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MILITARY STANDARD

IDENTIFICATION METHODS FOR BULK PETROLEUM PRODUCTS SYSTEMS INCLUDING HYDROCARBON MISSILE FUELS

FSC 91GP

DEPARTMENT OF DEFENSE

Washington DC 20301

Identification Methods for Bulk
Petroleum Products Systems Including
Hydrocarbon Missile Fuels

MIL-STD-161F

1. This standard has been approved by the Department of Defense and is mandatory for use by the Department of the Army, Navy and Air Force.

2. Copies of this standard may be obtained through regular channels from the Commanding Officer, Naval Publication and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

3. Copies of this standard may be obtained for other than official use by individuals, firms, and contractors from the Superintendent of Documents, U S Government Printing Office, Washington DC 20402.

4. Certain provisions of this handbook are the subject of international standardization agreements. When amendment, revision, or cancellation of this standard is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate coordinating action through international standardization channels, including departmental standardization offices, if required.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to San Antonio ALC/SFRM Kelly AFB TX 78241 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

The mixing of different grades and types of petroleum products and hydrocarbon missile fuels, because of the lack of proper identification, carelessness, or eradication of markings is ever present as a problem in field operations. The result of such action which renders these products useless for their intended purpose can be disastrous to aircraft, ships and ground equipment. Consequently, every possible precaution must be exercised to prevent the inadvertent mixing of different grades as well as dissimilar products.

MIL-STD-101, Color Code for Compressed Gas Cylinders and Pipelines, has established and assigned a color for recognition to each of six classes of materials. Five classes have been selected to represent universally recognized types of hazards involved in the handling of dangerous gases or liquids. The sixth class has been assigned exclusively for the use of fire protection materials and equipment. This basic color code requires application of color warnings in a distinctive manner as a visual aid and supplements the identification markings on compressed gas cylinders and piping systems.

The method prescribed in MIL-STD-161 which implements that portion of MIL-STD-101 pertaining to petroleum products and hydrocarbon missile fuels, has been evolved as a means of minimizing the chances for accidentally mixing these products in the operation of permanently installed military bulk storage and dispensing systems. Inasmuch as the limitations imposed by MIL-STD-101 permit only the use of "yellow" as the identifying color for petroleum products and hydrocarbon missile fuels, all other colors used heretofore must be removed or obliterated.

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ILLUSTRATIONS

1. SCOPE

1.1. Purpose. The purpose of this standard is to establish a uniform method for the identification of liquid petroleum products and hydrocarbon missile fuels stored in and dispensed from Government-owned or operated bulk facilities. The employment of this standard will promote greater safety to personnel and lessen the extent of error, confusion, and inaction in times of emergency by providing uniformity in the identification of products and product groups.

1.2. Application. The method of identification is applicable at all installations of the Department of Defense. It is NOT applicable to aircraft and ships. If desired by the cognizant activity and acceptable to the contractor, this identification method may be employed at Government-leased facilities.

2. REFERENCED DOCUMENTS

The issues of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

STANDARDS

FEDERAL

Federal Standard No. 595 -- Colors

MILITARY

MIL-STD-101 -- Color Code for Pipelines and for Compressed Gas Cylinders.

MIL-STD-140 -- Procedure for Determining Normal Loss Expectancies for Liquid Petroleum Products

NATO

ANNEX C to STANAG 1135 -- Interchangeability Chart of NATO Standardized Fuels, Lubricants, and Associated Products.

SPECIFICATIONS

FEDERAL

L-S-300 -- Sheeting and Tape Reflective, Non-exposed Lens, Adhesive Loading

MILITARY

MIL-M-43719A -- General Specification for Marking Materials and Markers, Adhesive, Elastomeric, Pigmented

Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement function should be obtained from the procuring agency or as directed by the contracting officer.

3. DEFINITIONS

3.1. Piping System. A piping system consists of any pipelines or part thereof used to convey liquid petroleum products, including heating fuel, and hydrocarbon missile fuels. This may be classified as tank car and tank truck loading and unloading connections; storage tank valves; pump manifold and valves; cross-country pipelines and their points of tie in with pumping stations; oil tanker connections and manifolds and other similar dispensing outlets.

3.2. Storage System. All exposed fixed storage tanks not specifically exempted in 1.2.

3.3. Title. A title is the identification required on piping systems listed in 3.1. A title shall identify the contents by complete nomenclature type/grade of product and military symbol (if established); e.g., Gasoline, Aviation, Grade 100/130. 1/ Generally recognized abbreviations may be used in lieu of the title; e.g., AVGAS 100/130 for Gasoline, Aviation, Grade 100/130.

3.4. NATO Symbol. 1/ A North Atlantic Treaty Organization (NATO) Symbol number which indicates that the product is interchangeable for its intended use with a particular product produced in one or more of the NATO participating nations. (See 4.5).

4. GENERAL REQUIREMENTS OR STATEMENTS

4.1. Identification Method. Bulk petroleum products and hydrocarbon missile fuels generally used in the military system have been classified and segregated by groups to facilitate the ready identification of product groups. This method establishes, defines, and assigns a yellow band or series of bands for recognition to each of eight groups of similar type products in a distinctive and conspicuous manner, as a visual aid and supplement to the written identification. These groups are aviation gasolines, automotive gasolines, jet fuels, distillates, heavy fuel (black) oils, lubricating oils, Thermally Stable Jet Fuels, and missile fuels as shown on Figures 1 through 8, and Table II. The written identification consists of the exact title as defined in 3.3; the NATO symbol as prescribed and defined in 4.5 and figure 11; the color band(s) will be as indicated in 5.1.3. The NATO symbol of a product (if established) is required on piping and storage systems located in the United States, as well as other NATO nations.

1/ (FOOTNOTE): Refer to the appropriate specification for approved military symbols for petroleum and related products used by the Department of Defense. NATO Symbols can be found in Annex C to STANAG 1135.

4.1.1. Application of Markings. Markings, which include titles, bands, and arrows, will be applied by painting and stenciling or, if desired, by means of decals, elastomeric film or reflectorized sheeting. If decals, film, or sheeting are used, material shall conform to specification MIL-M-43719A or L-S-300 as applicable. In addition to the locations indicated in the subsequent paragraphs, markings shall be applied at all receiving connections; at all dispensing outlets; at all tank fill and discharge lines; at locations where line connections are made to manifolds; and at any other location necessary to assure ready identification of the product in the system.

4.2. Color Specification. The colors assigned in the standard shall conform in hue and chroma to the requirements identified by numbers specified in Federal Standard No. 595.

4.3. Employment of Colors.

4.3.1. Warning Color. The color Yellow No. 13655 is assigned as a primary warning for all flammable materials in accordance with the provisions of the basic color code, MIL-STD-101. Petroleum products and hydrocarbon missile fuels are considered falling within this classification of materials.

4.3.2. Use of Black and White Colors. The colors Black No. 17038 and White Gloss No. 17875 are assigned, WITHOUT SIGNIFICANT MEANING, for general use as indicated in this standard.

4.3.3. Color Limitations. UNDER NO CIRCUMSTANCES will colors other than yellow for Warning and Black and White for Identification be assigned to petroleum products and hydrocarbon missile fuels. Special attention is invited to the color RED which is assigned exclusively for the use of fire protection materials and equipment. All other piping systems not carrying products within the scope of this standard will employ the warning colors assigned in MIL-STD-101 to the particular material.

4.3.3.1. Color of Piping Systems and Storage Systems. It is not the intent of this Standard to imply that the colors mentioned herein be used for coatings of piping or storage systems. The overall color shall be in accordance with departmental instructions. MIL-STD-140, Table II, entitled "Paint Factors," lists various paint colors and indicates their comparative efficiency in contribution to reduction in product breathing losses.

4.4. Use of Color Bands. The use of color bands on all dangerous piping systems as established in MIL-STD-101 has been recommended as an aid to color-blind personnel since the use of bands will indicate that hazards are present. Identifying titles and bands on pipelines must be clearly legible at all times and should be frequently inspected to insure legibility through cleanliness of the marked area.

4.5. NATO Symbol Marking. Piping systems handling products for which a NATO Symbol has been established, and are located in an area subject to servicing ground, sea, or air equipment of NATO Countries will, in addition to the NATO symbol, include the appropriate U.S. Military Symbol (if established) as a part of the title in accordance with 5.1.1. Should the

product handled become off-specification in any respect in excess of the NATO allowable deterioration limits before use, a line of a color contrasting with the NATO symbol and the background color will be drawn diagonally across and beyond the rectangle enclosing the NATO symbol. The thickness of this line will be such that it is clearly visible and the NATO symbol is then to be considered cancelled and the product may, if desired, be considered as an emergency substitute to the original product and will be used only under technical advice. The line or system will be promptly re-marked when the deteriorated product is replaced.

5. DETAILED REQUIREMENTS OR STATEMENTS

5.1. Liquid Petroleum and Hydrocarbon Missile Fuels Facilities System Identification.

5.1.1. Titles. Exact identification on rigid piping systems and above ground fixed storage tanks is mandatory. If identification of tank trucks, semi-trailers or tank cars is desired or specified by departmental directives, the system described herein may be used.

5.1.1.1. Application of Title. Titles will be applied in such a manner as to be clearly visible from operating positions. The use of stencils with standard size markings specified in Table I is recommended. The black background will have a minimum border three-fourths-inch wider than the lettered area. For piping smaller than three inches in diameter, metal flags or signs securely fastened to the pipe may be used with the appropriate title and products group band(s) lettered thereon.

5.1.2. Color of NATO Symbol Marking. The appropriate NATO symbol and the broken line enclosure shall be of yellow color.

5.1.3. Product Group Band(s). The yellow band(s) will be separated and distinguish the various groups of products. Except for lubricating oil lines, 5.1.4, and multiproduct lines, 5.1.5, petroleum products other than Thermally Stable Jet fuels and missile fuels are identified with one or more narrow bands. Thermally stable jet fuels are identified with a wide band, twice the width of a narrow band, followed by a narrow band, followed by another wide band. Hydrocarbon missile fuels are identified with one wide band, twice the width of the narrow band, followed by one narrow band. See Table II. It must be re-emphasized that the title is the principal identifying feature and the band(s) is not to be relied upon to identify a particular product.

5.1.4. Lubricating Oil Lines. Because of the infrequency of its use, bands have not been assigned to lubricating oils. A flag or sign may be employed as illustrated in figure 6. Each flag or sign shall have a yellow border of a minimum of three-fourths inch in width.

5.1.5. Multiproduct Lines. When a single pipeline is used for transporting more than one product, a flag or sign identifying the product currently in transit may be used in lieu of or as a supplement to the wide yellow identification band and nomenclature shown in figure 9. Identification of the product will be made at the time of transfer. The yellow band in these instances will be a minimum of thirty-six inches in width.

5.1.6. Use of Arrows. An arrow painted in yellow may be used to indicate the direction of flow of the product in the line. It will appear adjacent to the title and band(s) as shown in figure 10.

5.1.7. Application of Flags. In instances where a piping system or tankage is buried or inaccessible, and only a valve stem and wheel or gaging hatch are exposed, a metal flag or brass disc will be used as an aid identifying the product in facility. The flag post may be permanently fixed to the pipeline or tank or in concrete adjacent thereto. The brass identification disc will be placed on top of the valve wheel or gaging hatch.

5.1.8. Concrete Valve and Refueling Pits. In concrete pits and similar conditions where space will not permit banding and stenciling of the pipe, the vertical band(s) will be painted on the wall adjacent to the pipe to represent a product group. The title of the product will be stenciled horizontally in white cover black across the band(s). Where pit covers are installed, markings may be applied to the top of the covers.

6. SPECIAL REQUIREMENTS FOR CAMOUFLAGED SYSTEMS

6.1. Bulk Petroleum Product piping and storage systems which have been camouflaged for concealment shall have the contained product title, grade, and NATO Symbol stenciled at the locations indicated in 3.1 and 4.1.1, using the color Gray No. 36622 or Black No 37038 whichever is most easily discernable against the background color. Standard size letters as specified in Table I should be used. Yellow color bands and markings which would detract from the camouflage effect will not be utilized.

7. INTERNATIONAL STANDARDIZATION AGREEMENT

7.1. Certain provisions of this standard are the subject of international standardization agreement, NATO STANAG 3149.

TABLE I. Sizes of Letters and Bands

	Width of Bands		Space Between Bands	Length of Bands	Title Letter Size
	Wide	Narrow			
a. Pipe Diameter: Under 3"	6"	3"	3"	encircle	1/2"
3" to 6"	6"	3"	3"	encircle	1"
6" to 9"	6"	3"	3"	encircle	2"
Over 9"	8"	4"	4"	encircle	3"
b. Tank Capacity: 10,000 bbls and under	6"	3"	3"	33"	6"
Over 10,000 bbls	8"	4"	4"	54"	12"
c. Tank Car, Trucks: 1/					
2,000 gal and under	6"	3"	3"	24"	3"
Over 2,000 gal	6"	3"	3"	33"	6"

1/ Applicable to tank cars, semi-trailers, and tank trucks only when specified by departmental directives and in sizes specified by such directives where space limitations necessitate smaller markings.

TABLE II. Product Groups 1/

	Number of Yellow Bands Wide	Number of Yellow Bands Narrow	Examples Grade	Examples Symbol
Aviation Gasolines (AVGAS)	0	1	100/130	--
Automotive Gasolines (MOGAS)	0	2	MIL-G-3056B Type I	--
Jet Fuels	0	3	Jet Fuel JP-4	--
			JP-5	--
Distillates	0	4	Diesel Fuel (Regular)	DF-2
			Diesel Fuel (Marine)	--
			Fuel Oil, Grade 1	--
Heavy Fuel (Black) Oils	0	5	Fuel Oil Navy Special	--
			Fuel Oil, Grade 6	--
Lubricating Oils	Sign or Flag		MIL-L-22851 Type II	--
Thermally Stable Jet Fuels	2	1	Jet Fuel JP-7	--
Missile Fuels	1	1	Rocket Fuel RP-1	--

1/ (FOOTNOTE): Refer to the appropriate specification for approved military symbols for petroleum and related products used by the Department of Defense. NATO Symbols can be found in Annex C to STANAG 1135.

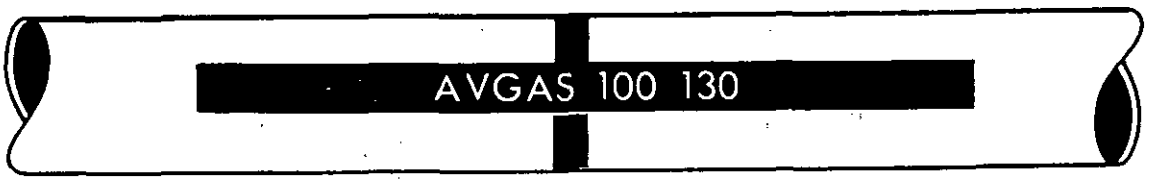

FIGURE 1. AVIATION GASOLINES--ONE NARROW BAND

FIGURE 2. AUTOMOTIVE GASOLINES--TWO NARROW BANDS

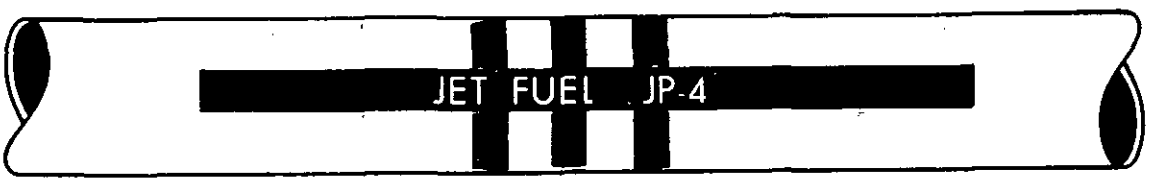

FIGURE 3. JET FUELS--THREE NARROW BANDS

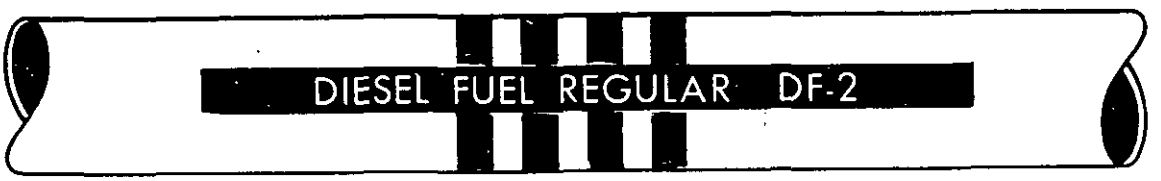

FIGURE 4. DISTILLATES--FOUR NARROW BANDS

FIGURE 5. HEAVY FUEL (BLACK) OILS--FIVE NARROW BANDS

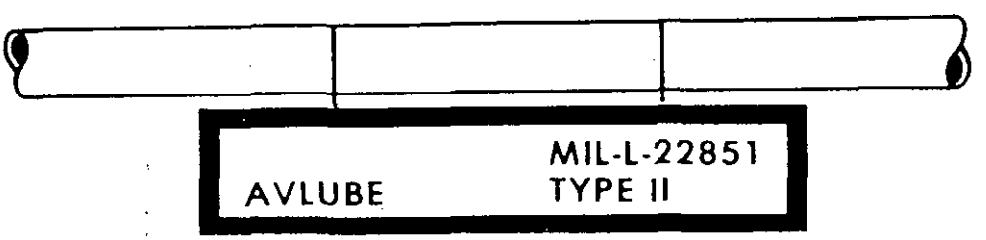

FIGURE 6. LUBRICATING OILS--SIGN

FIGURE 7. THERMALLY STABLE JET FUELS --- WIDE BAND-NARROW BAND-WIDE BAND

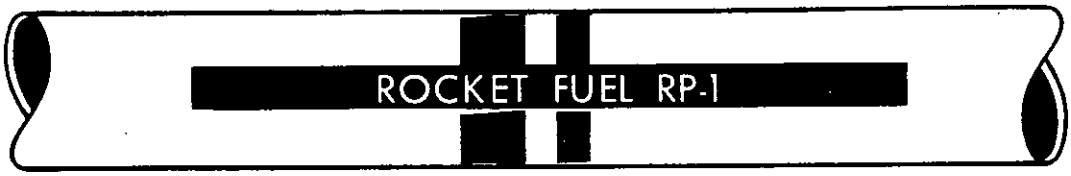

FIGURE 8. MISSILE FUELS -- 1 WIDE BAND- 1 NARROW BAND

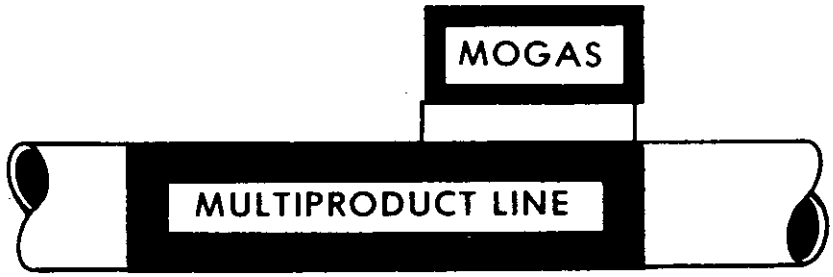

FIGURE 9. MULTIPRODUCT LINES

FIGURE 10. DIRECTION OF FLOW

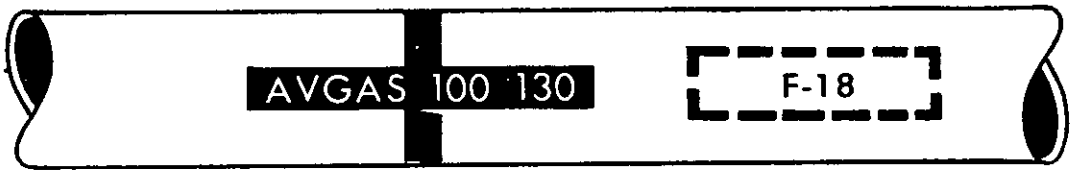

FIGURE 11. NATO SYMBOL MARKING

Custodians:

Army:	MI
Navy:	SA
Air Force:	68

Preparing Activity:
Air Force - 68

Project Number: 91GP-0077

Review Activities:

Army:	MI
Navy:	SA
Air Force:	68
DGSC:	GS

User Activity:

Air Force:	11

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