as requested.

5.10 Fuel Which Does Not Conform to Specification Requirements. Approval for use or disposition of fuel which does not conform to specification requirements shall be obtained from San Antonio ALC/SFTT, Kelly AFB TX 78241-5000, phone (512) 925-7613. Such actions authorized by telephone shall be confirmed in writing.

5.11 General Sampling Procedures.

5.11.1 The person taking the samples will ensure that a truly representative sample is taken. Cleanliness of equipment and the sampler's hands is extremely important. Use only lint-free material to wipe bottles. Bottles specifically cleaned for sediment or fiber analysis will not be rinsed with the product before sampling.

5.11.2 Do not sample drums by tilting and using a funnel placed in the sample can. Use a tube drum thief. For additional information on sampling, see ASTM D 4057, Manual Sampling of Petroleum and Petroleum Products.

5.12 Visual Inspection Method for Color, Clarity, Sediment and Free Water.

5.12.1 Use a clean one-quart round or rectangular glass bottle that has been cleaned with soap, rinsed with hot water, rinsed with distilled or demineralized water, then oven or air dried.

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5.12.2 Visual examination consists of inspection for color, clarity, sediment, and free water.

5.12.3 The fuel samples should be clear, colorless and bright. Very fine suspended solids or water will render the product hazy. Check for sediment or water contamination by swirling the sample so that a vortex is formed. Any sediment or water sediment present will accumulate on the bottom of the bottle directly beneath the vortex. Sediment should be no more than a slight smudge if picked up on a finger tip.

5.12.4 If the visual inspection indicates contamination of sample, test the fuel for particulates according to the applicable specification or drain fuel in one gallon increments until fuel passes visual inspection. If fuel does not pass the particulate test or if it does not pass the visual inspection after draining 20 one gallon increments, it shall be considered contaminated. Refer to paragraph 5.10.

5.13 Energy Management Laboratories:

5.13.1 Wright-Patterson AFB shipping address:

FB2300 Transportation Officer
Wright-Patterson AFB OH 45433
ATTN: SFTLA, Bldg 70, Area B

Mailing Address: Det 13, San Antonio ALC/SFTLA
Wright-Patterson AFB OH 45433-5000

SFTLA will test cruise missile fuel samples originating from all states and locations not served by SFTLC (Tampa FL) or SFTLD (Mukilteo WA).

5.13.2 Tampa, Florida laboratory shipping address:

Det 21, San Antonio ALC/SFTLC
Bldg 1121
MacDill AFB FL 33608-0051

SFTLC will test cruise missile fuel samples originating from the states of Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Oklahoma, Tennessee, Texas and Atlantic and European locations.

5.13.3 Mukilteo, Washington laboratory shipping address:

FH1002 Det 35, San Antonio ALC/SFTLD
PO Box 118
Mukilteo WA 98275

SFTLD will test cruise missile fuel samples originating from the states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah, Washington, Wyoming, and Alaskan and PACAF areas.

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6. NOTES

6.1 Subject term (key word) listing.

High density fuels
Cruise missiles
Exo-tetrahydrodi cyclopentadiene
Methylcyclohexane
Methylcyclopentadiene
Filter separator
Sampling
Testing

Custodian:

Air Force - 68

Preparing Activity

Air Force - 68

Project Number:

9135-F111

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APPENDIX

GENERAL CHARACTERISTICS AND HANDLING INFORMATION

10. General.

10.1 Scope. This appendix establishes general information for fuels used in military equipment. This appendix is not a mandatory part of the standard. The information contained herein is intended for guidance only.

10.2 Form of Notes. Notes contain supplementary interchangeability, usage and handling information.

10.3 Application. Each note under 30.1 is presented as a guide only. It is incumbent upon all concerned (engineering and supply personnel) to formulate specific notes as required.

20. Referenced Documents.

Not applicable.

30. Definitions.

Not applicable.

30.1 Informational Notes. As used, herein reflect the condition relative to the latest configuration.

30.1.1 Fuel Properties.

JP-9 is a high density hydrocarbon fuel composed of methylcyclohexane (MCH), perhydrodi (norbornadiene) (RJ-5), and exo-tetrahydrodi (cyclopentadiene) (JP-10). It has a flash point range of 60 to 80 Degrees F and a specific gravity of 0.935 to 0.955 (19.8 to 16.7 API). JP-9 is colorless.

JP-10 is a high density hydrocarbon fuel, composed solely of exo-tetrahydrodi (cyclopentadiene). Its flash point is 125 Degrees F minimum and it has a specific gravity of 0.935 to 0.943 (12.8 to 18.5 API). JP-10 is colorless.

PF-1 is a high density, colorless hydrocarbon fuel composed of MCH and JP-10. It has a flash point range of 60 to 80 Degrees F and specific gravity of 0.900 to 0.930 (25.7 to 20.7 API). PF-1 is colorless.

RJ-4 is a high density hydrocarbon fuel composed solely of tetrahydrodi (methylcyclopentadiene). It has a flash point range of 140 to 175 Degrees F. The specific gravity is 0.910 to 0.940 (24.0 to 19.0 API). RJ-4 is colorless.

30.1.2 Fuel Utilization. MIL-P-82522, Grade RJ-4, is the propellant in the Navy's Submarine Launched Cruise Missile (SLCM) and the Air Force's Ground Launched Cruise Missile (GLCM). RJ-4 will be handled and managed like JP-10.

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All instructions in this standard concerning the handling, testing and disposition of JP-10 will be applicable to RJ-4 regardless of whether the RJ-4 is Navy or Air Force product.

30.1.3 Fuel Characteristics. High density hydrocarbon missile fuels containing Fuel System Icing Inhibitor (FSII) often exhibit cloudiness at temperatures below 0 Degree F. This cloudiness is due to FSII coming out of solution and forming a liquid/liquid two-phase fluid. This is not detrimental to the fuel and does not necessarily indicate the presence of free water. The FSII will go back into solution when the fuel is warmed and the fuel again becomes transparent.

30.1.4 Safety and Handling. Information on the safety and handling precautions associated with flammable liquids can be found in the General Industry Standards of OSHA.

30.1.5 Filter Separator. Filter separators contain either one set of elements which performs both functions or two different sets, each of which performs one of the two functions of the filter separator. Whether one or two sets of elements are installed in the filter separator, the coalescing function is performed as the fuel passes through the first stage or first section of the element assembly. As the fuel passes through the coalescing element, or coalescing section of the element assembly, fine particles of water that may be in the fuel are collected or coalesced into larger droplets. Since the openings or passages through which the fuel passes are very small to perform the coalescing function, fine filtration, or removal of solid particles, also occurs at this time. The fuel is then passed through a water-repellent filter or teflon screen to prevent coalesced water from being discharged with the fuel. The separated water flows to the sump area of the filter separator for removal.

30.1.6 Static Electricity. As fuel flows through a system, electrostatic charges are generated and transferred into the fuel due to its low conductivity. Grounding and bonding of all conducting parts of the fuel system are the most effective means of reducing hazards created by electrostatic energy. These do not completely eliminate the hazards of static electricity, but by allowing the charge to dissipate, they reduce the hazard.

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TABLE I. SAMPLING AND TESTING REQUIREMENTS

Sample Source	Application	When Sampled	Where Sampled	Sampling Method	Quantity	Test Required	Test Method (1)
Tank Truck (2)	Product receipt	Upon receipt prior to off-loading	Drain sample	ASTM D 4057, Para 6.1.3	1 qt.	Color, clarity, sediment, free water	Para 5.12, this document
Bulk Tank and Distribution Systems	When in use	Daily, prior to distribution system activation	Main system filter sumps	ASTM D 4057, Drain sample, Para 6.1.3	1 qt.	Color, clarity, sediment, free water	Para 5.12, this document
	After receipt of Bulk Delivery	12 hrs after receipt of Bulk Delivery (3)	Recirculation loop down-stream of filter separator	ASTM D 4057, Spot sample, Para 6.1.6	2 gal.	All specification tests	Applicable specification
	Inspection and cleaning	First working day of each month (5)	Storage tanks	N/A	N/A	Water in tank bottom	Test with water indicating paste applied to end of tank dip stick. Check for FSII if free water is present. Remove free water per Para 5.5, this document
	Dormant storage	Every six months	Recirculation loop down-stream of filter separator	ASTM D 4057, Spot sample, Para 6.1.6	2 gal.	All specification tests	Applicable specification

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TABLE I. SAMPLING AND TESTING REQUIREMENTS (continued)

Sample Source	Application	When Sampled	Where Sampled	Sampling Method	Quantity	Test Required	Test Method (1)
Packaged Product (55 gal drums) (4)	Suspected contamination	Whenever contamination is suspected	Drum	ASTM D 4057, Drum sample, Para 9.6.3	2 gal.	All specification tests	Applicable specifications
Conditioning Unit (JP-10)	Missile Servicing	After each conditioning tank filling		According to unit operation manual	1 gal.	Particulates	MIL-P-87107
Priming Unit (JP-9 or PF-1)	Missile servicing	Daily (when in use)		According to TO21M AGM86-2-1	1 pt.	Flash point, FSII, visual check for free water	MIL-P-87107 or MIL-P-87173
Defuel Tank (JP-10) (2)	Missile servicing issue tank	Before transfer to issue tank or other container		Recirculation loop down-stream filter separator	2 gal.	All specification tests	MIL-P-87107

ALL SAMPLING, TESTING, AND INSPECTIONS WILL BE DOCUMENTED ON PERMANENT RECORDS.

- (1) Alternate methods may be used if approved by SA-ALC/SFTT, Kelly AFB TX 78241-5000.
- (2) Place in QC hold status pending receipt of test results.
- (3) Allow minimum of 12 hours elapsed time after each addition before drawing sample.
- (4) Drummed product shall be checked visually for free water and sediment whenever drums are opened prior to withdrawing fuel.
- (5) Use either SARGEL paste available from Sartomer Co, Westerchester PA 19380, or TEST MASTER paste available from Stewart-Hall Chemical Corp, 22 Washington, Mount Vernon NY 10553 for best results.

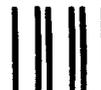
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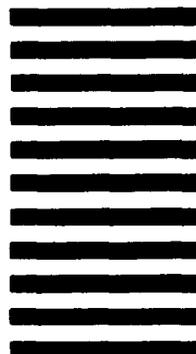
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions Reverse Side)

1 DOCUMENT NUMBER

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2 DOCUMENT TITLE

3a NAME OF SUBMITTING ORGANIZATION

b ADDRESS (Street, City, State ZIP Code)

5 PROBLEM AREAS

a Paragraph Number and Wording

b Recommended Wording

c Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER (Last, First, MI) - Optional

c MAILING ADDRESS (Street City, State ZIP Code) - Optional

4 TYPE OF ORGANIZATION (Mark one)

VENDOR

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b WORK TELEPHONE NUMBER (Include Area Code) - Optional

8 DATE OF SUBMISSION (YYMMDD)

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