

INCH-POUND

MIL-PRF-6086E  
13 February 1998  
SUPERSEDING  
MIL-L-6086D  
30 January 1992

## PERFORMANCE SPECIFICATION

### LUBRICATING OIL, GEAR, PETROLEUM BASE

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

#### 1. SCOPE

1.1 **Scope.** This specification covers two grades of petroleum base lubricating oil for gears (see 6.1).

1.2 **Classification.** The oil will be of the following grades, as specified: (see 6.2)

- a. Grade L - Light (identified by military symbol OGL and *NATO Code 0-153* (see 6.3))
- b. Grade M - Medium (identified by military symbol OGR and *NATO Code 0-155* (see 6.3))

#### 2. APPLICABLE DOCUMENTS

2.1 **General.** The documents listed in this section are specified in *sections 3 and 4* of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this lists, document users are cautioned that they must meet all specified requirements documents cited in *sections 3 and 4* of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: ASC/ENSI, 2530 Loop Road West, Wright-Patterson AFB OH 45433-7101, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 9150

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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**2.2 Government documents**

**2.2.1 Specifications, standards, and handbooks.** The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents will be those listed in the issue of the *Department of Defense Index of Specifications and Standards (DoDISS)* and supplement thereto, cited in the solicitation (see 6.2).

## STANDARDS

## FEDERAL

FED-STD-791 Lubricants, Liquid Fuels, and Related Products, Methods of Testing

**2.3 Non-Government publications.** The following documents form a part of this document to the extent specified herein. Unless otherwise specified the issues of the documents, which are DoD adopted, are those listed in the issue of the *DoDISS* specified in the solicitation. Unless otherwise specified the issues of documents not listed in the *DoDISS* are the issues of the documents cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

|             |   |
|-------------|---|
| ASTM D 91   | Precipitation Number of Lubricating Oils (DoD adopted)  |
| ASTM D 92   | Flash and Fire Points by Cleveland Open Cup   |
| ASTM D 97   | Pour Point  |
| ASTM D 130  | Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test        |
| ASTM D 445  | Viscosity of Transparent and Opaque Liquids (Kinematic and Dynamic Viscosities) (DoD adopted) |
| ASTM D 892  | Test for Foaming Characteristics of Lubricating Oils  |
| ASTM D 974  | Neutralization Number by Color-Indicator Titration  |
| ASTM D 1500 | ASTM Color of Petroleum Products (ASTM Color Scale)   |
| ASTM D 2270 | Calculating Viscosity Index from Kinematic Viscosity  |
| ASTM D 2783 | Measurement of Extreme-Pressure Properties of Lubricating Fluids (Four-Ball Method)           |

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

(Non-Government standards and other publications are available from the organizations that prepare or distribute the documents. These documents may be obtained through libraries or other informational services.)

**2.4 Order of precedence.** In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

**3. REQUIREMENTS**

**3.1 Qualification.** Gear oils furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.3).

**3.1.1 Requalification.** Requalification will be required if there is a change in the base stock source, refining treatment or additives. A minor change in the fluid formulation may be made without requalification, but only after notification to, and approval by, the qualifying activity. The qualifying activity may, at its discretion, waive complete requalification or may require only partial requalification testing to determine the significance and acceptability of the proposed formulation change.

**3.2 Materials.** The oil shall consist of base oil mixed with a suitable load-carrying additive. The additive shall not be corrosive or cause excessive foaming, and shall be completely compatible with the base stock. The oil shall be clear and free from visible water, suspended matter, dirt, sediment and other impurities when observed at room temperature  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Refined constituent materials shall not be used.

**3.3 Properties.** The properties of the finished gear oil shall be as specified in *table I* and 3.4.

**TABLE I. Properties of gear oil.**

| Characteristics      | Requirements |         | Unit                                  |
|----------------------|--------------|---------|---------------------------------------|
|                      | Grade L      | Grade M |                                       |
| Viscosity            | 23-34        | 60-82   | centistokes at $37.8^{\circ}\text{C}$ |
| Viscosity index      | 80           | 80      | minimum (min)                         |
| Flash point          | 137.8        | 154.5   | $^{\circ}\text{C}$ maximum (min)      |
| Pour point           | -40          | -28.9   | $^{\circ}\text{C}$ max                |
| Load Wear Index      | 40           | 40      | min                                   |
| Precipitation number | 0.1 ml       | 0.1 ml  | max                                   |
| Acid or base number  | 1.0          | 1.0     | max                                   |
| ASTM color           | 8            | 8       | max                                   |
| Foaming tendency     |              |         | max                                   |
| Sequence I           | 5-0          | 5-0     |                                       |
| Sequence II          | 20-0         | 20-0    |                                       |
| Sequence III         | 5-0          | 5-0     |                                       |

### 3.4 Performance

**3.4.1 Copper corrosion.** When tested as specified in *section 4* for three hours at  $100^{\circ}\text{C}$ , the corrosion produced shall not exceed No. 2 of the ASTM Corrosion Scale in accordance with *ASTM D 130*.

## 4. VERIFICATION

**4.1 Classification of inspections.** The inspections requirements specified herein are classified as follows:

- Qualification inspection (see 4.2)
- Quality conformance inspection (see 4.3)

## 4.2 Qualification inspection

**4.2.1 Qualification samples.** The qualification samples shall consist of 1 gallon formulated gear oil and 1 ounce load-carrying additive.

**4.2.2 Qualification tests.** Qualification sample(s) shall be subjected to all the tests specified in 4.4, method of inspection.

**4.2.4 Retention of Qualification.** In order to retain qualification of a product approved for listing on the QPL, the manufacturer shall verify by certification to the qualifying activity that the manufacturer's product complies with the requirements of this specification. The time of periodic verification by certification shall be in two-year intervals from the date of original qualification. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

**4.3 Quality conformance inspection.** Quality conformance inspection shall consist of the tests specified in *table II*. Samples shall be labeled completely with information identifying the purpose of the sample, name of product, specification number, lot and batch number (see 6.6), date of sampling, and contract number.

**TABLE II. Test method for gear oil properties.**

| Characteristic                 | ASTM          |
|--------------------------------|---------------|
| Viscosity                      | <i>D 445</i>  |
| Flash point                    | <i>D 92</i>   |
| Acid and base numbers          | <i>D 974</i>  |
| Copper corrosion <sup>1/</sup> | <i>D 130</i>  |
| Color                          | <i>D 1500</i> |
| Pour point                     | <i>D 97</i>   |
| Precipitation number           | <i>D 91</i>   |
| Viscosity index                | <i>D 2270</i> |
| Foaming tendency               | <i>D 892</i>  |
| Load Wear Index                | <i>D 2783</i> |

<sup>1/</sup> See test paragraph 4.4.2

## 4.4 Method of inspection

**4.4.1 Inspection.** Inspection shall be in accordance with *ASTM D 2783* and 4.4.2 of this specification.

**4.4.2 Physical and chemical values.** Tests shall be performed in accordance with the applicable methods specified in *table II*. Physical and chemical values specified in *section 3* apply to the arithmetic average of the

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determinations made on the samples for those values that fall within any stated repeatability or reproducibility limits of the applicable test methods.

## 5. PACKAGING

**5.1 Packaging** For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity with the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

**6.1 Intended use.** The two grades of gear oil covered by this specification are intended for use in light- to moderate-loaded gear trains or, gear boxes that operate in low- to medium-speed ranges down to -40°C.

**6.2 Acquisition requirements.** Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual document referenced (see 2.1 and 2.2).
- c. Grade and quantity of oil desired.
- d. Size and type of container in which the oil is to be furnished.
- e. Both the level of packaging and level of packing required.

**6.2.1 Purchase unit.** The oil will be purchased by volume, the unit being a U.S. gallon of 231 cubic inches at 15.6°C.

**6.3 Qualification.** With respect to products requiring qualification, awards will be made only for products that are at the time set for opening of bids, qualified for inclusion in the applicable QPL whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products they propose to offer to the Federal Government tested for qualification, so they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the QPL is AFRL/MLSE, Bldg 652, 2179 Twelfth St., Room 122, Wright-Patterson AFB OH 45433-7718. Information pertaining to qualification of products may be obtained from that activity.

**6.3.1 Qualification information.** It is understood that the material furnished under this specification subsequent to final approval will be of the same composition and will be equal to products upon which approval was originally

granted. In the event that the gear oil furnished under contract is found to deviate from the composition of the approval product, or that the product fails to perform satisfactorily, approval of such products will be subjected to immediate withdrawal from the QPL at the discretion of the approving activity.

**6.3.2 Data to accompany qualification samples.** The samples will be accompanied by a material safety data sheet and the following information: a) a certified test report containing complete information as to the source and type of base stock and additive materials used for the test, b) the detailed formulation and composition of the finished product, and c) laboratory data showing quantitative results of all tests required by this specification. The samples and reports will be forwarded to AFRL/MLSE, Bldg 652, 2179 Twelfth St., Room 122, Wright-Patterson AFB OH 45433-7718. The samples will be plainly identified by securely attached durable tags or labels marked with the following information:

- a. Sample for qualification inspection with grade identity  
LUBRICATING OIL, GEAR
- b. Specification *MIL-PRF-6086*
- c. Name of ingredient (for ingredient material)
- d. Name of manufacturer
- e. Product code number
- f. Date of manufacture

**6.3.2.1 Formulation sheets example.** An example of a satisfactory form for the formulation sheet, indicating the weight percentage and nature of each ingredient, is as follows:

|   |            |
|---|------------|
| Petroleum oil base stock (composition)                  | percentage |
| Load-carrying additive (manufacturer's name and number) | percentage |

**6.4 International agreement.** Certain provisions of this specification are the subject of international standardization agreement *ASCC Air Standard 15/1* and *NATO STANAG No. 1135*. When amendment, revision or cancellation of this specification is proposed that will effect or violate the international agreement concerned, the departmental custodians will inform their respective Departmental Standardization Office (DepSo) so appropriate action may be taken respecting the international agreement concerned.

## 6.5 Disposal actions

**6.5.1 Background.** Accumulated waste fluid will be disposed of through a waste oil recovery program unless prohibited by local law. Otherwise, the product will be disposed of in accordance to local law and regulations promulgated by the U.S. Environmental Protection Agency under *Public Law 94-580, Resource Conservation and Recovery Act of 1976*.

**6.5.2 Handling and safety precautions.** Personnel handling the product will wear appropriate impervious clothing to prevent repeated or prolonged skin contact. Local appraisal is required for exact health and safety complications and to prescribe precise application of protective clothing. If skin or clothing becomes moistened with the product, personnel will promptly wash with soap or mild detergent and water. Respirators are not required unless there is an inhalation exposure to mists. Personnel will wear protective clothing when using the product and when cleaning up spills.

**6.5.3 Depot-type operations.** Additionally, the used product, which has been drained from the hydraulic systems, will be combined with unused, but contaminated fluid from partially full containers and then recycled.

**6.5.4 Container disposal.** Tops from one-time use containers will be discarded with ordinary refuse. Containers will be made as empty as possible using gravity draining, after which they are to be crushed and buried in a permitted sanitary landfill or incinerated with general refuse. No special decontamination procedures are required for empty containers or their lids.

## 6.6 Definitions

**6.6.1 Bulk lot.** A bulk lot (batch) is an indefinite quantity of a homogeneous lubricant mixture of material (see 3.3) offered for acceptance in a single, isolated container; or manufactured in a single, plant run (not exceeding 24 hours) through the same processing equipment, with no change in the ingredient materials.

**6.6.2 Packaged lot.** A packaged lot is an indefinite number of one-quart cans, or other unit containers of identical size and type, offered for acceptance and filled with a homogeneous lubricant mixture of material (see 3.3) from a single, isolated container; or filled with a homogeneous lubricant mixture manufactured in a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in the ingredient materials.

## 6.7 Subject term (key word) listing

Copper corrosion

Flash point

Foaming tendency

Viscosity

**6.8 Changes from previous issue.** Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes. The changes are due to Acquisition Reform initiatives requiring Government specifications to be performance-based.

### Custodians:

Army - MR

Navy - AS

Air Force - 11

### Preparing activity:

Air Force - 11

(Project 9150-0826)

### Review activities:

Army - MI, AT

Navy - SA, SH

Air Force - 68

### International interest:

(See section 6)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-PRF-6086E

2. DOCUMENT DATE (YYYYMMDD)  
980213

3. DOCUMENT TITLE LUBRICATING, OIL, GEAR, PETROLEUM BASE

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

### 5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)  
(1) Commercial  
(2) AUTOVON  
(if applicable)

7. DATE SUBMITTED  
(YYYYMMDD)

### 8. PREPARING ACTIVITY

a. NAME ASC/ENSI  
AIR FORCE CODE 11

b. TELEPHONE (Include Area Code)  
(1) Commercial (937) 255-0175 (2) AUTOVON 785-0175

c. ADDRESS (Include Zip Code)  
2530 LOOP ROAD WEST  
WRIGHT-PATTERSON AFB, OH 45433-7101

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
Defense Standardization Program Office (DLSC-LM)  
8725 John J. Kingman road, Suite 2533, Ft. Belvoir, VA 22060-2533  
Telephone (703) 767-6888 AUTOVON 427-6888