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 SUPERSEDING
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FEDERAL SPECIFICATION

BUTANE, PROPANE, AND BUTANE-PROPANE MIXTURES

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 commercial liquefied petroleum fuel gases stored in the liquid state under pressure.

1.2 Classification.

1.2.1 Types. Liquefied petroleum gases shall be of the following hydrocarbon types, as specified (see 6.2):

- Type I - Butane.
- Type II - Propane.
- Type III - Butane-Propane Mixtures.

2. APPLICABLE DOCUMENTS

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

Federal Specifications:

- QQ-S-781 - Steel, Strapping, Flat.
- RR-C-910 - Cylinders, Compressed Gas: ICC 4BA, ICC 4BW, and ICC 4E.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-636 - Box, Fiberboard.

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).

(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 and Standards 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, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies).

Military Specification:

- MIL-V-2 - Valves, Cylinders, Gas (For Compressed or Liquefied Gases), General Specification for.

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Military Standards:

- MIL-STD-101 - Color Code for Pipelines and for Compressed Gas Cylinders.
- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized and Containerized Unit Loads 40" x 48" Pallets, Skids, Runners, or Pallet-Type Base.

(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.)

Laws and Regulations:

- 21 CFR 191 - Federal Hazardous Substances Act.
- 49 CFR 171-190 - Department of Transportation (DOT) Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

Natural Gas Processors Association (NGPA):

- NGPA Publication 2140-70 - Liquefied Petroleum Gas Specification and Test Methods.

(Application for copies should be addressed to the Natural Gas Processors Association, 808 Home Federal Building, Tulsa, Oklahoma 74103.)

National Fire Protection Association:

- NFPA-58 - Storage and Handling of Liquefied Petroleum Gases.

(Application for copies should be addressed to the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts 02110.)

3. REQUIREMENTS

3.1 Properties. Liquefied petroleum gases shall conform to the chemical and physical requirements of table I when tested as specified in 4.4.

TABLE I. Chemical and physical requirements

| Characteristics | Type I | Type II | Type III |
|---|-------------|-------------|-------------|
| Specific gravity 60°/60°F. | 0.560-0.600 | 0.500-0.518 | 0.510-0.590 |
| Vapor pressure at 100°F., p.s.i. gauge | 35-70 | 175-210 | 85-210 |
| Volatile Sulfur, grains per 100 cu. ft., max. | 15 | 15 | 15 |
| Volatile Residue: Temperature at 95 percent evaporation, deg.F., max. | 36 | -37 | 36 |
| Corrosion, copper strip, max. | No. 1 | No. 1 | No. 1 |
| Residual matter: residue on evaporation of 100 ml., max., ml. | 0.05 | 0.05 | 0.05 |
| Oil stain observation | pass | pass | pass |
| Moisture content | --- | pass | --- |
| Free water content | None | --- | None |

3.2 Odorization. All liquefied petroleum gases shall be effectively odorized by an approved agent of such character as to indicate positively, by distinct odor, the presence of gas down to concentration in air of not over one-fifth the lower limit of flammability (see 6.3). Odorization, however, is not required if harmful in the use or further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.

3.2.1 Odorants. The odorization shall be considered to be met by the use of 1.0 pounds minimum of ethyl mercaptan, 1.0 pounds minimum of thiophane or 1.4 pounds minimum of amyl mercaptan per 10,000 gallons of liquefied petroleum gas. However, these odorants and quantities shall not exclude the use of other odorants that meet the requirements of 3.2.

3.3 Containers. Unless otherwise specified, the liquefied petroleum gases shall be contained in Government-furnished containers in accordance with 49 CFR 171-190. When specified (see 6.2), the liquefied petroleum gases shall be contained in supplier-owned Department of Transportation approved containers.

3.3.1 Cylinders and valves. When specified (see 6.2), cylinders shall be furnished by the supplier and shall be in accordance with RR-C-910 and shall be equipped with valves in accordance with MIL-V-2.

3.3.2 Disposable cylinders. When specified (see 6.2), the cylinders shall be not more than 11 inches high and not more than 3 inches in diameter provided with a neck for connecting to the burner unit. The neck shall be one inch in diameter and shall have 20 NEF (National Extra Fine) threads per inch. Not less than fourteen ounces by weight of liquefied petroleum gas of the type specified (see 6.2), shall be furnished in a disposable cylinder conforming to 49 CFR 171-190.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. 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.

4.1.1 Any contractor who is not a manufacturer shall submit actual test data furnished by the gas manufacturer for the requirements of paragraph 4.4. The test data shall be determined in accordance with the test methods specified in table II and in conformance with the requirements of Table I. The submission of the actual test data shall not be interpreted to waive the Government's rights to make the specified tests or require the contractor to have them made in event the Government has reason to suspect that contamination of the gases may have occurred.

4.2 Classification of inspection. Inspection shall be classified as follows:

- (a) Quality conformance inspection (see 4.3).
- (b) Inspection of preparation for delivery (see 4.5).

4.3 Quality conformance inspection.

4.3.1 Inspection lot. Cylinders or containers of all gas of one type filled from the same source on the same day shall be considered a lot.

4.3.2 Sampling. Sampling for tests shall be from filled cylinders or containers and shall be in accordance with MIL-STD-105, inspection level S-4.

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4.3.3 Tests. Samples selected in accordance with 4.3.2 shall be tested as specified in 4.4. AQL shall be 1.5 percent defective.

4.4 Test methods. Each sample shall be tested in accordance with the test methods specified in table II to determine conformance with the requirements specified in 3.1.

TABLE II. Test methods

| Characteristics | Test Methods |
|-----------------------|--------------|
| Specific gravity | ASTM D 1657 |
| Vapor pressure | ASTM D 1267 |
| Volatile Sulfur | ASTM D 2784 |
| Volatile Residue | ASTM D 1837 |
| Corrosion | ASTM D 1838 |
| Residual matter | ASTM D 2158 |
| Oil stain observation | ASTM D 2158 |
| Moisture content | 1/ 2/ |
| Free water content | |

1/ One of the alternative methods for moisture content as described in the Commercial Propane Dryness Test, Cobalt Bromide Method, or Dew Point Method of the Natural Gas Processors Association.

2/ The presence or absence of water shall be determined by inspection of the sample on which the specific gravity is determined.

NOTE: The ASTM test methods cited in table II are included in the NGPA Publication 2140-70.

4.5 Inspection of preparation for delivery. An examination shall be made to determine whether packing and marking comply with the requirements of section 5. Defects shall be scored as specified in table III. Sampling shall be in accordance with MIL-STD-105. The sample unit shall be one container fully prepared for delivery. The lot shall be the number of containers offered for inspection at one time. The inspection level shall be S-2, with an AQL of 4.0 expressed in terms of defects per hundred.

TABLE III. Examination of preparation for delivery

| Examine | Defect |
|-------------------------|--|
| Cylinders or containers | Not as specified. |
| Contents | Not as specified. |
| Markings | Omitted; incorrect; illegible; improper size, location, sequence or method of application. |
| Materials | Component missing or damaged |
| Workmanship | Bulging or distortion of containers, cushioning inadequate, improper or missing. |

4.5.1 Examination for closure of shipping container. When shipping containers are required to be in accordance with PPP-B-636, examination for closure shall be in accordance with the appendix of that specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging. There is no applicable packaging for this item.

5.2 Packing. The packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A.

5.2.1.1 Disposable cylinders. Twelve disposable cylinders, each containing not less than 14 ounces (avoirdupois) by weight (see 3.3.2), shall be packed in a cleated plywood box conforming to PPP-B-601 (overseas type). Cylinders shall be blocked and cushioned to prevent movement. The box shall be at least 1/8 inch higher than the cylinders and the strapping shall be type 1, class B conforming to QQ-S-781.

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5.2.2 Level B.

5.2.2.1 Disposable cylinders. Twelve disposable cylinders, each containing not less than 14 ounces (avoirdupois) by weight (see 3.2.2), shall be packed in a close fitting box conforming to PPP-B-636, type CF, class domestic, grade 200 for civil agencies or type CF, grade V3c for Military agencies, as applicable, provided with partitions and dividers of the same height as the box which is at least 1/8 inch higher than the cylinder (see 6.2).

5.2.3 Level C. The liquefied gases, in quantities as specified (see 6.2), shall be packed or delivered in a manner to assure carrier acceptance and safe arrival at destination in compliance with the current Code of Federal Regulations, Title 49 CFR 171-190.

5.3 Marking. The marking shall be in accordance with The National Fire Protection Association, NFPA-58 and applicable Department of Transportation Regulations. In addition to any special markings required in the procurement document, marking required in the exterior shipping containers shall be in accordance with Fed. Std. No. 123 for civil agencies or MIL-STD-129 for military agencies, as applicable (see 6.2). For military agencies, the requirements for MIL-STD-101 shall apply for government owned cylinders (see 6.6).

5.3.1 Portable containers. In addition to 5.3, portable containers labeling shall comply with the labeling provisions of the Federal Hazardous Substances Act. The labeling shall be as follows:

"DANGER-EXTREMELY FLAMMABLE - CONTENTS UNDER PRESSURE

Do not use near heat, sparks or flame.
Do not puncture or incinerate container or store
at temperatures above 120°F.
Keep out of the reach of children."

5.4 Palletization. When specified (see 6.2), cylinders shall be palletized in accordance with MIL-STD-147.

6. NOTES

6.1 Intended use. The fuel gases covered by this specification are intended primarily as heating fuel, and for cooking and water-heating purposes; however, the fuel gases may also be used as supplementary gases for power fuel, for metallurgical and chemical processing operations, as a standby, and as enrichment fuel for natural gas.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type of gas (see 1.2.1).
- (c) Type of container (see 3.3, 3.3.1, and 3.3.2).
- (d) Level of packing required (see 5.2).
- (e) Quantities required (see 5.2.1, 5.2.2, and 5.2.3).
- (f) Applicable pack required (see 5.2.2.1).
- (g) Applicable marking document (see 5.3).
- (h) When cylinders shall be palletized (see 5.4).

6.3 The lower flammable limits of the more commonly used liquefied petroleum gases are: Propane, 2.1 percent; Butane, 1.8 percent. These figures represent volumetric percentages of gas in gas-air mixtures (see 3.2).

6.4 Thermal values for gases may be calculated with use of NGPA Publication 2145, Standard Table of Physical Contents for Paraffin Hydrocarbons.

6.5 Additional technical information may be obtained from the Butane-Propane Handbook. (Copies of this publication may be obtained from Chilton Publishing Co., Chestnut and 56th Street, Philadelphia, Pennsylvania 15022.)

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6.6 Maintenance of Government owned cylinders. Purchasers should specify the extent to which Government owned cylinders that require maintenance should be processed by the gas supplier.

6.6.1 The gas supplier should furnish at no additional cost all services which are required at each and every filling of a cylinder to comply with applicable regulations, this specification and normal good practices. Such services would include, but not be limited to, all inspection, testing, evacuation, and cleaning services required for the gas supplied.

6.6.2 A schedule of allowable fees should be specified by the purchaser for the gas supplier's performance of additional services such as the replacement of valves or cylinder caps, hydrostatic testing, and color coding. All materials and components for these services would be furnished by the gas supplier.

MILITARY INTERESTS:

Custodians:

Navy - 1
Army - ME
Air Force - 68

Review activities:

Navy - SH
Army - ME

User activities:

Navy - MC
Army - MI

Military coordinating activity:

Navy - YD

Preparing activity:

GSA-FSS

CIVIL AGENCIES INTEREST:

DOT-FAA
GSA-FSS
PO
VA-DMS

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