

## METRIC

MIL-PRF-17331K(SH)

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SUPERSEDING

MIL-PRF-17331J(SH)

09 September 2003

## PERFORMANCE SPECIFICATION

## LUBRICATING OIL, STEAM TURBINE AND GEAR, MODERATE SERVICE

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers a single classification of steam turbine and gear lubricating oil, moderate service, for use in main and auxiliary turbines and gears, air compressors, and certain hydraulic equipment, as well as for general mechanical lubrication. The lubricating oil will be identified as follows:

Military symbol  
2190 TEP

NATO symbol  
O-250

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

S9510-AB-ATM-010 - Nuclear Powered Submarine Atmosphere Control Manual

(Copies of the chapter titled "Material Control Program" are available from Commander, Naval Sea Systems Command, ATTN: SEA 05Z4, 1333 Isaac Hull Ave. SE Stop 5122, Washington Navy Yard, DC 20376-5122 or by email request to [commandstandards@navy.mil](mailto:commandstandards@navy.mil).)

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil), with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

## MIL-PRF-17331K(SH)

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 these documents are those cited in the solicitation or contract.

## AMERICAN SOCIETY FOR QUALITY

ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203-3066 or online at [www.asq.org](http://www.asq.org).)

## ASTM INTERNATIONAL

ASTM D92 - Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester

ASTM D97 - Standard Test Method for Pour Point of Petroleum Products

ASTM D129 - Standard Test Method for Sulfur in Petroleum Products (General Bomb Method)

ASTM D130 - Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

ASTM D287 - Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

ASTM D445 - Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

ASTM D665 - Standard Test Method for Rust-Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water

ASTM D892 - Standard Test Method for Foaming Characteristics of Lubricating Oils

ASTM D943 - Standard Test Method for Oxidation Characteristics of Inhibited Mineral Oils

ASTM D974 - Standard Test Method for Acid and Base Number by Color-Indicator Titration

ASTM D1298 - Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

ASTM D1401 - Standard Test Method for Water Separability of Petroleum Oils and Synthetic Fluids

ASTM D1552 - Standard Test Method for Sulfur in Petroleum Products (High-Temperature Method)

ASTM D2272 - Standard Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel

ASTM D2622 - Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-Ray Fluorescence Spectrometry

ASTM D3427 - Standard Test Method for Air Release Properties of Petroleum Oils

ASTM D4052 - Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

ASTM D4057 - Standard Practice for Manual Sampling of Petroleum and Petroleum Products

ASTM D4172 - Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four Ball Method)

ASTM D4310 - Standard Test Method for Determination of Sludging and Corrosion Tendencies of Inhibited Mineral Oils

ASTM D4898 - Standard Test Method for Insoluble Contamination of Hydraulic Fluids by Gravimetric Analysis

## MIL-PRF-17331K(SH)

- ASTM D4927 - Standard Test Method for Elemental Analysis of Lubricant and Additive Components-Barium, Calcium, Phosphorus, Sulfur, and Zinc by Wavelength-Dispersive X-Ray Fluorescence Spectroscopy
- ASTM D4951 - Standard Test Method for Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
- ASTM D5182 - Standard Test Method for Evaluating the Scuffing Load Capacity of Oils (FZG Visual Method)
- ASTM D5950 - Standard Test Method for Pour Point of Petroleum Products (Automatic Tilt Method)
- ASTM D6304 - Standard Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
- ASTM D6443 - Standard Test Method for Determination of Calcium, Chlorine, Copper, Magnesium, Phosphorus, Sulfur, and Zinc in Unused Lubricating Oils and Additives by Wavelength Dispersive X-ray Fluorescence Spectrometry (Mathematical Correction Procedure)
- ASTM D6481 - Standard Test Method for Determination of Phosphorus, Sulfur, Calcium, and Zinc in Lubrication Oils by Energy Dispersive X-ray Fluorescence Spectroscopy
- ASTM E29 - Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at [www.astm.org](http://www.astm.org).)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 General. For purposes of determining conformance with each requirement, an observed value or calculated value shall be rounded off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off procedure given in ASTM E29.

3.2 Qualification. The lubricating oil furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) before contract award (see 4.2 and 6.3).

3.3 Material. The lubricating oil shall be a stable, homogeneous blend of virgin petroleum lubricating oil stocks plus additive agents, if necessary, to meet the requirements of this specification. However, the use of additives to improve the viscosity-temperature characteristics of the base stocks is not permitted, although additives, in quantities up to 0.5 percent by weight, may be used to meet the pour point requirement. Additives, if used, shall not contain chlorine or zinc materials. Additive components as contained in the sample tested and granted qualification approval shall not be changed without approval of the qualifying activity.

3.4 Oil compatibility. The lubricating oil shall be compatible with reference oil furnished by the Government (see 4.4.5). For information on obtaining reference oil, see 6.3.

3.5 Homogeneity. Additive agents, when used, shall remain uniformly distributed throughout the oil at all temperatures above the pour point and up to 121 °C (250 °F). If the oil is cooled below its pour point, it shall regain its homogeneity at temperatures of 6 °C (10 °F) above its pour point and shall retain that homogeneity up to 121 °C (250 °F) (see 4.4.1).

3.6 Chemical and physical. The lubricating oil shall conform to the chemical and physical requirements as specified in [table I](#).

## MIL-PRF-17331K(SH)

3.7 Toxicity. When evaluated in accordance with 4.4.3 [the Health Hazard Assessment (HHA)], the lubricating oil shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.4.3 and 6.7).

3.8 Off-gassing. The lubricating oil shall be tested for off-gassing in accordance with the requirements of 4.4.2. The Navy will review the results and assign a usage category. The required usage category is “Permitted” or “Limited” (see 4.4.2 and 6.6).

3.9 Ozone depleting substances (ODS). The use of ODS in the composition of the lubricating oil under this specification directly or referenced in any federal test method is hereto prohibited. Environmentally safe and non-ODS alternative solvents shall be substituted in test methods for any previously specified ODS such as 1,1,1-trichloroethane, tri-chlorofluoroethane, perchloroethane, or other chlorofluorocarbons (CFC). A dehydrated mixture of primary alcohol such as ethanol or isopropyl alcohol and non-aromatic hydrocarbon solvent resulting in a minimum flash point of 60 °C (140 °F) plus adequate solvent action shall be used as an alternative for any ODS.

3.10 Tri-cresyl phosphate (TCP). If TCP is used as an antiwear additive, not more than 1.0 percent of the additive shall be the ortho isomer (see 6.8.2).

3.11 2,6-Di-tert-butylphenol (DTBP). The addition of DTBP (Chemical Abstract Service Number 128-39-2) in any lubricating oil produced under the military symbol 2190 and NATO symbol 0-250 is prohibited; this applies to both surface ships and submarine use. DTBP shall not be intentionally added to the oil. The level of DTBP, if detected, shall not exceed 10 parts per million (see 4.4.4).

3.12 Appearance. The lubricating oil shall be free of haze or cloudiness (see 4.4.6).

#### 4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification tests shall be conducted at a laboratory acceptable to NAVSEA. Qualification inspection shall consist of all of the tests specified herein to satisfy the requirements in section 3 and [table I](#). A minimum sample size of 30 gallons is required for qualification testing.

4.2.1 Change approval. A change in product composition, formulation, or ingredients used in the manufacture of lubricating oil, which has been qualified, shall require written approval of NAVSEA. Incorporation of any changes, which have not been so approved, shall require requalification of item in question.

4.2.1.1 Requalification. Unless otherwise approved by NAVSEA, requalification shall consist of the tests specified in [table I](#) and 4.4.

## MIL-PRF-17331K(SH)

TABLE I. Chemical and physical requirements and test methods.

Characteristics	Requirement	Test Method (ASTM or other)
Sulfur, %	<sup>1/</sup>	D129, D1552, D2622, D4927, D4951, D6443, D6481
Acid number, mg KOH/g oil, max.	0.3	D974
Corrosion (in presence of salt water)	None	D665, Procedure B <sup>2/</sup>
Corrosion test at 100 °C (212 °F), (Copper strip) appearance, max.	Classification 1	D130
Oil compatibility	Pass	See 4.4.5
Water, percent, max.	0.01	D6304
Gravity, API	<sup>1/</sup>	D287, D1298, D4052
Air release time, (minutes at 50 °C, max.)	20	D3427
Flash point, °C (°F), min.	204 (400)	D92
Pour point, °C (°F), max.	-6 (20)	D97, D5950
Viscosity: mm <sup>2</sup> /s at 4.4 °C (40 °F), max. mm <sup>2</sup> /s at 40 °C (104 °F) mm <sup>2</sup> /s at 100 °C (212 °F), min.	870 77-97 8.0	D445
Emulsion test, after 30 minutes settling time Oil layer/water layer/emulsion, max.	41/-/3	D1401 <sup>3/</sup>
Oxidation test, after 1000 hours: Acid number, mg KOH/g, max. Total sludge, mg, max. Total iron, mg, max. Total copper, mg, max.	2.0 100 100 100	D943 D974 D4310 D4310 <sup>4/</sup> D4310
Oxidation by rotating pressure vessel, minutes to failure, min.	200 <sup>1/</sup>	D2272
Scuffing load capacity (FZG), failure load stage	Load Stage 9	D5182
Wear test, scar diameter, mm, max.	0.33	D4172 <sup>5/</sup>
Homogeneity, separation	None	See 4.4.1
Foam characteristics: After blowing/after 10 minutes Sequence I, mL, max. Sequence II, mL, max. Sequence III, mL, max.	65/0 65/0 65/0	D892 <sup>6/</sup>
Cleanliness, mg/100 mL, max.	2.5	D4898 <sup>7/</sup>

## MIL-PRF-17331K(SH)

TABLE I. Chemical and physical requirements and test methods – Continued.

## NOTES:

- <sup>1/</sup> In conformance testing, values are compared to qualification results (see 4.3.1).
- <sup>2/</sup> Prior to the test, the oil shall be water-washed as follows: 300 grams of the oil to be tested shall be stirred with 50 grams of water for 30 minutes at 90 °C (194 °F) using the beaker and stirrer as specified in ASTM D665. After 30 minutes stirring, the mixture shall be transferred to a separatory funnel and left to separate. Then the water layer shall be drawn off and the oil submitted to the salt-water corrosion test. The test shall be run for 24 hours.
- <sup>3/</sup> Distilled water and stirring temperature of 54 °C (130 °F) shall be used. Discrete water droplets entrained in the oil layer and clinging to the wall of the cylinder may be added to the water layer at a volume of 0.1 mL per droplet. The results shall be reported using the format of oil layer/water layer/emulsion layer (time in minutes). There is no requirement for water layer. The emulsion limit applies to any of the three types of emulsions defined in the test method. If more than one emulsion type is present, the 3 mL maximum limit applies to the combined volume of the different emulsion types.
- <sup>4/</sup> The total iron content shall be determined using the procedure and calculations described in the Procedure for Determination of Sludge Weight and the Procedure for Determination of Copper in Oil, Water and Sludge for Procedure A of ASTM D4310, except iron shall be substituted in place of copper where appropriate.
- <sup>5/</sup> Testing conditions shall be:
- (a) Load: 15 kilograms
  - (b) Oil temperature: 80 °C
  - (c) Speed: 600 revolutions per minute (rpm)
  - (d) Duration of test: 120 minutes
- <sup>6/</sup> Option A is not allowed on freshly blended oils. If testing is done more than 1 week after blending, Option A is allowed. A ring of bubbles around the edge of the graduated cylinder shall be considered complete collapse or 0 mL.
- <sup>7/</sup> Sample shall be tested in accordance with ASTM D4898 using 0.8-micrometer pore diameter membrane filters.

4.3 Conformance inspection. Each sample selected as specified in 4.3.2 shall be tested as specified in [table I](#) and 4.4.6 except that the scuffing load capacity (FZG), oxidation test (ASTM D943), wear test, compatibility, air release, and homogeneity tests will not be required.

4.3.1 Lot conformance requirements. The results from each sample selected as specified in 4.3.2, when tested as specified in [table I](#), shall not vary from the analysis of the sample given qualification approval by more than the tolerances listed below:

- a. Gravity, degrees API:  $\pm 1.0$
  - b. Sulfur, percent:  $\pm 20$  percent of value for qualified product <sup>(1)</sup>
  - c. Viscosity:
    - (1) mm<sup>2</sup>/s kinematic at 4.4 °C (40 °F): maximum 870
    - (2) mm<sup>2</sup>/s kinematic at 40 °C (104 °F):  $\pm 8$  <sup>(2)</sup>
    - (3) mm<sup>2</sup>/s kinematic at 100 °C (212 °F):  $\pm 1$  <sup>(2)</sup>
  - d. Pour point, °C:  $\pm 3$  <sup>(2)</sup>
  - e. Oxidation by rotating pressure vessel: -15 percent maximum
- <sup>(1)</sup> For oils qualified below 0.15 percent sulfur: no minimum restriction. Plus 0.08 percent allowable.
- <sup>(2)</sup> Shall meet requirements of this specification (see [table I](#)).

## MIL-PRF-17331K(SH)

4.3.2 Sampling for conformance.4.3.2.1 Inspection lot.

4.3.2.1.1 At place of manufacture. For the purpose of sampling, one lot of lubricating oil shall consist of a manufacturer's batch. When material cannot be identified by batch, a lot shall consist of not more than 38 m<sup>3</sup> (10,000 gallons).

4.3.2.1.2 At place of delivery. For the purpose of sampling, one lot of lubricating oil shall consist of all oil in a single shipment.

4.3.2.2 Sampling a storage tank. A representative sample of 5 gallons of lubricating oil shall be taken from each lot in accordance with ASTM D4057.

4.3.2.3 Sampling during loading. Samples shall be drawn at the discharge pipe where it enters the bulk carriers (tank cars, tank trucks, and so forth). At least four samples shall be taken at regular intervals during the entire period of loading or filling, each sample being 1 pint. Only one sample for one continuous drum filling operation is required and shall be taken after approximately 10 percent of the volume of product has been drummed.

4.3.2.4 Sampling of filled containers. Where the lubricating oil is contained in drums or cans, quart samples shall be drawn from four randomly selected drums in the lot and composited, unless the lot consists of less than five containers, in which case a 1-gallon sample shall be drawn from one drum. The contents of each container to be sampled shall be shaken, rolled, or stirred to mix the contents thoroughly. Equal portions shall be withdrawn from approximately the center of each drum by means of a thief or other sampling device.

4.3.2.5 Examination of filled containers. A random sample of filled containers shall be selected from each lot in accordance with ASQ Z1.4 at inspection Level II to verify compliance regarding fill, closure, marking, and other requirements not involving tests. Samples shall be examined for defects of the container and the closure, for evidence of leakage, and for unsatisfactory markings. Each container shall also be weighed to determine quantity. Any container in the sample having one or more defects or under required fill shall be cause for rejection of the container.

4.3.3 Rejection of lots. When the sample of lubricating oil fails any of the tests, this shall be cause for rejection of the lot represented by the sample.

4.4 Test methods.

4.4.1 Homogeneity. After determining the pour point of the oil, the test jar and oil shall be returned to cooling bath. The test jar and oil shall be cooled to 6 °C (10 °F) below the pour point and held at that temperature for 3 hours. The jar of oil shall be removed from cooling bath and allowed to warm to room temperature. Next, the jar and oil shall be placed in oil bath, the bath shall be brought to a temperature of 121±2.8 °C (250±5 °F), and held at test temperature for 1 hour. The jar of oil shall be removed from oil bath and allowed to cool in air to room temperature. The test oil shall be examined visually for sediment or separation of insoluble material at temperatures from 6 °C (10 °F) above the pour point and up to 121 °C (250 °F) (see 3.5).

4.4.2 Off-gassing. The lubricating oil shall be tested for off-gassing at a Government-approved testing facility in accordance with S9510-AB-ATM-010 chapter titled "Material Control Program" (see 3.8 and 6.6).

4.4.3 Toxicity. An HHA shall be conducted to ensure conformance to 3.7, as required by the qualifying activity. The Navy and Marine Corps Public Health Center (NMCPHC) will evaluate the lubricating oil using the administrative HHA data provided by the manufacturer/distributor to the NMCPHC.

4.4.4 2,6-DTBP. Analytical data with the method documented from a NAVSEA-approved laboratory shall be submitted as specified (see 6.2) to document relative absence of DTBP, and, if detected, shall not exceed 10 ppm (see 3.11).

## MIL-PRF-17331K(SH)

4.4.5 Oil compatibility. Oil shall be considered compatible with the reference oil furnished by the Government if a 1:1 mixture of the test oil with the reference oil gives passing values on the oxidation (ASTM D943), corrosion (salt water), foam, and emulsion tests (see 3.4). A reference oil is an oil listed on the Qualified Products List for MIL-PRF-17331. For information on obtaining a reference oil, see 6.3.

4.4.6 Appearance. The appearance of the lubricating oil shall be assessed by filling a clear quart-sized bottle with the lubricating oil and holding the sample in front of a strong light source. The lubricating oil shall be inspected for any cloudiness or haziness (see 3.12).

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 lubricant is intended for use in main and auxiliary turbines and gears, air compressors and certain hydraulic equipment, as well as for general mechanical lubrication.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Quantity required.
- c. Requirement for the results of off-gas testing (see 4.4.2).
- d. Requirement for analytical data documenting relative absence of DTBP (see 4.4.4).
- e. Packaging requirements (see 5.1).
- f. Activities requiring copies of completed MSDS (see 6.4).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 17331 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 that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil). An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.3.1 Provisions governing qualification. Copies of SD-6, "Provisions Governing Qualification," are available online at <http://quicksearch.dla.mil/> or <https://assist.dla.mil>.

6.4 Material safety data sheets (MSDS). Contracting officers will identify those activities requiring copies of completed MSDS prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.



## MIL-PRF-17331K(SH)

6.5 International standardization agreement implementation. This specification implements international standardization agreement NATO STANAG 1135. When amendment, revision, or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at <https://assist.dla.mil>.

6.6 Material certification. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the submarine's atmosphere and can result in health hazards to personnel or deleterious effects on machinery. These controls are administered through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, S9510-AB-ATM-010 chapter titled "Material Control Program". Under the Submarine Material Control Program, all materials considered for use on submarines require certification and assignment of a usage category. Under the certification process, candidate materials are selected by Navy activities or contractors, and a request for certification is submitted to the Naval Sea Systems Command, SEA 05S, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil). The certification request is accompanied by detailed information, including descriptions of the material, method of application, usage, and storage. A chemical analysis is conducted, which is normally accomplished through off gas testing. The off gas test is required to be conducted in a Government-approved laboratory designated by the preparing activity. Information pertaining to this test requirement may be obtained from the Naval Sea Systems Command, SEA 05S, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to [CommandStandards@navy.mil](mailto:CommandStandards@navy.mil). Based on the chemical analysis results, a usage category is assigned to the material defining whether, and to what extent, the material may be used on submarines.

6.7 Toxicity evaluation. The NMCPHC requires sufficient information to permit an HHA of the product. Upon completion of the HHA, a copy will be provided by the NMCPHC to the Government for evaluation.

6.8 Definitions.

6.8.1 Bulk lot. A bulk lot consists of a quantity of a homogeneous mixture of fluid offered for acceptance in a single, isolated container or manufactured in a single plant run, through the same processing equipment, with no change in the ingredient materials.

6.8.2 Ortho isomer. Isomers are compounds with the same molecular formula but different structures. The ortho isomer is one where adjacent sites on a benzene ring are substituted.

6.8.3 Packaged lot. A packaged lot consists of an indefinite number of 55-gallon drums or smaller unit packages of identical size and shape, offered for acceptance, and filled with a homogeneous mixture of fluid from a single, isolated container, or filled with a homogeneous mixture of fluid.

6.9 Subject term (key word) listing.

2190 TEP

Air compressors

Gas turbine auxiliaries

Line shaft bearings

6.10 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.

Preparing Activity:  
Navy – SH  
(Project 9150-2011-004)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.