

MIL-P-19131(SHIPS)
23 January 1956
SUPERSEDING
S47-3 (in part)
(See 6.3)

MILITARY SPECIFICATION

PUMPS, ROTARY, POWER DRIVEN, MISCELLANEOUS

1. SCOPE

1.1 Scope.- This specification covers positive displacement, power driven, miscellaneous, rotary pumps.

1.2 Classification.- Pumps shall be of the following classes and types:

Class N-2 - Diesel fuel oil service or transfer.

Class N-4 - Purifier pumps and Diesel engine attached fuel oil.

Class O-2 - Lubricating oil service or transfer, and fog oil transfer_a

Class O-3 - Lubricating oil, small attached, for auxiliary machinery.

Type I- Cam and plunger.

Type III - Screws without timing gears.

Type IV - Impellers with timing gears.

Type V - Spur, helical or herringbone gears.

Type VI - Spur, helical or herringbone gears with timing gears,

Type VIII - Internal gear,

Type IX - Vane (swinging).

2. APPLICABLE DOCUMENTS

2.1 The following specifications, standards and drawings, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

FF-B-171 - Bearing, Ball, Annular, (General Purpose).

FF-B-185 - Bearings, Roller, Cylindrical; and Bearings, Roller, Self-Aligning.

QQ-I-652 - Iron Castings, Gray.

QQ-S-691 - Steel, Plate, Marine Boiler.

FED. SUP. CLASS 4320

MIL-P-19131(SHIPS)

FEDERAL (cont'd.)

QQ-S-751 - Steel, Structural, (Including Welding).

GGG-P-15 - Packing Tools, Extracting and Tamping; Stuffing Box Packing and Lantern Glands.

GGG-P-781 - Pullers, Bushing, Bearing, Gear, Wheel Hub and Cylinder Sleeve, Installing and Removing.

MILITARY

MIL-B-233 - Boxes, Repair Parts.

JAN-P-735 - Primer, Paint, Zinc -Chromate, Alkyd Type

MIL-S-869 - Steel: Forgings for Nitriding and Nitrided Steel.

MIL-S-890 - Steel: Forgings and Bars for Hulls, Engines, and Ordnance (Heat Treated).

MIL-N-894 - Nickel-Copper-Alloy Bars, Plates, and Other Wrought Forms.

MIL-S-901 - Shockproof Equipment, Class HI (High-Impact) Shipboard Application, Tests for.

MIL-D-963 - Drawings, Production (for Electrical and Mechanical Equipment for Naval Shipboard Use).

MIL-C-2174 - Controllers and Master Switches, Direct-Current (Naval Shipboard Use).

MIL-C-2212 - Controllers and Master Switches, Alternating-Current (Naval Shipboard Use).

MIL-I-15024 - Identification Plates, Information Plates and Marking Information for Identification of Electrical, Electronic and Mechanical Equipment.

MIL-T-15071 - Technical Manuals for Mechanical and Electrical Equipment.

MIL-S-15083 - Steel; castings.

MIL-B-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).

MIL-R-15137 - Repair Parts for Electrical and Mechanical Equipment (Naval Shipboard Use).

MIL-E-15163 - Engines, Diesel, Commercial-Type.

MIL-C-15328 - Coating, Pretreatment (Formula No. 117 for Metals).

MIL-B-16261 - Bronze, Bearing: Castings.

MIL-B-16540 - Bronze, Phosphor; Castings.

MIL-M-16576 - Metal, Gun; Castings.

MIL-P-16789 - Preservation, Packaging, Packing and Marking of Pumps, General, and Associated Repair Parts.

MIL-P-19131(SHIPS)

MILITARY (cont'd.)

- MIL-M-17059 - Motors; Alternating-Current, Fractional HP (Shipboard Use).
- MIL-M-17060 - Motors; Alternating-Current, Integral HP (Shipboard Use).
- MIL-I-17166 - Iron Castings; Nodular Graphitic (Ductile Iron) (for Shipboard Applications),
- MIL-M-17413 - Motor, Direct-Current, Integral HP (Shipboard Use).
- MIL-N-17506 - Nickel-Copper-Aluminum Alloy, Wrought.
- MIL-C-17516 - Copper-Silicon Alloy Bars, Plates, Rods, Sheets, Strips, Flat Wire, Wire, Forgings, and Structural and Special Shaped Sections.
- MIL-T-17523 - Turbine, Steam, General Auxiliary (Naval Shipboard Use).
- MIL-P-17545 - Primer, Paint, Shipboard, Alkyd-Red Lead Type, Formula No. 116.
- MIL-M-17556 - Motors; Direct Current, Fractional HP (Shipboard Use).
- MIL-G-17859 - Gear Assembly, Speed Decreaser; and Gear Assembly, Reverse (Naval Shipboard Use).
- MIL-V-20065 - Valve, Relief (Shipboard Use).

NAVY DEPARTMENT

- General Specifications for Inspection of Material.
- General Specifications for Ships:
 - Section S9- 1- Welding and Allied Processes.

STANDARDS

MILITARY

- MIL-STD-10 - Surface, Roughness, Waviness and Lay.

DRAWINGS

BUREAU OF SHIPS

- B-104 - Flanged Composition Pipe Fittings.
- B-105 - Flanged Composition Pipe Fittings.
- B-110 - Steel Flanges for Steel Tubing -10 Inches and Smaller (150 P. S. 1., 650° F. ; Over 10 Inches 50 P.S.I., 650° F.).

MIL-P-19131(SHIPS)

BUREAU OF SHIPS (cent'd.)

- B-153 - Packings and Gaskets, Application of.
- B-176 - Flanges, Composition, Silver Brazing.
- B-177 - Flanges, Composition, Silver Brazing.
- B-214 - Root Conn actions for Attaching Piping.

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

2.2 Other publications. - The following document forms a part of this specification. Unless otherwise indicated the issue in effect on date of invitation for bids shall apply.

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.).

3. REQUIREMENTS

3.1 Qualification. - Class N-2 and class O-2 pumps furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein (see 6. 2).

MIL-P-19131(SHIPS)

3.2 Pump characteristics. - The general range of pump characteristics shall be in accordance with table L Characteristics of pumps to be procured shall be specified in the individual contracts or orders.

Table I - Pump characteristics.

Class	Discharge pressure	Rated capacity	Suction lift at rated capacity ¹	Viscosity range of liquid for test purposes	Range of liquid temperatures under operating conditions ²	Preferred type of drive
	P. s. i. g.	G. p. m.	Inches of mercury	SSU	Degrees Fahrenheit	
N-2	10 - 50	10 - 50	10 - 15	33 - 100	35 - 100	Motor
N-4	10 - 50	1 - 15	10 - 15	33 - 500	35 - 180	Attached to unit being served
O-2	25 - 100	15 - 300	10 - 20	130 - 5000	60 - 160	Turbine motor
O-3	10 - 50	1 - 15	5 - 10	75 - 1700	60 - 160	Attached to unit being served

¹ Referred to centerline of pump rotors.

² Temperatures do not necessarily correspond with the viscosity range, but indicate temperature pumps may be expected to encounter in service.

MIL-P-19131(SHIPS)

3.3 General design. -

3. 3.1 The principle of reliability is paramount and no compromise of this principle shall be made with any other basic requirements of design. It is the intention of this specification to obtain pumps of such design that they will operate over a long period of years with a minimum of servicing. Where wear or erosion is unavoidable the parts subjected to such wear or erosion shall be of the best materials available for the purpose in order to reduce these detrimental effects to a minimum. The design and construction of all pumps shall be the most compact consistent with the following requirements:

- (a) Reliability.
- (b) Accessibility for repair.
- (c) Resistance to wear or corrosion.
- (d) Economy.
- (e) Satisfactory operation when inclined as follows, unless otherwise specified in the contract or order:

Surface ships

- (1) degrees from the normal horizontal position in the fore and aft plane (permanently inclined).
- (2) Up to 15 degrees to either side (permanently inclined).
- (3) With the ship rolling up to 45 degrees from the vertical to either side.
- (4) With the ship pitching 10 degrees up and down from the normal horizontal plane.

	Submarines	Submerged	Snorkel	Surface
Trim (permanent)	30 degrees	7 degrees	7 degrees	7 degrees
Pitching	10 degrees	10 degrees	10 degrees	10 degrees
Time of complete pitch cycle	4 seconds	4 seconds	4 seconds	4 seconds
List (permanent)	15 degrees	15 degrees	15 degrees	15 degrees
Rolling	30 degrees	30 degrees	30 degrees	30 degrees
Time of complete roll cycle	12 seconds	12 seconds	12 seconds	8 seconds

Note 1.- Degrees indicated are measured from the vertical to either side from list and roll, and from the normal horizontal plane up or down from trim and pitch.

Note 2.- Horizontal pumps are normally in a ship with the shaft in the fore and aft position.

3.3.2 Shockproofness. -

3.3.2.1 All equipment shall be designed to withstand shock due to fixing of the ship's own armament and noncontact underwater explosions of near-miss aerial bombs, torpedoes, and mines. Every attempt shall be made to design the equipment to resist shock as specified in graphs, A, B, and C, shown on figure 1, it being understood that these shocks are applied at the footings of the component. Shockmounts shall not be used unless bureau or agency concerned approval of the mount and its proposed application is given.

3.3.2.2 Equipment shall be designed to resist shock by using the accelerations specified on the graph shown on figure 1 for determining shock forces. The determination of stresses resulting from these forces is accomplished by the application of the usual methods of analytical mechanics. The allowable stress in components due to shock shall be the yield strength (0.2 percent offset) of the material. Normal stresses in parts, such as the tensile stress in a bolt due to initial pull-up, shall not be added to the shock stresses. It is of paramount importance that the accelerations shown on the curves of figure 1 be utilized in the design of holding down bolts, supporting feet or lugs and main structural members of the equipment and that no failure or permanent deformation occur as a result of shock. Components of an assembly mounted on a common rigid base need not be designed for higher accelerations than the values for which the whole assembly is designed unless the designer has reason to believe that higher accelerations will be experienced by the components.

3.3.2.3 The design of all complete pump units shall be such that they are capable of passing the high-impact shock test specified in Specification MIL-S-901.

3.3.2.4 Bolts designed to be stressed in shear shall be installed in holes with a minimum of clearance, as experience indicates that large clearances allow impacting and subsequent failure.

3.3.3 Alignment between separate components of a unit shall, in general, be maintained by means of keyways or other adequate means.

3.3.4 In no case shall a piece of equipment be rigidly supported from more than one plane.

3.3.5 The design, construction, and workmanship, of the equipment shall be such that a minimum practical noise level will result under all operating conditions.

MIL-P-19131(SHIPS)

3.3.6 All pumps shall be self-priming and capable of removing air from the suction lines. The pumps may at times be required to handle oils lighter than those specified, water, sediment and sludge, such as may settle out and accumulate in the bottom of tanks; Hence, where the lubrication of the pump is supplied by the fluid pumped, the bearings, rotors, and gears shall be of such design and materials that the pumps will operate in a manner satisfactory to the bureau or agency concerned when pumping such fluids for limited periods (see 3.3.8.9.1.1).

3.3.7 Mounting.-

3.3.7.1 Pump units shall be horizontally or vertically mounted, as Specified (see 6. 1).

MIL-P-19131(SHIPS)

3.3.7.2 Each horizontal pump and driving unit shall be mounted on a common bedplate.

3.3.7.3 Unless otherwise specified in the contract or order, each vertical pump and driving unit shall be base mounted or table mounted, as specified (see 6.1).

3.3.7.4 For the base mounted units, the base may be either integral with the pump casing or a separate piece, and the base shall have provision for bolting to a foundation.

3.3.7.5 For the table mounted units, the table mount may be either integral with the pump casing or bracket, or it may be a separate piece.

3.3.7.6 A suitable bracket shall be provided between the pump and driver of vertical units.

3.3.7.7 When so specified, class N-4 and O-3 pumps may be attached directly to the units being served (such as an engine or purifier) instead of having their own bedplates. These pumps may also be driven by the units served.

3.3.7.8 Bedplates, bases, table mounts and brackets shall be designed so that they shall be sufficiently rigid to permit handling, shipment and installation of the unit onboard ship, without disturbing the alignment of the assembled units, and such that the normal distortion, weaving or vibration of the supporting structures onboard ship cannot cause misalignment between the pumps and driving units,

3.3.7.9 Each component part of an assembled unit supported directly by the bedplate, base, table mount, or bracket, shall be doweled thereto to facilitate reassembly and maintenance of alignment.

3.3.7.10 All bearing and seating surfaces of bedplates, bases, table mounts, or brackets shall be finished machined.

3.3.7.11 In the event special bulkhead mounting is required, sideplates shall be furnished subject to all the conditions specified for bedplates.

3.3.7.12 Horizontal class O-2 and N-2 pumps shall be designed so that all bearings, rotors, and shafts may be removed and replaced without disconnecting piping, except stuffing box gland seal piping, and without removing the pump or its driving unit from the bedplate or base.

MIL-P-19131(SHIPS)

3.3.7.13 Each vertical class O-2 and N-2 unit, in order to facilitate interchangeability, shall be constructed to permit rotation of the pump with respect to its driver.

3.3.8 Bearings, -

3. 3.8.1 Radial bearings. - Radial bearings may be of the ball, roller or sleeve type.

3. 3.8.2 Ball or roller bearings for radial loads and the installation thereof shall be in accordance with Specifications FF-B-171 and FF-B- 185.

3. 3.8.3 Sleeve radial bearings may be of the fixed or self aligning type as approved for design and application by the bureau or agency concerned. Ample bearing surface shall be provided for each sleeve bearing.

3.3.8.4 Thrust bearings. - Pumps shall be designed to counteract any unbalanced hydraulic or ~~mechanical thrust~~ under normal service condition. In this connection consideration shall be given to the fact that the normal motion of a ship at sea or an abnormal list or trim giving an inclined operating platform may introduce mechanical thrust in a unit which might otherwise be in satisfactory balance.

3.3.8.5 Thrust bearings may be of the straight thrust rolling contact, combined radial and thrust rolling contact or plain sliding surface type.

3.3.8.6 Thrust bearings of the rolling contact type and the installation thereof shall be in accordance with Specifications FF-B- 171 and FF-B-185, as applicable.

3. 3.8.7 Sliding surface thrust bearings shall be as approved for design and application by the bureau or agency concerned..

3.3.8.8 Bearing installation. -

3.3.8.8.1 Where sleeve bearings are fitted in closed heads they may be of the solid bushing type secured by pins or keys. For independent bearings on brackets fitted at stuffing box ends, the sleeve bearings shall be split along the axis. All sleeve bearings in class O-2 and N-2 pumps shall be so arranged to permit renewal or ref itting without removal of the pump rotor from the casing, and they shall be securely fitted to prevent axial movement.

3.3.8.8.2 For either internally or externally mounted bearings, the bearing housing shall be cast integral with the pump case or bearing bracket, or secured thereto in such a manner as to insure alignment.

MIL-P-19131(SHIPS)

3.3.8.8.3 Bearing brackets shall be either cast integral with the casing, securely bolted to the casing on a machined shoulder, or held in alignment-With the casing by at least two heavy dowels and securely bolted thereto. The use of bolts alone for securing brackets is prohibited,

3.3.8.9 Bearing lubrication. -

3.3.8.9.1 Ball, roller, sleeve or sliding surface bearings may be lubricated by the fluid pumped where such bearings are located within the pump casing and are not separated by packed glands from the fluid pumped, provided the bearing housings are so designed that there are no pockets, which may act as water, sediment, or sludge traps and a continuous circulation of fresh oil is provided through such bearings.

3.3.8.9.1.1 Bearings lubricated by the fluid pumped shall be required to operate in a manner satisfactory to the bureau or agency concerned throughout the test specified in 4.2.8.1; however deterioration to a point requiring replacement of the bearings immediately after the test will not disqualify the bearings.

3.3.8.9.2 Externally mounted ball or roller bearings shall be lubricated in accordance with Specification FF-B-171 or FF-B- 185, as applicable.

3.3.8.10 The number, type and arrangement of bearings shall be as approved by the bureau or agency concerned.

3.3.9 Piping and valves. -

3.3.9.1 All suction, discharge, and relief valve connections on class O-2 and N-2 pumps shall be flanged; the flanged connections shall be in accordance with Drawings B-104, B-105, B-110, B-176, and B-177, as applicable. Suction and discharge pressure gage connections shall be flanged; the flange connections shall be in accordance with Drawing B-214.

3.3.9.2 Gland seal piping shall be 1/8 inch iron pipe size (i. p. s.) extra heavy steel pipe, with steel valves, steel fittings and steel unions, all screwed.

3.3.10 Drains. - The bottom of all pump casings or heads shall be provided with a drain connection. Drains shall be fitted to drip pockets.

3.3.11 Relief valves. -

3.3.11.1 Relief valves shall be in accordance with Specification MIL-V- 20065.

MIL-P-19131(SHIPS)

3.3.11.-2 Unless otherwise specified in the contractor order, all pumps shall be fitted on the discharge side with relief valves, of size and setting approved by the bureau or agency concerned. The relief valve shall be externally adjustable and of such size that it will pass the full rated capacity of the pump with a pressure rise of not more than 10 percent over the rated discharge pressure.

3.3.11.3 The relief valve shall be installed within the pump casing. The valves shall be of such a design that leakage of oil from the spring case or leakage of air into the discharge side of the valve is prevented.

3.3.12 Casing and heads. -

3.3.12.1 Casings, also referred to as cylinders, are those parts which enclose the rotors. The bores of the casings are parallel to the rotors.

3.3.12.1.1 Casing liners, also referred to as rotor housings, are replaceable parts located between the casing and the rotors.

3.3.12.1.2 Casing liners, or casings if not fitted with liners, are wearing parts (see 3.9.2. 1).

3.3.12.1.3 Casings shall be made as light as possible consistent with strength and shall be ribbed and braced on the outside as necessary to give stiffness and rigidity under the working pressure. The interiors shall be smooth cored with easy bends wherever the direction of flow is changed.

3.3.12.2 It is preferred that pump casings for pumps having a capacity of 50 gallons per minute or more be equipped with easily removable liners. However, consideration will be given to pumps not having this feature. Either liners or casings shall be supplied as repair parts as specified in 3.9 covering wearing parts.

3.3.12.3 Suction and discharge openings shall be cast integral with the casings or heads, shall have machined and scraped or ground flange faces suitable for metal to metal joints, and shall be located as approved by the bureau or agency concerned.

3.3.12.4 The heads shall have accurately machined faces with a ground or scraped finish. Joints between casings and heads may be made up either metal to metal or with a thin plant or animal fiber gasket not exceeding 0.010 inch in thickness. Heads shall be rabbetted or doweled to the casings.

3.3.12.5 Forcing bolts and lifting bolts shall be provided as necessary for convenient handling during overhaul.

MIL-P-19131(SHIPS)

3.3.12.6 One or more test lugs may be required to be cast integral with gun metal castings in accordance with Specification MIL-M- 16576, at the discretion of the bureau or agency concerned. When test lugs are required the bureau or agency concerned will advise in its comments on working drawings as to the number, size and location of the test lugs required.

3.3.13 Rotors and shafts, -

3.3.13.1 All rotors shall be accurately finish machined or ground throughout. They shall be integral with or secured to the shafts by keys or other method approved by the bureau or agency concerned. Rotors shall be secured positively against lateral displacement on shafts,

3.3.13.2 Means shall be provided for the escape of the liquid pumped from all points between rotors or gear teeth where it may be trapped during operation and thereby create a dangerously high pressure. Means of entrapment relief shall be satisfactory to the bureau or agency concerned.

3.3.13.3 Deflector rings or other similar method approved by the bureau or agency concerned shall be used to prevent leakage from the stuffing boxes running along the shafts. The use of felt seal rings only will not be permitted. If authorized in combination with other methods, they shall be installed so they can be replaced without dismantling the pump.

3.3.13.4 Shafts shall have a minimum hardness of 275 Brinell, and shall be accurately machined and ground. Means shall be provided on the driven or driving shaft of each unit so that a portable tachometer may be quickly and easily applied or unless a revolution counter is permanently installed. Either the tachometer or revolutions counter shall be of a type which is satisfactory to the bureau or agency concerned. Provision for the use of tachometer will not be required on pumps driven by alternating current motors.

3.3.14 **Timing gears.** - Timing gears may be of the spur or double helical type. Timing gears of steel shall be case hardened to a minimum depth of 0.0625 inch and shall have a hardness of 575 to 700 Brinell. Gears shall be fully enclosed and adequately lubricated. Timing gears shall be located so as to prevent either radial or lateral movement. The method is to be approved by the bureau or agency concerned.

3.3.14.1 Provision shall be made for replacement of timing gears in the field, so that it will be satisfactory to carry and replace individual parts of rotating elements. The method of installing and timing the timing gears shall be thoroughly explained, with sketches if necessary, in the technical manuals.

MIL-P-19131(SHIPS)

3.3.15 Couplings. -

3.3.15.1 Unless otherwise specifically approved by the bureau or agency concerned a flexible coupling of all metal construction and of a design satisfactory to the bureau or agency concern shall be installed between the pump and the driving unit.

3.3.15.2 AU coupling hubs, which are to be fitted to driving or driven shafts larger than 1 inch in diameter, shall be fitted to the shafts on a taper, shall be secured against turning on the shafts by keys fitted parallel to the taper, and shall be secured on the shafts by lock nuts.

3.3.18 Stuffing boxes and packing. -

3.3.16.1 Stuffing boxes shall be of adequate depth and so designed that when properly packed leakage is reduced to a minimum under all operating conditions.

3.3.16.2 Pump gland packing shall conform to the applicable specifications listed on Drawing B-153. Sufficient space shall be provided between the bearings and stuffing boxes to permit ready renewal of packing and inspection and overhaul of the bearings.

3.3.18.3 Where a stuffing box is subject to discharge pressure, the design of the box shall be such as to trap the leakage therefrom by the use of a seal ring, or other method approved by the bureau or agency concerned, and return same by drain piping to the suction side of the pump, with needle valve to control the flow where necessary. Where a stuffing box is subject to suction pressure, suitable means shall be provided by seal rings and seal piping connected to the discharge of the pump for sealing the packing to prevent leakage of air into the pump suction. The sealing piping shall be fitted with a needle valve or valves as necessary for proper control.

3.3.16.4 Glands and seal rings, if used, shall be split in halves with the halves secured together in a manner to form solid rings for setting up.

3.3.16.5 All stuffing box glands shall be set up by nuts threaded on gland swing bolts or studs secured in the casings.

3.3.16.6 Seal rings shall be constructed, insofar as practical, so that lantern gland extracting tools in accordance with Specification GGG-P-15 may be used.

MIL-P-19131(SHIPS)

3.3.17 Rubbing speeds. - The maximum rubbing speed in feet per minute for a particular type pump shall be the speed established for the type pump during the qualification test. Pumps shall not be offered or furnished on any contract or order which operate at a rubbing speed greater than the rubbing speed at which the pump of the same type operated on qualification test.

3.3.18 Threaded parts. - Threaded parts shall conform to Handbook H28.

3.3.19 Welding. - Welding shall be in accordance with Section S9-1 of the General Specifications for Ships.

3.3.20 Painting. - AU external unmachined surfaces of ungalvanized ferrous metal parts shall be thoroughly cleaned and coated with one coat of pretreatment conforming to Specification MIL-C-15328, and one coat of zinc chromate primer, Specification JAN-P-735, or one coat of red lead primer conforming to Specification MIL-P-17545, followed by a finish coat of light gray equipment enamel conforming to Specification MIL-E-15090.

3.3.20.1 Painting of external surfaces of nonferrous parts of pumps will not be required.

3.4 Material. -

3.4.1 Material shall be as specified herein. Material not definitely specified shall be of the best quality used for the purpose in commercial practice, and shall be subjected to review and approval by the bureau or agency concerned. Material shall be free from all defects and imperfections that might affect the serviceability of the finished product.

3.4.2 The use of materials other than those indicated will be considered when the contractor shows the necessity for the substitution and the material proposed is readily obtainable. Substitution of materials will require the specific approval of the bureau or agency concerned in each case.

MIL-P-19131(SHIPS)

3.4.3. Materials for the pumps shall in accordance with table II as applicable.

Table II - Materials for class N-2, and O-2 pumps.

Application	Material	Specification
Casing and heads	Bronze, bearing castings Cast steel, class B Gun metal Nodular iron	MIL-B-16261 MIL-S-15083 MIL-M-16576 MIL-I-17166
Shafts	Forged steel, alloy No. 1 or No. 2 Nitrided steel, class a Nickel-copper-aluminum alloy Nickel-copper-alloy, rolled, class a or b	MIL-S-890 MIL-S-869 MIL-N-17506 MIL-N-894
Rotors	Forged steel, alloy No. 1 or No. 2 Nitrided steel, class a or b High test grey iron castings Nodular iron Gun metal Copper-silicon-alloy	MIL-S-890 MIL-S-869 QQ-I-652 MIL-I-17166 MIL-M-16576 MIL-C-17516
Sleeve bearings	Bearing bronze, grade II Phosphor bronze, grade A	MIL-B-16261 MIL-B-16540
Rotor housing or casing liners	Bearing bronze, grade II High test grey iron Nodular iron	MIL-B-16261 QQ-I-652 MIL-I-17163
Timing gears	Forged steel, alloy No. 2 Nitrided steel, class a or b	MIL-S-890 MIL-S-869
Casing side wearing plates	Chromium cobalt plated, 300 Brinell hardness minimum Nitrided steel	MIL-S-869
Stuffing-box glands	Phosphor bronze, grade A Bearing bronze, grade I Gun metal	MIL-B-16540 MIL-B-16261 MIL-M-16576
Piston slide pins	High test grey iron Nodular iron	QQ-I-652 MIL-I-17166
Bedplate	Cast steel, class CW Steel, structural (including welding) Steel, plate, marine boiler	MIL-S-15083 QQ-S-751 QQ-S-691

MIL-P-19131(SHIPS)

3.4.3.1 Materials for class N-4 and O-3 pumps shall be the same as listed in table 1 except that commercial materials may be used in place of Navy specification material.

3.4.3.2 Rotors for N-4 and O-3 pumps maybe of oil resistant rubber compound subject to specific approval of the bureau or agency concerned.

3.5 Pump drivers. -

3.5.1 Pumps may be direct connected or geared to the driving units as specified or approved in each case by the bureau or agency concerned, Attached pumps, class O-3 and N-4, may be geared, chain driven or belt driven,

3.5.2 Turbines. - Turbine drives shall be in accordance with Specification MIL-T-17523, and shall have the characteristics as specified in the contract or order.

3.5.3 Motors. - Motor drives shall be of the type and characteristics specified in the contract order and shall conform to Specification MIL-M- 17413 or MIL-M- 17556 for direct current, motors, and to Specification MIL-M- 17059 or MIL-M- 17060 for alternating current motors. Unless otherwise specified in the contract or order motors shall have the following features:

- | | |
|--|--|
| (a) Navy service | Service A. |
| (b) Ambient temperature | 50° c |
| (c) Duty | Continuous. |
| (d) Enclosure | Totally enclosed or totally enclosed fan cooled. |
| (e) Insulation | Class A or B. |
| (f) Type of bearings | Ball. |
| (g) Winding direct current or alternating current | shunt.
Squirrel cage induction. |
| (h) Design, alternating current | Design C. |
| (i) The full load torque at all speeds of multispeed motors shall be constant. | |

MIL-P-19131(SHIPS)

3.5.3.1 Motor rating. - The horsepower rating of each motor shall be not less than that required by the pump under maximum power conditions as determined by actual tests of identical or similar equipment. If such data is not available the required horsepower rating of the motor shall be determined by the following formula:

$$\text{Horsepower of motor} = \frac{1.05 (\text{max. hp. output of the pump})}{(\text{eff. of pump})}$$

If the motor hp. as determined by the above formula is less than 2 hp., then the value determined by the above formula shall be multiplied by an additional factor of:

$$1.5 = \left(\frac{\text{above formula hp.}}{4} \right)$$

The actual motor rating shall be in accordance with Navy standard motor ratings, but not less than the above formula hp.

3.5.4 Reduction gear. - Where gears are used, they shall be of the spur, single or double helix, or worm type in accordance with Specification MIL-G- 17859,

3.5.5 Controllers. - Motor controllers shall be in accordance with Specification MIL-C-2174 for direct current and Specification MIL-C-2212 for alternating current. Unless otherwise specified in the contract or order, controllers shall have the following features:

- | | |
|-------------------------|---|
| (a) Operation | Manual. |
| (b) Function | Motor starting. |
| (c) Duty | Continuous. |
| (d) Enclosure | Dripproof. |
| (e) Protective features | Thermal overload and
low voltage protection. |

Across-line direct current controllers are permissible for motors rated 1/2 to 1 horsepower, provided the motor is properly designed and the inrush currents (as determined by dividing the terminal volts by armature circuit resistance of the motor) do not exceed 10 times the rated current of the motor.

MIL-P-19131(SHIPS)

3.5.6 Diesel engine drivers shall be in accordance with Specification MIL-E- 15163 and shall have the characteristics as specified in the contract or order.

3.5.7 Gasoline engine drivers shall be as specified in the contract or order,

3.6 Identification plates. and information plates. -

3.6.1 Identification plates and information plates shall be furnished on each pump. These plates shall be type A or B in accordance with Specification MIL-I- 15024, except that identification plates of aluminum or plastic shall not be used.

3.6.2 Identification plates and information plates shall be firmly secured to the equipment with corrosion resistant metallic screws.

3.6.3 pump identification plates shall contain data as follows:

- (a) Manufacturer's name.
- (b) Manufacturer's model or type and size.
- (c) Service application.
- (d) Manufacturer's serial number.
- (e) Salient design characteristics:
 - (1) Capacity in gallons per minute.
 - (2) Discharge pressure.
 - (3) Suction lift.
 - (4) Speed of shaft in revolutions per minute.
 - (5) Brake horsepower.
 - (6) Test pressure.
 - (7) Viscosity range (operating).
- (f) Contract number (and item number for multiple unit orders).
- (g) Bureau of Ships stock number.
- (h) Section for inspector's stamp.

3. 6.4 Each driving unit and each pump pressure regulator or other accessory unit shall have an identification plate in accordance with the applicable equipment specification.

MIL-P-19131(SHIPS)

3.7 Drawings. -

3.7.1 Drawings shall be in accordance with type I of Specification MIL-D-963.

3.7.2 Outline drawings of the units (pump and driver) shall be furnished on each contract or order. Outline drawings of class O-2 and N-2 pumps shall comprise two sheets. The first sheet shall contain all the information, except performance curves, required by Specification MIL-D-963, to be shown on outline drawings. Completion and submission for final approval of the first sheet shall not be delayed by action required to complete the second sheet.

3.7.2.1 The second sheet shall contain complete performance curves. These curves shall be the performance acceptance tests curves required by 4. 3.5 and 4.3.6. The curves shall be on graphs which shall have dimensions approximately but not greater than 7 inches by 10 inches. Each graph shall contain the data required by 4.3.5. Promptly after completion of the performance acceptance tests the second sheet shall be completed.

3.7.2.1.1 After approval of the sheet of the outline drawing, which contains the curves, four positive (white background) prints of each graph shall be forwarded to the bureau or agency concerned. Each graph shall be on a sheet which has the same dimensions as the sheets comprising the technical manuals (see 3. 8). Each graph shall be arranged on a sheet in such manner that all information shown thereon may be easily read after insertion, by the bureau or agency concerned, in the technical manual. Reference to these curves shall not be contained in the index or text of the manual. Delivery of the final manuals shall not be delayed by actions required to complete and deliver to the bureau or agency concerned the four sets of pages showing the performance acceptance test curves.

3.7.3 Pump master drawings shall include detail drawings of all parts, and sectional assembly drawings with lists of material comprising all parts.

3.7.3.1 Detail drawings shall contain a number of details on each sheet; details of a single pump part on size A sheets, resulting in a multiplicity of drawing sheets, shall be avoided.

3.7. 3.2 The sectional assembly drawing shall contain a complete list of material with references to detail drawings. The assembly drawing shall not include couplings or brackets which may vary with different contracts or orders.

MIL-P-19131(SHIPS)

3.7.3.3 Any subassembly made up of parts which require special alignment or assembly methods which cannot be disassembled, repaired and reassembled onboard ship without the use of special tools and jigs shall be indicated as a subassembly in the list of material.

3.7.4 On detail drawings, surface roughness, waviness and lay shall be specified in accordance with requirements and symbols specified in Standard MIL-STD-10.

3.7.5 Drawings for drivers and associated equipment shall be in accordance with their respective specifications.

3.7.6 The center of gravity of the unit shall be indicated on outline drawings.

3.8 Technical manuals. -

3.8.1 Technical manuals shall be in accordance with type C of Specification MIL-T-15071.

3.8.2 Identification piece numbers of parts referred to in technical manuals shall be identical to the identification piece numbers shown on approved master drawings.

3.8.3 Technical manuals shall contain reproductions of dimensioned outline drawings of all units.

3.8.4 Preliminary technical manuals submitted for approval shall include all proposed sections of the books.

3.8.5 Two copies of technical manuals shall be packed with each pump unit. Additional copies shall be furnished as specified (see 6. 1). If final technical manuals are not available at the time pumps are shipped, then 2 copies of preliminary technical manuals shall be packed with each pump unit. The final books shall be delivered at a later time as specified in Specification MIL-T-1 5071.

3.9 Repair parts and tools. -

3.9.1 Onboard. - Repair parts shall be furnished and processed in accordance with Specification MIL-R- 15137.

MIL-P-19131(SHIPS)

3.9.2 Each set of repair parts and tools specified in the contract or order shall contain the parts listed in table III. Unless otherwise specified in the contract or order, the quantity of repair parts per set shall be based on one pump per ship (one pump per set of repair parts).

Table III - Onboard repair parts.

Item	Name of part	Quantity per set
a	Ball or roller bearings	100 percent complete
b	Oil seals	replacement for all
c	Packing, if special, and packing spacers	installed units per vessel.
d	Coupling bushings, pins, springs, and other wearing parts	
e	Sleeve, sliding surface bearings	One to four units per vessel
f	Cams, slides, slide pins, housings or liners, and similar wearing parts	100 percent replacement for one pump
		Over four units per vessel, 100 percent replacement for two pumps
g	Timing gears, reduction gears and pinions	100 percent replacement for one pump
h	Complete rotating element including bearings and complete coupling	

3.9.2.1 Casings shall be supplied in accordance with item (f) of table III for pumps not equipped with housings or liners (see 3.3. 12).

MIL-P-19131(SHIPS)

3.9.2.2 Pump rotor, item (h) of table III, shall be completely assembled ready for installation in the pump for which intended. This shall be interpreted to include any nonrotating part which can be installed only by removing some rotating part or parts of the pump rotor.

3.9.2.3 The quantities of onboard -repair parts listed in table III far items (a) and (g) inclusive shall not 'be reduced by reason of the same part being furnished with complete rotor, item (h).

3.9.3 Repair parts such as those for turbines, gears, engines, motors, and controllers, shall be furnished in accordance with the applicable component specifications

3.9.4 Special tools and wrenches. -

3.9.4.1 Each set of onboard repair parts shall include a complete set of all special tools and wrenches required for maintenance of the pumps, gears and drivers.

3.9.4.2 One set of special operating tools and wrenches shall be furnished with each pump unit, and shall include all wrenches and tools required for the operation of the complete pump units. Each set of special operating tools and wrenches shall be furnished in separate steel boxes. If *there are* not more than two such tools per set they may be attached to the pumps in a secure but readily accessible manner, rather than boxed

3.9.4.3 Each tool or wrench shall be indelibly marked indicating the intended purpose.

3.9.4.4 Tools which are available in the Catalog of Naval Material, General Stores Section, such as common wrenches and standard pullers, will not be required. Standard complete or limited sets of pullers or parts of puller sets in accordance with Specification GGG-P-781 shall be identified as to type and use in notes on the outline or section assembly drawings, Special tools shall be detailed, and included in the list of material.

3.9.4.5 Each box containing onboard repair parts shall contain a list entitled "List of onboard repair parts and tools". The list shall be in a format suitable for use on outline drawings and in the technical manuals. It shall not be less than nominal 8-1/2 by 11 inches in size.

MIL-P-19131(SHIPS)

3.9.4.5.1 The format of the list shall include a heading and columns of data for the items listed. The heading shall include titles and applicable entries as follows:

Reproduced from drawing number _____
 Number Of ships _____
 Application _____
 Contract number _____
 Manufacturer _____
 Quantities are for _____ units per ship
 The columns shall include:
 Piece number _____
 Name of part _____
 Quantity _____
 Drawing number _____
 Standard Navy stock number _____
 Additional columns may be used as applicable

3.9.4.5.2 The list shall be so treated as to be resistant to oil, water and fading.

3.9.5 Stock. - The selection, stock number and quantities of repair parts for stock shall be determined and processed in accordance with Specification MIL-R- 15137.

3.9.5.1 Unless otherwise specified in the contract *or* order, the cognizant supply demand control point for repair parts for stock shall be Ships Parts Control Center, Mechanicsburg, Pennsylvania

3.10 When any specification which forms a part of this, specification requires that the product be subjected to and pass qualification tests, only products which are listed on the applicable Qualified Products List on the date of invitation for bids or which may be added to that Qualified Products List subsequent to that date shall be utilized in the construction of equipment specified to be in accordance with this specification. In the event no Qualified Products List has been issued, the contractor shall request instructions as to what testing will be required to determine whether the product meets the requirements of the specification.

MIL-P-19131(SHIPS)

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests. - Tests shall be classified as follows:

- (a) Qualification tests.
- (b) Performance acceptance tests.
- (c) Hydrostatic tests.

4.2 Qualification tests. -

4.2.1 Qualification tests at a laboratory. - Qualification tests on class N-2 and class O-2 shall be conducted at a laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.2.8.

4.2.2 In addition to the tests at the laboratory class N-2 and O-2 pumps shall pass the following shipboard service tests:

- (a) Two or more pumps of the same general design and general operating characteristics shall have given satisfactory service onboard Naval vessels for a period of at least two years and shall still be in service on such vessels at the time qualification approval is requested.
- (b) When the design of pump in service, for which the manufacturer request qualification approval, does not meet current Naval requirements as regards suction lift, discharge pressure and capacity characteristics, the manufacturer will be required to furnish satisfactory evidence that he has produced pumps of a design, suction lift, discharge pressure and capacity characteristics equal to those currently required for Naval service. The Bureau of Ships may require additional qualification approval tests of any design of pump which in its opinion has been changed sufficiently to require further demonstration of its suitability..

4. 2.3 Pumps submitted for qualification tests shall have characteristic ratings of not less than the following:

<u>Class N-2</u>		<u>Class O-2</u>	
Rated capacity	50 g. p. m.	Rated capacity	100 g. p. m,
Discharge pressure	50 p. s. i.	Discharge pressure	100 p.s.i.
Suction lift	15 inches Hg.	Suction lift	20 inches Hg,

MIL-P-19131(SHIPS)

4.2.4 Qualification tests shall be conducted to determine that performance and design of the pumps are in compliance with this specification. The pressure, capacity, and other characteristics of the unit for the qualification test shall be as arranged between the Bureau of Ships and the exhibitor.

4.2.5 Separate qualification tests will be required on vertical and on horizontal units of each type, except that qualification granted on vertical design may be extended also to cover horizontal design at the discretion of the Bureau of Ships.

4.2.6 Units submitted for qualification test shall be operated at the maximum rubbing speed for which the unit is designed. Approval of a design of pump operating at a rubbing speed greater than that at which the tested unit operated on qualification approval test will not be *given* without an additional life test (see 3.3.17 and 4.2.8.1). The life test specified in 4.2.8.1 is intended to demonstrate the reliability of the type.

4.2.7 Unless otherwise arranged between the Government and the exhibitor, the pump for the qualification test shall be furnished complete with a prime mover and necessary accessories. The prime mover need not be made to Government specifications however, see (4. 3.10. 3). Qualification of a pump does not include qualification of the driver.

4.2.8 The following tests, in the order listed, shall be made to determine qualification:

- (a) Performance tests to demonstrate the ability of the pump to operate at the design characteristics (see 4.2. 4). Sufficient data shall be taken during these tests to prepare pump characteristic curves as specified in 4.3.5, except that curves of capacity versus power input to the driving unit, as specified in 4.3, 5 (e), will not be required.
- (b) Additional operating runs under conditions to be selected by the Bureau of Ships to determine:
 - (1) Volumetric efficiency, (2) mechanical efficiency and
 - (3) capacity, at varying speed.
- (c) Dismantle pump and measure all parts subject to wear and erosion.
- (d) Life test (see 4.2.8.1).
- (e) Dismantle pump to measure extent of wear and erosion and to note general condition of pump.
- (f) Duplicate runs under (a) and (b) to determine loss of volumetric efficiency, mechanical efficiency and capacity due to wear (see 4.2.8. 2).
- (g) Shock test (see 4.3.10.1).

MIL-P-19131(SHIPS)

4.2.8.1 The life test shall consist of a run of 50 hours' continuous duration using a mixture of 1 percent fuel oil and 99 percent fresh water, temperature about 100° F., at rated discharge pressure of the "pump and with a suction lift of 5 inches mercury, at the maximum rated speed of pump under test (see 3.3.8.9.1.1)

4.2.8.2 A comparison of the mechanical and volumetric efficiencies and the capacity of the pump before and after the life test. shall be made to determine loss in efficiencies and capacity due to the life test. If such comparison shows that the efficiencies or capacity of the pump have not been excessively reduced in comparison, with other pumps of the type designed for the same service, and if the wear on any parts indicates that it will not result in complete failure of the pump, the unit will be considered suitable for use in Government service provided all other requirements of this specification are complied with. If, however, during the test, complete failure occurs for any reason, the unit will be rejected.

4.3 Performance acceptance tests. -

4.3.1 The driving unit shall be tested as required by the applicable specifications for motors.

4.3.2 One class 0-2 and N-2 pump of each size and design as selected by the Government inspector, complete, including the turbine or the motor and controller, and reduction gear, if any, shall be given a test to determine the overall power or steam consumption of the unit under the conditions of the contract. This test may be conducted at the shop of the main contractor or subcontractor as arranged with the bureau or agency concerned. The test ordinarily shall be conducted at the same time as, and shall include, the inclined operation requirements as specified for the driving units; (see Specifications MIL-T- 17060 and MIL-M- 17413), For inclined operation tests, the unit need not be fully loaded, but shall be run at maximum operating speed and loaded sufficiently to prevent damage to the unit. The functioning of the speed governors of turbine driven pumps shall be carefully observed during these tests, and all adjustments that may be necessary to insure operation satisfactory to the bureau or agency concerned at all normal speeds shall be made before the units are accepted, The turbine governors shall function as specified in Specification MIL- T- 17523. When pump pressure regulating governors are specified, (see 6. 1) the foregoing test procedure shall apply also to this equipment. In this test the ability of the pump to handle its rated capacity of specified liquid at all specified viscosities and with maximum specified suction lift for the viscosity of the liquid being handled shall be adequately demonstrated.

MIL-P-19131(SHIPS)

4. 3.3 Routine tests. -

4.3.3.1 Each class N-2 and class O-3 pump, except the pump tested as required by 4.3.2, shall be tested on order to determine its ability to deliver rated capacity of specified liquid at the minimum specified viscosity against rated discharge pressure and with the suction lift specified for the minimum viscosity. This test shall be of sufficient duration to indicate to the representative of the bureau or agency concerned that the specified characteristics have been met.

4.3.3.2 Each class H-2 and class O-2. pump, except the pump tested as required by 4.3.2, shall be tested at rated speed for a continuous nonstop run of at least 30 minutes. While running at this speed the pump need not handle load as this test is to insure proper. alignment and balance.

4.3.3.3 The tests specified in 4.3. 3.1 and 4.3.3.2 may be conducted without the contract driving units, provided the contract driving units, including reduction gears, if used, have been independently tested as specified in 4.3.1.

4.3.3.4 All rotors, shafts and timing gears, including repair rotating elements for class N-2 and class O-2 pumps, shall be tested for smoothness of running at all speeds including maximum rated speed.

4.3.4 Selective tests. -

4.3.4.1 Sampling.- Class N-4 and class O-3 pumps shall be selected in accordance with table IV by the representative of the bureau or agency concerned for tests in accordance with 4.3.4.3 to 4.3.4. 5, inclusive.

MIL-P-19131(SHIPS)

4.3.4.2 **Lot.-** A lot shall consist of a group of pumps of the same type and class having the same characteristics produced under uniform conditions over a short period of time.

Table IV - Sampling for selective tests.

Number of pumps in the lot	Minimum number of pumps to be tested
2 or 3	2
4 to 8, incl.	3
9 to 15,	4
5 to 25, incl.	5
26 to 40, incl.	6
41 to 65, incl.	8
66 to 110, incl.	10
111 to 180, incl.	13
181 to 300, incl.	17
301 to 500, incl.	22
501 and over	1

¹1 out of each 20 produced.:

4.3.4.3 Each selected pump shall be subjected to a thorough examination to ascertain that the material, workmanship and design are in conformance with this specification.

4.3.4.4 Each selected pump shall be tested in order to determine its ability to deliver rated capacity of specified liquid at the minimum specified viscosity against rated discharge pressure and with the suction lift specified for the minimum viscosity. This test shall be of sufficient duration to indicate to the representative of the bureau or agency concerned that the specified characteristics have been met.

4.3.4.5 Means shall be provided by the contractor to drive the selected pump at the speeds necessary for these tests,

MIL-P-19131(SHIPS)

4.3.4.6 If any selected pump is found not to conform to this specification, the lot which it represents shall be rejected. A rejected lot may be resubmitted for selective tests provided the manufacturer, after having been informed of the reason for rejection, has inspected or tested each pump in the lot for deficiencies noted and has removed all nonconforming units.

4.3.5 Sufficient data shall be taken during the tests of 4.3.1, 4.3.2 and 4.3.3 to prepare pump characteristic curves as specified curves as specified below. The curves shall be corrected in all cases to the steam or the electric power operating conditions specified in the contract or order. Complete operating characteristics of the pump and its driver, as specified in the contract or order, as well as the operating characteristics of the unit during the particular test run, shall be shown on each curve sheet. The capacity shall be expressed in gallons per minute, the discharge pressure in pounds per square inch gage, the suction lift in inches of mercury, the viscosity in Saybolt seconds universal (unless otherwise specified in the contract or order) and the speed in revolutions per minute. Curves shall be furnished as follows:

- (a) At least two curves of capacity versus pump speed at constant specified discharge pressure and at constant specified maximum suction lift when handling specified liquids as follows:
 - (1) One curve at maximum specified viscosity.
 - (2) One curve at minimum specified viscosity.
 - (3) One curve at each intermediate viscosity that may be specified in the contract or order.
- (b) A curve of capacity-versus pump mechanical efficiency for each of the curves obtained under item (a),
- (c) A curve of capacity versus volumetric efficiency for each of the curves obtained under item (a).
- (d) A curve of capacity versus horsepower input to the pump for each of the curves obtained under item (a).
- (e) A curve of capacity versus power input to the driving unit, expressed in pounds of steam per hour or electrical horsepower as applicable, for each of the curves obtained under item (a).
- (f) One curve of capacity versus suction lift at specified maximum discharge pressure and at rated speed for each of the viscosity values specified in item (a).
- (g) In the event that two or more rated capacities are specified, a set of curves, which are required by subparagraphs (a) to (f) inclusive, shall be furnished for each specified rated capacity.

MIL-P-19131(SHIPS)

4.3.6 An exception to 4.3.5 will be permitted in the case of pumps driven by single speed alternating current motors in which case the pump may be run at constant speed and a curve of capacity versus pump discharge pressure submitted in lieu of the curves required under item (a). The curves of efficiencies and power shall be plotted versus discharge pressure in lieu of versus capacity as required under items (b), (c), (d) and (e).

4.3.7 In order to simplify the foregoing test procedure, the Bureau of Ships when requested, may authorize separate tests of the driving unit (including reduction gear, if any), and pump at the works of different manufacturers and will accept overall power or steam-consumption results and characteristics curves computed from the results thereof. However, this shall not be construed in any way to release the primary contractor from an operating run on one completely assembled unit from each contract or contracts for identical units. This operating test shall be run with the unit fully loaded, and shall demonstrate compliance with all requirements of this specification as to operation of constant pressure and turbine governors, thrust, balance, lubrication, at maximum rated speed.

4.3.8 The capacity of the pump (selected as specified in 4.3.2) may be determined by any convenient method that will insure obtaining results with probable errors not greater than 2 percent. All gages shall be calibrated before and after the tests or oftener, if necessary. The specified viscosities shall be maintained within 5 percent regardless of temperatures.

4.3.9 Reports. -

4.3.9.1 Complete performance acceptance test reports, including copies of recorded test data and characteristic curves plotted therefrom and covering the following shall be furnished as specified in 4.3.9.2:

- (a) Test report of driving unit.
- (b) Test report of controller (if involved).
- (c) Test report of pump.
- (d) Test report on the combined assembled unit, including a definite report on the suitability of the driving unit (and controller or pressure regulating governor, if furnished) for its specific application and harmony of assembly of all independent units going to make up the complete equipment.

MIL-P-19131(SHIPS)

4.3.9.2 The reports specified in 4.3.9.1 shall be distributed as follows:

- (a) Three to the bureau or agency concerned (to be forwarded via the cognizant inspector).
- (b) One for primary district inspection office.
- (c) One for branch inspection office (If any).
- (d) Two to each supervisor of shipbuilding concerned (one for supervisor's files, the other for the shipbuilder).
- (e) One to the Commander of each ship building yard concerned, for Navy yard built ships, when specified in the contract or order.

4.3.10 Shock tests. -

4.3.10.1 One complete pumping unit of each type, design and size on contract or order shall be subjected to the high impact shock test of Specification MIL-S-901 as specified in 3.3.2. Class N-4 and Q-30 pumps which are attached to the units served need not be shock tested separately from the units to which they are attached.

4.3.10.2 Shock tests will be conducted at the manufacturer's plant. Where a manufacturer is unable to conduct these tests at his own plant, he may arrange to have them conducted at a commercial laboratory, or Government laboratory suitably equipped to conduct tests. Where shock tests are conducted at a Government laboratory, copies of the applicable master drawings shall accompany the units.

4.3.10.3 All pump units shall be shock tested with drivers unless otherwise approved by the bureau or agency concerned. Flexible coupled pumps shock tested with one driver will not be required to be shock tested again when supplied with a different driver. Prime movers are subject to shock tests in accordance with the applicable equipment specifications.

4.3.10.4 Compliance with shock resistance requirements may be covered by test of a similar unit subject to bureau or agency concerned approval.

4.3.10.5 Equipment previously shock tested and accepted will not be required to be retested for shock except when evidence of low shock resistance develops in the units installed. The bureau or agency concerned will initiate action with the manufacturer for correction of deficiencies, and may require shock tests at any time.

MIL-P-19131(SHIPS)

4.3.10.6 The pump unit shall be considered to have failed to pass the shock tests in the event of any of the following:

- (a) Breakage of any parts, including mounting bolts.
- (b) Appreciable distortion or dislocation of any part, such as shaft, mounting feet, bearings.
- (c) A mechanical unbalance of more than two times the amplitude of unbalance measured prior to tests at rated speed, or more than that permitted by the specifications for the driver.

4.3.10.6.1 Pump units which have been subjected to the high-impact shock test and have failed to conform to the requirements of this specification will not be acceptable.

4.3. 10.7 Pump units which have been subjected to the high-impact shock test and have successfully passed this test shall be considered acceptable for such service as the bureau or agency concerned may authorize. Such equipment shall be reconditioned by the manufacturer as follows:

- (a) Minor deformations of mounting flanges shall be corrected.
- (b) Minor deformations-affecting alignment shall be corrected.
- (c) All bearing shall be replaced.
- (d) Each part shall be carefully examined by the contractor and any part which he considers substandard shall be replaced,

Minor deformations shall be defined as those which do not cause unqualified rejection of the design under high-impact shock test but which are in excess of the design dimensional tolerances specified on the applicable pump drawings.

4.3. 10.8 Performance acceptance test and shock test of attached pumps, class N-4 and class O- 3, shall be conducted in conjunction with the tests of the equipment which they serve.

4.4 Hydrostatic tests. - Each pump casing shall be tested hydrostatically to one and one-half times the maximum rated discharge pressure, but in no case less than 50 p.s. L A light grade of mineral oil, not exceeding 200 secon Saybolt universal (at 130° F.) may be used for hydrostatic tests.

4.5 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

MIL-P-19131(SHIPS)

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking shall be in accordance with Specification MIL-P- 16789 and as specified (see 6. 1).

5.2 When specified (see &1) onboard repair parts and tools shall be furnished in onboard repair part boxes conforming to type M or type W of Specification MIL-B-233. Type "W" boxes shall be fitted with nonmagnetic hardware throughout.

6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

- (a) Title, number, and date of this specification,
- (b) Installation:
 - (1) Horizontal OR vertical mounting.
 - (2) If vertical, whether base mounted or table mounted.
 - (3) Size of the inlet and outlet connections or a statement that these shall be as approved by the bureau or agency concerned.
 - (4) Limits of length, width, and height for disassembly of unit for normal maintenance overhaul, if limits are required for particular installation.,
 - (5) A statement as to the location of inlet and outlet connections.
- (c) Pump characteristics:
 - (1) Rated capacity.
 - (2') Discharge pressure.
 - (3) Suction lift.
 - (4) Characteristics of liquid:
 - (a) Viscosities.
 - (b) Liquid temperatures.
- (d) Type drive.
- (e) Turbine characteristics (for turbine drive):
 - (1) Type of connection to driven unit.
 - (2) Steam conditions (pressure and temperature) at the throttle and the maximum designed boiler steam drum pressure of the installation for which the turbine is intended.
 - (3) Exhaust conditions (pressure or vacuum) at turbine exhaust.

MIL-P-19131(SHIPS)

- (f) Electrical characteristics (for motor drive):
 - (1) Voltage, phase characteristics and frequency.
 - (2) Service class.
 - (3) Ambient temperature.
 - (4) Duty.
 - (5) Enclosure.
 - (6) Winding (d. c.) or design of motors (a, c,).
 - (7) Bearings.
 - (8) Insulation.
- (g) Internal combustion engine characteristics (for engine drive),
- (h) A complete list of all items of equipment, not essentially parts of the pump, which the pump contractor is required to furnish. Usual mention should be made in such a list of repair parts and tools. The following items should be considered also if it is required to have the pump manufacturer or contractor supply them:
 - (1) Relief valves or relief by-pass valve.
 - (2) Drain valves.
 - (3) Suction and discharge valves.
 - (4) Pressure vacuum or combined gages.
 - (5) Thermometers and thermometer sockets.
 - (6) Permanently connected revolution indicators.
 - (7) Air or vent valves and cocks,
 - (8) Motor controllers.
 - (9) Pressure regulating governors.
 - (10) Number of technical manuals required.
- (i) Type of preservation and packing required and type of onboard repair parts boxes (type. M or type W of Specification MIL-B-233), if required (see 5. 2).
- (j) Data required with bids.

6.2 With respect to products requiring qualification, awards will be made only for such products as have, prior to the bid opening date, been tested and approved for inclusion in Qualified Products List QPL-19 131, whether or not such products have actually been so listed by that date. Manufacturers are urged to communicate with the Chief of the Bureau of Ships, Department of the Navy, Washington 25, D. C. and arrange to have the products that they propose to offer tested for qualification.

6.3 This specification supersedes that part of Section S47-3 of the General Specifications for Machinery covering pumps for class N-2, N-4, O-2, O-3 services.

MIL-P-19131(SHIPS)

Patent notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation *whatsoever*; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

Bureau of Ships

MIL-P-19131(SHIPS)

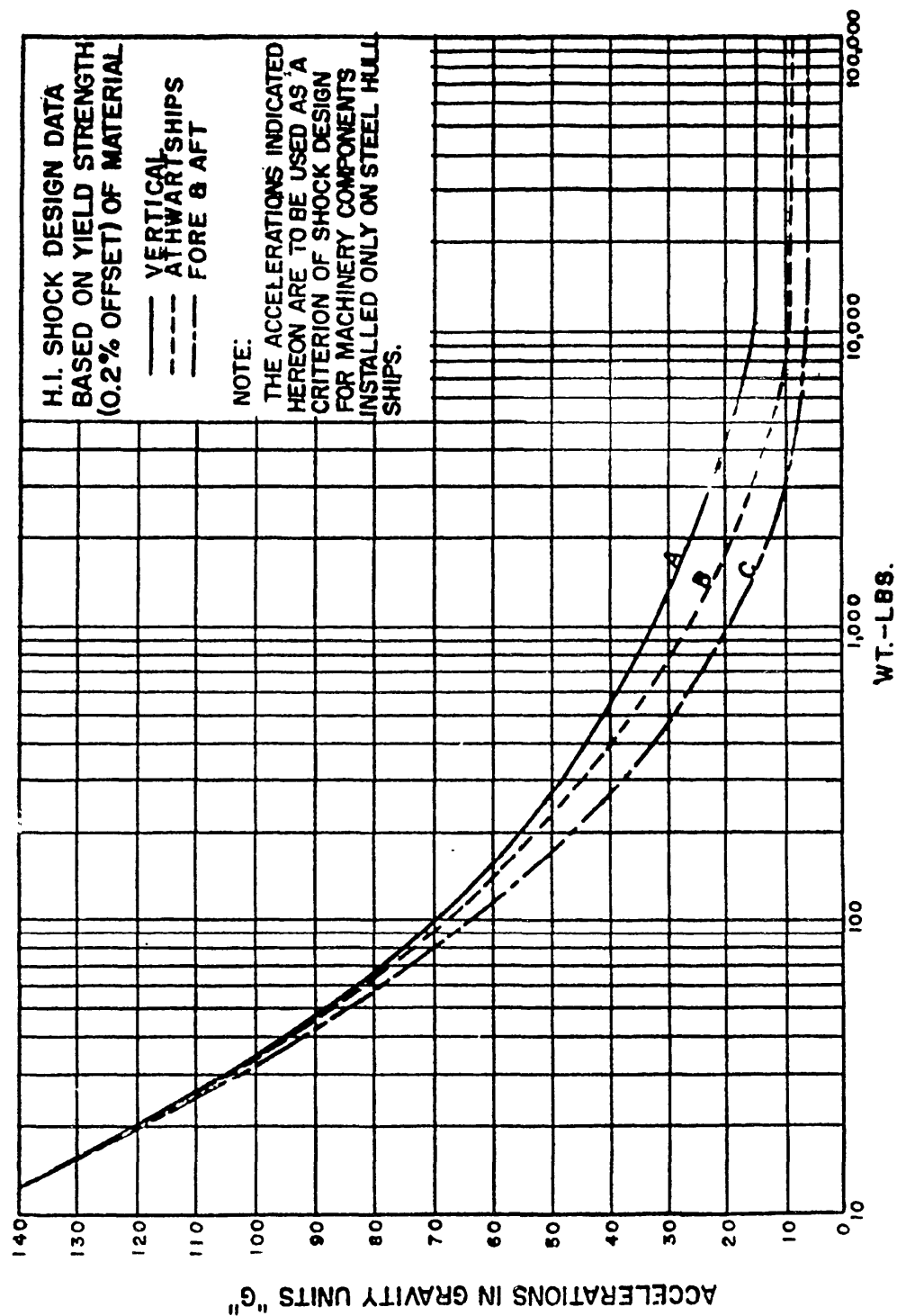


Figure 1.—H.I. Shock design data.

B 4 5 7 7 8

SH 491

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<p style="text-align: center;">INSTRUCTIONS</p> <p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).</p>		
SPECIFICATION		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

FOLD

DEPARTMENT OF THE NAVY

POSTAGE AND FEES PAID
NAVY DEPARTMENT

OFFICIAL BUSINESS

Commander
Naval Ship Engineering Center
Attn: Code 6034
Department of the Navy
Washington, D. C. 20360

FOLD

PLATE NO. 15419 (BA