

INCH-POUND

MIL-STD-1410A
17 March 1989

SUPERSEDING
MIL-STD-1410
4 August 1975

MILITARY STANDARD
METHODS FOR SELECTION
OF INDUSTRIAL ENGINES FOR
END ITEM APPLICATION

AMSC N/A

FSCs 2805, 2815

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DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

Methods for Selection of Industrial Engines
for End Item Application.

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1. SCOPE

1.1 Purpose. This standard is to facilitate the selection of industrial-type diesel and gasoline engines for application in military end item equipments. Use of this standard will assure that clear instructions are provided to suppliers for preparation and submission of engine data criteria. This standard is to be used as a guide in selecting the engine for inclusion in end item specifications.

1.2 Scope. The end item specification will establish the requirements for use in selecting a diesel or gasoline engine for that end item of equipment (see 6.3). Engines covered by this standard shall be of the commercial industrial-type as follows:

- Diesel: Medium- and high-speed engines, air- or liquid-cooled 2- or 4-stroke-cycle.
- Gasoline: Group I: Air-cooled, 2- or 4-stroke-cycle, under 10 net continuous bhp.
- Group II: Air- or liquid-cooled, 4-stroke-cycle, 10 net continuous bhp and above.

1.3 Basis of selection. In general, engines will be diesel to comply with the single fuel concept.

1.4 End item classification. Classification of end items shall be as follows:

- Class I: Standard commercial. An end item which is not modified for military use, i.e., tractor, crane, generator, which is offered to the public commercially.
- Class II: Modified commercial. An end item which is a standard commercial end item modified to meet specific military requirements.
- Class III: Noncommercial counterpart. An end item which is not the manufacturer's standard commercial or a modified commercial item but consists of commercially available components including engine assembled to meet specific military needs through a performance specification.
- Class IV: Military design. An end item which is specifically intended for the military and is covered by a specification and a design drawing package suitable for manufacture of the end item.

1.4.1 Engine selection. The method of selecting an engine for the end item classifications described herein shall be as follows.

1.4.1.1 Class I, standard commercial end item. The engine shall meet one of the following requirements in the following order of preference:

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- a. Commercial experience. The engine shall have achieved a minimum of 1-year satisfactory operation in a similarly defined commercial application. The supplier shall complete the engine description and performance history (see figure 1). Engine acceptability will be determined by the procuring activity following review of engine performance history for the specifically defined application.
- b. Environmental Protection Agency (EPA) tests. The engine or its EPA tested counterpart shall have successfully completed the EPA test 40 CFR 85. Copies of the EPA certificate, certified maintenance records, and maximum certified brake horsepower rating achieved during the 1000-hour test shall be submitted for review. Evidence of major failures of high mortality engine parts or recurring minor failures of other engine parts during the 1000-hour test may preclude acceptability of the engine. Records submitted will be verified with the Environmental Protection Agency.
- c. Manufacturer's certified test data. Certified test data by the engine manufacturer based on a minimum of 1000 hours previous endurance testing, including all essential data items as shown in table I of Test Method 1000 of MIL-STD-1400, shall be submitted for review by the procuring activity prior to the application in the end item.
- d. Noise measurement data. Certified noise measurement data shall be submitted for review by the procuring activity prior to application in the end item. Data shall be taken with engine operating at maximum rpm. Evidence of excessive noise (greater than 85dB(A) at 1 meter) may preclude acceptability of the engine.

1.4.1.2 Class II, modified commercial end item. The engine shall meet one of the following requirements in the following order of preference:

- a. Commercial experience: Same as 1.4.1.1a.
- b. Environmental Protection Agency (EPA) tests: Same as 1.4.1.1b.
- c. Manufacturer's certified test data: Same as 1.4.1.1c.
- d. Noise measurement data. Same as 1.4.1.1d.

1.4.1.3 Class III, noncommercial counterpart end item. The engine shall meet one of the following requirements in the following order of preference, in addition to the requirements and tests specified in the end item specification:

- a. Military or related commercial experience. The engine shall have achieved a minimum of 1-year satisfactory operation in a similarly defined military or related commercial application defined in the end item procurement solicitation as comparable for evaluation of the

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intended military application. The supplier shall complete the engine description and performance history (see figure 1). Engine acceptability will be determined by the procuring activity following review of the engine performance history for the specifically defined application.

- b. Environmental Protection Agency (EPA) tests: Same as 1.4.1.1b.
- c. Manufacturer's certified test data: Same as 1.4.1.1c.
- d. Engine test: The engine shall successfully complete Test Method Series 1000 of MIL-STD-1400 with certified test data submitted for review prior to application in the end item.
- e. Noise measurement data. Same as 1.4.1.1d.

1.4.1.4 Class IV, military design end item. The engine shall be in accordance with applicable military specifications and drawings.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are 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).

SPECIFICATIONS

FEDERAL

- | | |
|-----------|---|
| O-F-1044 | - Fuel, Engine Primer: Cold Starting, in Pressurized and Nonpressurized Containers. |
| W-S-506 | - Spark Plug. |
| VV-F-800 | - Fuel Oil, Diesel. |
| VV-G-1690 | - Gasoline, Automotive, Leaded or Unleaded. |

MILITARY

- | | |
|-------------|---|
| MIL-L-2104 | - Lubricating Oil, Internal Combustion Engine, Tactical Service. |
| MIL-G-3056 | - Gasoline, Automotive, Combat. |
| MIL-G-46015 | - Gasoline, Automotive, Combat, Referee Grade. |
| MIL-A-46153 | - Antifreeze, Ethylene Glycol, Inhibited, Heavy Duty, Single Package. |
| MIL-F-46162 | - Fuel, Diesel, Referee Grade. |

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- MIL-L-46167 - Lubricating Oil, Internal Combustion Engine, Arctic.
- MIL-A-52363 - Air Cleaners, Intake: Dry-Type (for Internal-Combustion Engine).
- MIL-E-52649 - Engine Cold Starting Aids, Ether Fuel Primers.
- MIL-C-62122 - Cable Assembly: Intervehicle Power: Plug and Receptacle.
- MIL-T-83133 - Turbine Fuel, Aviation, Kerosene Type, Grade JP-8.

STANDARDS

FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY

- MIL-STD-1400 - Engines, Gasoline and Diesel, Methods of Test.
- MIL-STD-1472 - Human Engineering Design Criteria for Military Systems, Equipment, and Facilities.
- MS35000 - Battery, Storage, Lead-Acid, Waterproof.
- MS35909 - Spark Plug: Shielded, 14 MM, 1-1/4 Inch Well (Other Than Aircraft).
- MS39254 - Cylinder, Engine Starting (Engine Cold-Starting Aid).
- MS51009 - Spark Plug, Shielded, 18 MM, 1-1/4 Inch Well (Other Than Aircraft).
- MS51389 - Raincap, for Air Cleaner Intake, for Industrial Engines.
- MS53063 - Indicator, Air Cleaner, Intake, Restriction Mechanical Type.
- MS75047 - Battery, Storage, Lead-Acid, Waterproof 24 Volt.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 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 are those in effect on the date of the solicitation.

Federal Regulations

Code of Federal Regulations

- 40 CFR 85 - Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines.

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(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 Non-Government publications. The following document(s) 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 cited 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).

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE Handbook.

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15086.)

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

2.3 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. DEFINITIONS

3.1 Industrial-type engine. An industrial-type engine is a heavy-duty, liquid- or air-cooled engine designed specifically for industrial-type applications or versions of truck, marine, and automotive engines.

3.2 Engine accessory. An engine accessory is any functional item attached to the engine that is not necessarily required to operate the engine, i.e., generator, alternator.

3.3 Engine component. An engine component is any functional item required for the operation of the engine, i.e., water pump, fuel pump, fuel injector, carburetor.

4. GENERAL REQUIREMENTS

4.1 General requirements.

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4.1.1 Engine. Engines used in any of the four classifications of end items described herein shall be certified and warranted by the engine manufacturer as being suitable for the intended application using military fuels and lubricants specified herein unless otherwise specified in the end item specification.

4.1.2 Engine components and accessories. Engine components and accessories furnished with each engine shall be the engine manufacturer's standard commercial items unless otherwise specified in the end item specification (see 6.3).

4.1.3 Ease of maintenance. Routine engine servicing and adjustments shall be performed without interference or necessity to remove other components.

4.1.4 Threaded parts and common parts. All screw threads shall be in accordance with FED-STD-H28 or applicable DIN Standards.

4.1.5 Identification marking. Unless otherwise specified (see 6.3), each engine shall be identified in accordance with the engine manufacturer's standard commercial practice.

4.1.6 Emission control. When required by law, engines for vehicles shall conform to EPA Regulations, 40 CFR 85, as applicable, for control of air pollution by crankcase emissions, exhaust emissions, and fuel evaporative emissions (see 6.3).

4.1.7 Engine rotation. Unless otherwise specified in the end item specification, the rotation of the engine shall be counterclockwise when viewed from the power takeoff end (see 6.3).

4.1.8 Belts and pulleys. Drivebelts (V) and pulleys shall conform to the SAE Handbook Standards.

4.1.9 Lubrication system. Engines of the wet-sump type shall be equipped with an oil-level-indicating bayonet gage. The bayonet gage shall be in accordance with SAE J614b. The volume of oil indicated between the "ADD" and "FULL" marks on the dipstick shall be sufficient to permit a minimum of 8 hours of operation without requiring additional oil. Engines shall be capable of satisfactory operation using military type lubricating oils conforming to MIL-L-2104 and MIL-L-46167, grades as applicable.

4.2 Special characteristics and features. The following special characteristics and features shall apply to engines furnished in the end item classifications classes III and IV, when specified in the end item specification.

4.2.1 Operational requirements. The engine shall start within 5 minutes of initial starting action (turning on glowplugs, discharging ether unit, engaging cranking motor, or any other initiating action). Full power shall be obtained

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after 15 minutes of warmup under any of the conditions or combination of conditions specified in 4.2.1.2, 4.2.1.3, and 4.2.1.4 unless otherwise specified in the end item specification (see 6.3).

4.2.1.1 Maximum engine operating limits. Unless otherwise specified in the end item specification, the maximum engine operating limits allowable, except for group I gasoline engines, shall not exceed conditions specified in table I (see 6.3).

TABLE I. Maximum engine operating limits.

Data items	Standard commercial	Modified commercial	Noncommercial counterpart	Military design
Bhp	Equal to or less than established by 1.4.1.1.	Equal to or less than established by 1.4.1.2.	Equal to or less than established by 1.4.1.3.	Same as established by 1.4.1.4.
Oil gallery temperature	230 °F*	230 °F*	230 °F*	230 °F*
Radiator top tank temperature	210 °F*	210 °F*	210 °F*	210 °F*
Exhaust smoke (value) ^{1/}	4.5**	4.5**	4.5	4.5

*Limits which vary from specified values shall be based on acceptable performance of commercial end item and will be allowable only when the engine manufacturer agrees to warrant engines at the higher limits.

**Exhaust smoke (diesel engine only) shall be limited in accordance with MIL-STD-1400 except those that are limited by EPA certification.

^{1/} As measured by a Robert Bosch EFAW 68 analyzing instrument, or its equivalent, at room temperature (65 °F to 80 °F).

4.2.1.2 Elevation conditions. Operation at any elevation from sea level (29.92 inches Hg) with a maximum ambient temperature of 125 °F to 5000 feet (24.9 inches Hg) with a maximum ambient temperature of 107 °F.

4.2.1.3 Temperature conditions. At any ambient temperature from +125 °F to -25 °F.

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4.2.1.4 Tilt conditions. The engine shall operate at the tilt angle specified in the end item specification with minimum oil level as shown on the dipstick measured with the engine in the level or normal position (see 6.3).

4.2.2 Average oil consumption. The average oil consumption of a liquid-cooled engine, as applied to the end item, shall not exceed .0035 lbs/bhp hr.

4.2.3 Lifting provisions. The engine shall be provided with lifting eyes or other attachments that would enable the engine to be lifted in its normal position. Each attachment shall be of sufficient size and strength to allow lifting of the engine without damage to the attachment or any part or accessory of the engine. When practical the lift points shall be labeled "LIFT HERE" in accordance with 4.2.11.

4.2.4 Manual throttle control. A manual throttle control shall be furnished and shall permit operation of the engine at any selected speed under any of the conditions specified herein. The manual throttle shall not restrict the action of the governor when the engine is operating at a governed speed. The manual throttle shall be labeled "THROTTLE" and shall be labeled to indicate the functional result of the control movement (i.e. FAST, SLOW) per 4.2.11.

4.2.5 Control systems. When any or all of the following controls are to be provided, they shall be of the engine shutoff, warning-light, or buzzer type as specified in the end item specification (see 6.3). Glass-tube mercury switches and controls actuated by the gage needle position shall not be used.

4.2.5.1 High-temperature control.

4.2.5.1.1 Liquid-cooled engines. When liquid-cooled engines are to be provided with a high-coolant-temperature-engine-shutoff control, the control shall be set to actuate at the maximum temperature recommended by the engine manufacturer.

4.2.5.1.2 Air-cooled engines. When air-cooled engines are to be provided with a high-cylinder-head-temperature-engine-shutoff control, the control shall be set to actuate at the maximum temperature recommended by the engine manufacturer.

4.2.5.2 Lubricating oil control. When engines are to be provided with a control to limit low lubricating oil pressure operation, the control shall operate through direct pressure of the lubricating oil. The control shall be set to actuate at the minimum oil pressure recommended by the engine manufacturer.

4.2.5.3 Overspeed control. The engine shall be provided with an overspeed control to automatically stop the engine if the engine speed exceeds the maximum speed recommended by the manufacturer. The overspeed control shall operate independently from the regular governing mechanism and shall require

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manual resetting. When corrective action prior to loss of power is specified in the end item specification, an audible or visual overspeed warning device shall be provided in lieu of or in addition to time-delay, automatic-overspeed stopping of the engine as specified.

4.2.6 Cooling systems.

4.2.6.1 Liquid-cooled engines. The cooling system shall be of the type specified in the end item specification (see 6.3) and shall conform to the engine manufacturer's recommendations for all of the specified operating conditions. Cooling system shall be compatible with permanent type antifreeze conforming to MIL-A-46153.

4.2.6.2 Air-cooled engines. When an air-cooled engine is furnished (see 6.3), the engine shall be cooled by a fan that is either gear-driven, belt-driven, or directly driven from the crankshaft. The engine shall be provided with a fan shroud. The air intake face of the fan shroud shall be provided with a removable grille or screen guard. The fan shroud shall be designed to protect personnel from the rotating fan.

4.2.7 Exhaust system. The exhaust header outlet shall be provided with a suitable connection for attachment to the exhaust system in the end item.

4.2.8 Governing system. Engines shall be provided with either a centrifugal or hydraulic variable-speed governor, gear-driven from the engine, or an electronic variable-speed governor (see 6.3). Provisions shall be made for trimming governed speed setting throughout the entire load range while the engine-driven equipment is in operation. The engine speed at any load between no-load and full rated load shall be not less than 10 percent. Engines for vehicle application may be supplied with a maximum-minimum speed governor, or as specified in the end item specification.

4.2.9 Air-induction system. When a heavy-duty air cleaner is furnished (see 6.3), it shall be of the dry type conforming to MIL-A-52363, with a raincap conforming to MS51389 and a restriction indicator conforming to MS53063.

4.2.10 Cranking System. Unless otherwise specified in the end item specification, an electric-cranking system shall be furnished (see 6.3).

4.2.10.1 Electric-cranking system. The electric-cranking system shall be either a 12- or 24-volt (see 6.3) electric circuit energized by storage batteries. The electric circuit shall have a negative ground and shall include the following:

- a. Electric-cranking motor with appropriate automatic engagement and drive mechanisms.

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- b. Storage batteries with appropriate frame or box.
- c. Battery-charging generator/alternator with appropriate regulator, wiring, and mounting provisions.
- d. Circuit devices, including switches, relays, connectors, receptacles, and wiring.

4.2.10.2 Cranking motors. The cranking motor shall be furnished by the engine manufacturer or shall be approved by the engine manufacturer for the particular end item application.

4.2.10.3 Storage batteries. Unless otherwise specified (see 6.3), batteries shall be furnished and shall conform to MS35000 or MS75047. The batteries shall be shipped charged and dry, with one filling of electrolyte furnished separately with each battery. Batteries shall be contained and restrained in a corrosion-resisting and acid-resisting box or frame providing for gas venting, drainage, rigid battery positioning, and accessibility to and observation of the battery cells and terminals. The battery terminals and clamps shall be at least 1 inch (25.4 mm) away from any uninsulated electrical conductors. With the battery-container cover removed, sufficient clearance shall be provided for removal of batteries and to permit connection and disconnection of the battery cables without danger of shorting the battery against other components. If the electric-cranking system uses more than one storage battery, then a pictorial battery connection diagram that is readable while the batteries are being serviced shall be provided.

4.2.10.4 Battery cables and terminals. Battery cables shall be in accordance with SAE J541 for "Heavy Duty Use" at the applicable voltage, except the positive and negative terminal shall be colored red, labeled "+", and colored black, labeled "-", respectively per 4.2.11. Battery cables shall not be spliced. Cable resistance shall conform to starter-motor manufacturer's recommendations.

4.2.10.5 Cold weather starting aid systems.

4.2.10.5.1 Starting priming systems. When utilized (see 6.3), the auxiliary fluid priming system shall conform to MIL-E-52649, type III, size as applicable. Fuel cylinders shall conform to MS39254 using primer fuel conforming to O-F-1044. A tapped and plugged hole, or holes, 0.25-inch (6.35-mm) NPT, shall be provided in the intake manifold or other component of the air-induction system to facilitate application of priming devices.

4.2.10.5.2 Combustion air preheating systems. When utilized (see 6.3), the combustion air preheating system, whether high-watt intensity "glow plug" electrical type or fuel burning type, shall enable the engine to start at ambient air temperatures as low as minus 25 °F. If "glow plugs" are used, they

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shall be 12- or 24-volt to be compatible with the electrical system specified in the end item specification (see 6.3).

4.2.10.6 Charging generator/alternator. The battery-charging generator shall be of the direct current (dc) or alternator (rectified alternating current (ac)) type. A protective-relay assembly shall be provided to protect the complete battery-charging system when an alternator system is furnished. The relay assembly shall protect the charging system from the batteries being incorrectly installed, incorrect polarity of slave or jumper cables, and performing maintenance or repairs anywhere on the engine or engine-driven equipment when using an electric-arc welder.

4.2.10.7 Charging receptacles. When auxiliary electrical power is required (see 6.3), a waterproof slave receptacle shall be provided for connection to an external power source for emergency engine starting and for recharging the batteries. The receptacle shall conform to MIL-C-62122 and shall have sufficient clearance to insert a plug conforming to MIL-C-62122 with its cable. The receptacle shall be mounted for access outside the enclosure of the engine-driven equipment and shall be connected into the battery circuit.

4.2.11 Human factors engineering. The engine, engine components, and engine accessories shall conform to accepted Human Factors Engineering Design Criteria as described in MIL-STD-1472. Special design emphasis shall be given, but not limited to, paragraph 4 (General Requirements), 5.4 (Controls), 5.5 (Labeling), 5.6 (Anthropometry), 5.9 (Design for Maintainability), and 5.13 (Hazards and Safety) of MIL-STD-1472, as applicable.

4.3 Peculiar requirements. Peculiar requirements for engines furnished in end item specifications, classes III and IV, shall be as follows when specified in the end item specification.

4.3.1 Gasoline engines.

4.3.1.1 Valve mechanism (4-stroke-cycle engines). Induction hardened exhaust valve seats or replaceable exhaust valve seat inserts, pressed or shrunk into place, shall be used.

4.3.1.2 Two-stroke-cycle engines. Two-stroke-cycle engines shall be lubricated from a pressure-vapor system. The gasoline tank filler shall incorporate a cap marked to indicate the quantity of lubricating oil to be mixed with a full tank of gasoline.

4.3.1.3 Four-stroke-cycle engines. Four-stroke-cycle engines shall be of the wet-sump type and shall have a splash, a forced feed and splash, or a pressure system for lubrication.

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4.3.1.4 Fuel system. All components of the fuel system shall operate with fuels conforming to MIL-G-3056, MIL-G-46015, and VV-G-1690.

4.3.1.5 Cranking system. Manual cranking for group I engines shall be either a rope or handcrank. The rope or handcrank shall be furnished. If an automatic-rewind rope starter is used, the rope shall be galvanized flexible steel-stranded wire rope or braided nylon. An auxiliary starting sheave at an accessible location shall be provided for use in the event the rewind starter becomes inoperative.

4.3.1.6 Ignition system. A distributor, magneto, or breakerless type ignition system shall be furnished. The system shall be complete and shall include all accessory items necessary for operation of the engine. An ignition switch shall be provided. Spark plugs for 4-stroke-cycle engines shall conform to W-S-506, MS35909, or MS51009.

4.3.2 Diesel engines.

4.3.2.1 Cylinder blocks. Cylinder blocks shall be provided with replaceable cylinder liners or individually replaceable cylinders or provision for reboring and sleeving the cylinders for any bore diameter 4 inches (101.6 mm) or more, unless a sleeveless engine is specified. All engines having aluminum alloy cylinder blocks shall have cast in or replaceable cylinder liners.

4.3.2.2 Fuel system. All components of the fuel system shall operate with fuels conforming to MIL-F-46162, MIL-T-83133, and VV-F-800.

5. TEST

5.1. Preproduction tests.

5.1.1 Classes I and II end item classifications. Unless otherwise specified in the end item specification (see 6.3), preproduction tests of engines are not required for standard commercial or modified commercial end items.

5.1.2 Classes III and IV end item classifications. The engines shall be tested in accordance with MIL-STD-1400, Test Method 2000, prior to the installation in the end item when specified in the end item specification (see 6.3).

5.2 Production engine tests. Each engine shall be examined and tested in accordance with the engine manufacturer's standard production run-in tests. The engine manufacturer shall certify that the test method used has been his current standard commercial practice for at least 6 months prior to bid. If at any time the certified test method is changed, the engine manufacturer shall recertify that the new method is his current commercial practice.

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5.3 Production control tests. Production control tests shall be conducted on sample engines in accordance with the engine manufacturer's standard quality control procedures. The engine manufacturer shall certify that the quality control procedures used have been his current standard commercial practice for at least 6 months prior to bid.

6. NOTES

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

6.1 Intended use. This standard contains requirements for the selection of industrial engines for end item application.

6.2 First article baseline. Successful completion of the end item first article tests should determine the engine baseline configuration for the duration of the contract. Changes to the engine will be controlled through configuration management procedures.

6.3 Options. End item procurement documents should specify the following:

- a. Title, number, and date of this standard.
- b. When a gasoline or diesel engine should be furnished (see 1.2 and 1.3).
- c. End item classification (see 1.4).
- d. Method of selecting engine (see 1.4.1 through 1.4.1.4).
- e. When engine components and accessories are not manufacturer's standard commercial items (see 4.1.2).
- f. When engine identification marking will not be the manufacturer's standard commercial practice (see 4.1.5).
- g. When engine is required to conform to EPA Regulations (see 4.1.6).
- h. When engine rotation is other than counterclockwise (see 4.1.7).
- i. When environmental operating conditions shall be other than specified in this standard (see 4.2.1).
- j. When maximum engine operating limits may be exceeded (see 4.2.1.1, table I).
- k. Tilt conditions required (see 4.2.1.4).
- l. When engine control systems are to be furnished, and type (see 4.2.5).

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- m. Type cooling system required (see 4.2.6.1 and 4.2.6.2).
- n. Type of governing system to be furnished (see 4.2.8).
- o. When a heavy-duty air cleaner is to be furnished (see 4.2.9).
- p. When a cranking system other than electric is to be furnished, and type (see 4.2.10).
- q. Whether cranking system shall be 12- or 24-volt (see 4.2.10.1).
- r. When MS storage batteries are to be furnished (see 4.2.10.3).
- s. When a cold weather starting aid system is to be furnished, and type (see 4.2.10.5).
- t. When a charging receptacle is to be provided (see 4.2.10.7).
- u. When preproduction tests on engines are required (see 5.1.1).
- v. When the engine should be tested in accordance with MIL-STD-1400, Test Method 2000 (see 5.1.2).

6.4 Special clauses. The clauses given in the succeeding paragraphs are to aid the procuring agency in preparing invitations for bids and contracts to ensure that required data and information is supplied by the supplier to determine compliance with the applicable selection method.

6.4.1 Data requirements. The end item supplier is responsible for obtaining from the engine manufacturer all information and data required in this standard for review by the Government. The supplier shall be considered nonresponsive if all required information and data is not included in the proposal (see table II). Each supplier should indicate which of the selection methods, as defined in 1.4.1, the engine to be furnished meets.

- a. If commercial experience is indicated, figure 1, "Engine Description and Performance History", should be submitted with the supplier's proposal.
- b. If Environmental Protection Agency (EPA) tests are indicated, EPA certification, along with maximum certified brake horsepower rating achieved during the 1000-hour test, should be submitted with the supplier's proposal.
- c. If manufacturer's certified test data is indicated, the supplier should furnish certified engine test data based upon a minimum of 1000 hours engine endurance testing for review by the procurement activity.

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- d. If engine test (applicable only to class III, noncommercial counterpart end items) is indicated, the engine should be successfully tested and certified test data should be submitted to the Government for review prior to application in the end item.

TABLE II. Required data.

Required data	Time of submission
Engine description and performance data, see 1.4.1.1a, 1.4.1.2a, and 1.4.1.3a.	Submission of bid.
EPA data, see 1.4.1.1b, 1.4.1.2b, and 1.4.1.3b.	Submission of bid.
Manufacturer's certified test data, see 1.4.1.1c, 1.4.1.2c, and 1.4.1.3c.	Prior to first article inspection.
Noise measurement data, see 1.4.1.1d, 1.4.1.2d, and 1.4.1.3e.	Submission of bid.
MIL-STD-1400 certified test data, see 1.4.1.3d.	Prior to first article inspection.
Certification of suitability for intended use, see 4.1.1 and 6.4.2a.	Prior to first article inspection.
Certification of production engine and production control tests, see 5.2 and 5.3, including copy of procedures.	Submission of bid.
Warranties, see 6.4.2.	Submission of bid.

6.4.2 Warranty clause. In addition to the warranty extended by the prime supplier for the end item, a separate warranty should be furnished by the engine manufacturer to cover the following:

- a. Suitability of the engines for specified end item classification use. The engine should be certified and warranted by the engine manufacturer that the engine is suitable for its intended use providing the end item supplier's installation design and service/maintenance schedule is approved by the engine manufacturer.
- b. Satisfactory operation of the engine on the fuels and lubricants specified herein.

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- c. Satisfactory operation of the engine at the environmental conditions specified in the end item specification.
- d. Certify that components and accessories are current items of production for class I and class III engines.

6.5 Subject term (key word) listing.

Engines, commercial industrial
Engines, diesel
Engines, four-stroke-cycle
Engines, gasoline
Engines, industrial
Engines, military design end item
Engines, modified commercial end item
Engines, noncommercial counterpart end item
Engines, standard commercial end item
Engines, two-stroke-cycle
Methods for selection of industrial engines
Selection of industrial engines, methods for

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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ENGINE DESCRIPTION AND PERFORMANCE HISTORY

1. Engine manufacturer _____
2. Engine Model No. _____ Specification No. _____
3. Horsepower

Maximum power	_____	bhp at	_____	max rpm	_____	bmp.
Maximum intermittent (1hr)	_____	bhp at	_____	rpm	_____	bmp.
Net continuous	_____	bhp at	_____	rpm	_____	bmp.
Horsepower required for end item	_____	bhp at	_____	rpm	_____	bmp.
4. Maximum torque _____ lbs/ft at _____ rpm.
5. Bore _____ in.
6. Stroke _____ in.
7. Total displacement _____ cu in.
8. Weight _____ lbs.
9. Height _____ in., length _____ in., width _____ in.
10. Major customers for end item application.

NameAddress

11. End item description

FIGURE 1. Engine description and performance listing form.

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Custodians:

Army - ME
Air Force - 99

Preparing Activity:
Army - ME

Project 2805-0552

Review Activities:

DLA - CS
Air Force - 82

User Activities:

Army - CE
Navy - MC

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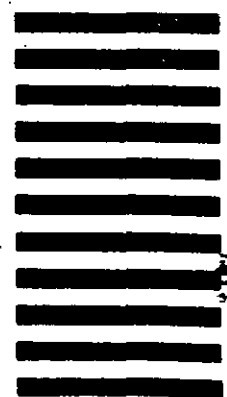
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-STD-1410A	2. DOCUMENT TITLE Methods for Selection of Industrial Engines for End Item Applic
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
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	b. WORK TELEPHONE NUMBER (Include Area Code) - Optional
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